INESCPORTO
INSTITUTO DE ENGENHARIA DE SISTEMAS
E COMPUTADORES DO PORTO
LABORATÓRIO ASSOCIADO

INESC PORTO
ASSOCIATE LABORATORY

ACTIVITY REPORT 2011
AS REQUESTED BY FCT
http://www.fct.mctes.pt/fctsig/

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INESCPORTO
LABORATÓRIO ASSOCIADO

ÍNDICE

1 Main Page

as in http://www.fct.mctes.pt/fctsig/

Relatório Científico 2011 - Página de Rosto

Na lista de opções (menu) desta página poderá encontrar um conjunto de links para as diversas páginas do formulário que deve preencher, bem como a página "Lacrar" (Lock), a qual, uma vez cumpridos os requisitos mínimos, lhe permitirá dar por concluído esse preenchimento.

2 Objectives and Achievements

This part of the report will allow you to describe the way in which the Unit or the LA is organized and managed, to give the general objectives of the research within the Unit or the LA and finally to give a brief description of the main achievements of the research carried out as a whole during the 2011 period. A maximum number of characters (without spaces) are allowed in each field. If the number of characters exceeds the maximum you will not be able to complete the form and an error message will appear when you try to save your work

2.1 Unit Description (3000 ca.)

Here indicate form of organization and management

IMPORTANT FOREWORD

INESC TEC is forced to report its activities in the rigid format of this online form, which is not adequate to describe the organization. Therefore, this report cannot be understood as an accurate description of activities. INESC TEC strongly objects to this format and the impossibility to report correctly its activities.

The site http://profile.inescporto.pt/ includes charts, comparisons 2002-2007 and data from 2008 to 2011, some presentations in power point form and other material relevant to the understanding of all the dimensions of activity of the LA.

This FCT report format assumes that the generic organization of an Associate Lab is based on “research groups” per scientific area, with multi-disciplinarity at the "research line" level. This is not the case with INESC TEC, which is organized in multi-disciplinary Units. In a Unit, one may find a blend of several skills or scientific knowledge in distinct areas, as required for technology transfer.

When examining this report, please note that:

a) The Section Research Groups is used to refer to our Research Units with a scientific multidisciplinary profile

b) The Section Research Lines is used just to refer to a second tier of interdisciplinary activities.

A descriptive site for INESC Porto: http://www.inescporto.pt.

A monthly news bulletin is http://bip.inescporto.pt.

The associate Units have their own sites:

LIAAD: http://www.liaad.up.pt/

CRACS: http://cracs.fc.up.pt/

CISTER: http://www.cister.isep.ipp.pt/

HASLab: http://haslab.di.uminho.pt/

MANAGEMENT

In 2011, INESC TEC was recognized as an Associate Laboratory. It is composed of 8 Units hosted by INESC Porto, one of which actually is in the University of Minho, plus 4 autonomous Associate Units. INESC Porto is a private non-profit institution with the following associates: University of Porto (62%), INESC (36%), IPP (2%).

INESC Porto acts as the coordinating entity for INESC TEC. The General Council of INESC Porto appoints the BD - Board of Directors for a 2-year mandate. It is organized in a Dpt. of Information and Logistics (DIL) and 5 Support Services (Communications and Informatics, Media, Informatics for Management, Building Manag., Lab and Workshop Service). Under DIL other services exist (juridical, human resources, accounting and treasury, project manag.). The BD meets every other week in the Units Council (UC) with Unit Coordinators (including Associates), DIL and support services. Decisions are collectively discussed and policies deployed through the UC mechanism. Processes of delegation of responsibility are also in place. The INESC Porto Units have independent executive management and complete scientific autonomy. The pool of resources is under common management and the solidarity among groups is a rule. The BD of INESC Porto has put in place the necessary set of regulations applying to the different statutes of researchers, working conditions, careers and rewards, and performance evaluation.

The Associate Units (LIAAD, CRACS, UGEI, CISTER, plus the special case of HASLab) have independence of governance and autonomy of decision but they must however coordinate their scientific policy with one another and INESC Porto under the INESC TEC framework. As some of them are hosted in other institutions, they sometimes depend or local administrative staff while others are already integrated in administrative terms within INESC Porto.

The Scientific Council (SC) has representatives of the Units plus 3 members appointed by the BD.

The Scientific Advisory Board (SAB) is composed of invited high-profile international scientists and is now common to the entire INESC TEC.

2.2 General Objectives (3000 ca.)

This refers to the current aims of the Unit or LA as a whole

MISSION

INESC TEC extends the original mission of INESC Porto, which was created with the complementary objectives of developing high level scientific research and acting as an effective interface between university and economic agents and/or public administration. So, INESC TEC has activity both in Science and in Technology Transfer. In this respect, INESC TEC champions and has nurtured and evolved a technology transfer model different from other research institutions in Portugal, and which is also uncommon worldwide.

DOUBLE ROLE

INESC TEC, with INESC Porto as the coordinating entity, is recognized by the Ministry of Science as an Associate Laboratory within the Science and Technology System of Portugal. At the same time, INESC Porto is also a Technological Infra-structure recognized by the Ministry of Economy and Innovation.

This double character means that its mission is not limited to scientific research but extends to the assistance of economic agents and public administration and institutions in general, through technology transfer and innovation as well as highly specialized consultancy.

INESC TEC also promotes spin-off and spin-out companies, hosting them during an early-stage pre-incubation phase and often participates in their capital.The profile of its researchers, therefore, reflects the large spectrum of responsibilities incurred in by the Associate Laboratory.

This means that the evaluation of the output and productivity must comply with all items identified in the Decree-Law 125/99, Art. 29 and cannot be condensed on an isolated "paper counting". For this exercise, one must take in account that a fraction of the research body is devoted to technology transfer. In this respect, the role and model of INESC TEC displays high similarities with the Fraunhofer Institutes in Germany.

STRATEGIC CONCEPT

INESC TEC embodies the concept of knowledge-to-value production chain: FROM KNOWLEDGE PRODUCTION TO SCIENCE-BASED INNOVATION. The working organization obeys to the concept of smooth integration of knowledge producers (creating science) with developers (producing applications) and of these with appliers (transferring to industry, generating spin-off companies, etc.). Therefore, the profile of a typical Unit in INESC TEC includes all these components and is a more effective integration than the one achieved with the research lines.

Research projects generate new knowledge and excellence at the international level: post graduate theses and papers are published. Projects in tandem move knowledge along the chain: prototypes are developed and relationship with industry is strengthened. New projects are designed, materializing the value of innovation at the end of the chain: technology transfer, licensing. Eventually, new spin-off companies are incubated and launched.

This is done with a careful blending of scientists from the University with full time contracted researchers and full time contracted professionals – engineers, mathematicians, economists, physicists. And this is supported by a highly qualified staff in project management, juridical, public relations, human resources.

2.3 Main Achievements during the year of 2011 (3000 ca.)

Highlights from past research over the reported period.

The elements reported below relate to the criteria defined in Art. 29 of the Decree-Law 125/99 from April 20, under which an Associate Lab activity must be evaluated.

SCIENCE AND TECHNOLOGY RESULTS AND EFFICIENCY

New record number of 203 papers published in international journals (119 in 2010) and record total number of 595 publications in journals, book chapters and international conferences (386 in 2009).

New record number of 27 PhD theses completed by INESC TEC researchers.

Record turnover of about 14 million Euro with a yearly financing from FCT of 1.7 million Euro only (multiplying factor of 8)

Specific scientific results are reported by each RG in the corresponding sections. The space provided in this on-line form in insufficient to describe the achievement of an organization as large as INESC TEC.

DIRECT R&D CONTRACTS AND CONSULTING

R&D advanced services and consulting, in direct contracts with national and international industry, represented about 40% of the income in project activity.

7 proposals for spin-off business were studied and entered a coaching process.

CONTRIBUTION TO NATIONAL SCIENCE AND TECHNOLOGY POLICIES

Research results finding application in tech transfer in industry

E-Government projects contribution to management of municipalities and regions

Exporting technology (e.g., robotics)

INTERNATIONALIZATION/WORLD RECOGNITION

Large no. of papers co-authored with researchers from foreign institutions

Exporting technology and consultancy: contracts with Embraer (Br), DoE/Argonne NL (USA) and other prestigious organizations in Europe and Brazil

28 European projects simultaneously run.

35% of project activity income derives from international activity

50 grantees from foreign countries, most of them PhD students

Projects with top USA Universities: CMU, MIT and UT Austin – CMU sends PhD students to INESC Porto

INESC TEC in Brazil with increasing project activity – 7 large projects run.
1 IEEE Fellow with permanent link, other IEEE Fellows with regular collaboration.

QUALITY OF MANAGEMENT AND ORGANIZATION

The quality of the management and support services has been externally considered exceptional. INESC Porto won the 1st Prize in the "Novo Norte Inovador" contest in 2011, promoted by the Regional Coordination and Development Commission, for its relevant contributions in the portuguese system of innovation.

Record turnover of 14 million Euro in 2011.

INESC TEC managed in 2001 circa 600 researchers, with 200 holding a Doctoral degree.

COOPERATION WITH OTHER INSTITUTIONS

A large body of evidence shows that the cooperation with other institutions is very strong.

In 2011, INESC TEC has expanded forming two new poles: at the School of Engineering of the Polytechnic Institute of Porto and at the University of Minho. It has cooperation agreements with a number of schools of the national polytechnic system.

It run an on-going project to build a Centre of Knowledge for Sustainable Energy (including investment of about €3.5 M in 2010-2012).

The cooperation with CMU, MIT and UTexas Austin was promoted to a stronger level with joint projects and activities. The cooperation with Brazilian Universities was kept at a high level.

DISSEMINATION OF RESULTS

External impact (national and international) of INESC Porto Bulletin BIP (read in 58 countries, 265 visits on average per day in 2011).
Record number of 476 papers in international conferences in 2011.

3 Activities

This part of the report will allow you to describe general activities of the Unit or the LA that are aimed at integrating the research of various groups of which multidisciplinary and/or trans-disciplinary activities are of particular relevance. The second part is aimed to describe work that the Unit or the LA does to extend beyond the scientific environment and to reach the general public, schools or other forms of engaging the public in the work of the Unit or the LA.

3.1 Integrative/multidisciplinary activities during the year of 2011 (3000 ca.)

Special activities that aim to carry out research across disciplines.

According to the reports of our Scientific Advisory Board, the successes of INESC Porto are centred at its ability to bring "on-demand" to the technology transfer activities an effective blend of engineering disciplines. This is achieved because its Research Groups are formed and run under the concept of being multi-disciplinary. Therefore, for INESC TEC the need for a special reporting section to declare activities aiming to stimulate and carry out research across disciplines is somewhat redundant.

Furthermore, an important number of projects gather together resources from different groups, as it may be observed in the activity reports of each group.

To enhance cross-communication, several Groups organize a regular (weekly or bi-weekly) series of scientific discussion meetings, which receive the name of “Lab Meetings”. The most active are on Telecommunications, Power Systems, Optoelectronics and Technology Transfer.

The Board of Directors (BD) also promotes, with the supervision of the Scientific Council and under the recommendation of the Scientific Advisory Board, a strain of activities denoted LAI (Inter-unit Action Lines).

A LAI is a coherent scientific or technological domain that cuts across INESC Porto organization and promotes scientific discussion, workshops, exchange of experience and ideas in an organized fashion. To support this activity, the BD defined a set of supporting measures including guaranteeing a base budget to each self-organized LAI. The Scientific Council manages the recognition of each LAI proposal and monitors its activity. There are scientific and activity targets that must be met in order to maintain the recognition of a LAI. LAIs in Optimization or in Machine Learning and Signal Processing are examples of this.

This structuring of scientific coordination cross-groups is built over an increasing number of projects being tackled by 2 or more Groups is consortium. A growing number of examples can be found in 2011, either in European projects or in direct research contracts with industry, e.g., joining power systems and telecommunications, manufacturing engineering systems with information systems, telecommunications with optoelectronics, power systems with artificial intelligence, manufacturing engineering systems with management and industrial engineering, telecommunications with robotics, etc.

This multidisciplinary integration encompasses all Units (INESC Porto and Associate).

The constitution of a new Centre of Knowledge for Sustainable Energy is a new organized effort to support research across disciplines. In 2010 the approval of funding was obtained, and in 2011 the works began for the erection of a new building next to INESC Porto headquarters. Also, INESC TEC is providing support for the Associate Unit CISTER to move into a new building, improving considerably the working conditions including cross-cooperation.

3.2 Outreach activities during the year of 2011 (3000 ca.)

Science and Society/general public/schools, etc.

INESC TEC gives great importance to communication with citizens. In 2011 this activity followed the general trend of recent years:

- The Communication Service (SCom) includes three specialists with post-graduation in Media and Communication and in Translation. It originated 192 (112 in 2010) news items from press releases. Monitoring in 2010 identified a total of 385 news items regarding INESC Porto/INESC TEC in the main Portuguese media – plus 11 in internacional media.
- The SCom, among other duties, runs a digital monthly Bulletin (BIP, http://bip.inescporto.pt/) in Portuguese, with news on science and projects developed, that reaches a vast community of readers in Portugal and Brazil. A version of BIP in English (http://bip.inescporto.pt/en) is also published every 3 months.
- AWStats provided a counting of accesses to BIP. In the first half of 2011, the Bulletin had visits from 106 countries, the top being Portugal, USA, Germany, Russia, Brazil, Czech Republic, Ukraine, China, Sweden and Japan, with a total number of about 400,000 pages viewed, an average of more than 2000 per day.
- INESC TEC developed a consistent action of presence in the civil society with participation in a diversity of events and initiatives. As a consequence, experts from INESC Porto are regularly interviewed by TV and radio stations (beside the press) on the hot topics that the society is debating.
- INESC Porto, the coordinator of INESC TEC, is one of the partners of the Ciência Viva (CV) association whose aim is to promote science among youth. It has regularly cooperated with the CV initiatives, namely in the annual programs to receive students from secondary schools for short periods of time in its laboratories. Also, a member of the Board of Directors is a member of the Scientific Advisory Board of the Ciência Viva Center of Bragança.
- INESC TEC also participated in several national Exhibitions (e.g. Forum do Mar), and supported to the University of Porto annual event as well as the Engineering and Sciences Faculties Open Days.
- The SCom also organised diverse external and internal initiatives.
- Public talks and lectures were given by the senior members of INESC TEC in various locations, in secondary schools and in Civic Associations, beside scientific and technical meetings.

4 Funding

In this section include funding details during the reporting period. In the item LA FCT include the total sum of the Base+Programmatic funding of the Associate Laboratory.

	2007	2008	2009	2010	2011	Total
LA FCT	1.250.000,00	1.447.500,00	1.971.592,05	1.662.516,74	**1.881.169,05**	
Projects FCT	243.958,00	464.320,00	499.951,10	890.350,00	**2.028.596,36**	
Other National	1.343.667,00	998.469,00	381.029,90	1.509.648,00	**1.744.188**	
Other International	1.417.767,00	1.191.549,00	871.931,86	1.319.043,00	**1.838.738,1**	
National Industry	1.409.480,00	1.636.454,00	2.228.402,57	2.126.473,00	**1.895.042**	
International Industry	96.110,00	155.477,00	374.263,20	533.351,00	**617.560**	
Total	**5.760.982,00**	**5.893.769,00**	**6.327.170,68**	**8.041.381,74**	**10.005.293,51**	

5 General Indicators

This section is designed to provide information regarding the researchers and the technical personnel hired, and the total number of completed PhDs thesis during the reported period.

5.1 Composition and Training

In this section indicate the number of researchers that the LA intended to hire during the reporting period based on the original contract with the FCT and those whose contract started in the reporting period. In the Balance indicate the result per year as +1 (in the case that hired one more that expected) or -1 (in the case hired one less that expected) and so on. Include also the researchers hired through the Ciência Programme and the total number of integrated Researchers with PhD and the PhD or Mater thesis completed in the period.

	2007	2008	2009	2010	2011	Total
Nº of Researchers Proposed	0	0	0	0	**0**	
Nº Researchers Hired (LA)	4	0	1	2	**1**	
Balance	4	0	1	2	**0**	
No. of Researchers Hired (Ciência Programme)	0	0	9	0	**0**	
No. of Researchers integrated with PhD	692	0	102	111	**201**	
Training PhDs (PhD thesis completed	93	0	15	23	**27**	

(*) Number of eligible integrated researchers holding a doctoral degree.

5.2 Researchers hired

In this section indicate the individual researchers hired in the period by introducing the association key (previously named as public key), their starting date and if applicable their finishing date. In case the researchers also hold a part-time position at another institution (teaching at University or Polytechnic) also indicate this in Other Institution.

Warning: Dates must be in the dd-mm-aaaa format.

Nome	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Other Institution
Yannick PHULPIN	01/01/2011	30/11/2011	

5.3 Technical Personnel Hired

In this section indicate individual technical personal hired. To do so all personal must be registered at the FCT and have an association key.

Warning: Dates must be in the dd-mm-aaaa format.

Nome	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Other Institution

5.4 Additional Comments

In this space you can provide any additional information regarding the section General Indicators

COMMENTS TO THE FUNDING TABLE

This table includes the funding obtained from public sources, national (e.g. FCT, QREN) and international (e.g. European Commision), as a sum of all contributions received by all Units in the INESC TEC Associate Laboratory.

However, the lines related to Industry (both national and international) are only indicative and refer to the activity exclusively conducted by the Unit INESC Porto. The resources obtained from industry contracted research are spread over a diversity of legal entities that host all the Units of INESC TEC and the figure consolidation exercise has not been possible so far with accuracy.

6 Research Groups

In this section of the report you have the names of each Research Group and their Principal Investigators that were indicated in the last report. By following the link in the groups name you will be able to access the individual form of the group.
This list includes the currently active Research Groups as well as the Research Groups reported to be active in the previous year.

Reference	Group Title
RG-Norte-50014-3346	Manufacturing Systems Engineering
RG-Norte-50014-3347	Telecommunications and Multimedia
RG-Norte-50014-3348	Optoelectronics and Electronic Systems
RG-Norte-50014-3349	Power Systems
RG-Norte-50014-3351	Innovation and Technology Transfer
RG-Norte-50014-3406	LIAAD Laboratory of Artificial Intelligence and Decision Support
RG-Norte-50014-3435	Information Systems and Computer Graphics
RG-Norte-50014-3507	CRACS Center for Research in Advanced Computing Systems
RG-Norte-50014-3946	Robotics and Intelligent Systems
RG-Norte-50014-3947	High Assurance Software Laboratory
RG-Norte-50014-3948	UGEI Unidade de Gestão e Engenharia Industrial
RG-Norte-50014-3949	CISTER Centro de Investigação em Sistemas Confiáveis e de Tempo Real

6.1 Group Description - UESP

Research Group Title	MANUFACTURING SYSTEMS ENGINEERING
Principal Investigator	Jorge Manuel Pinho de Sousa
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 61.690,00

European Commission: 576.785,00

QREN: 304.724,00

TOTAL: 943.199,00

6.2 Objectives & Achievements

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 were Prof. Jorge Sousa, together with M.Sc. Luís Carneiro.

OBJECTIVES

The mission of the Manufacturing Systems Engineering Unit can be summarized by the following general goals:

i) to contribute for the performance improvement of industrial companies, through R&D projects, consultancy, technology transfer and training;
ii) to foster high quality research initiatives in the specific areas where the elements of the group have international recognition, and start innovative research programs in new emergent topics;

iii) to transfer the resulting knowledge and technologies to software houses, equipment producers and industrial companies, through applied research, technology transfer and consulting projects.

Along with a strong application focus, the group is committed to conduct high quality research projects. The main activity areas of the group include: Enterprise Collaborative Networks, Operations Management, Decision Support Systems including Production Planning and Cutting and Packing Problems, Transportation Systems and Logistics, Systems Integration, and Consultancy services.

This activity is grounded in research developed around 3 main RESEARCH VECTORS:

1. Collaborative Networks;

2. Optimization and Decision Support;

3. Operations Management and Logistics.

Collaborative Networks: the main topics covered by this research vector are the following:

1. Collaborative Network strategies;

2. Information and Knowledge Management;

3. Decision Support in Collaborative Networks.

Research has been pursued in new collaboration models, supply-chain management, flexibility and decision support systems.
Collaborative business networks form a strong interdisciplinary research area that covers topics such as: supply-chain management; virtual organisations; dynamic capacity management; operations planning and co-ordination; early warning and event management; semantic and technical interoperability; collaborative performance management; life-cycle support of self-forming business networks.

Moreover, the Unit develops research in information and knowledge management in collaborative networks, including topics such as: models for socio-technical analysis, ontologies, collaborative processes, information management and knowledge management in collaborative networks.

Optimization and Decision Support: the main topics covered by this research vector are the following:

1. Combinatorial Optimization and Metaheuristics;

2. Hybrid optimization methods;

3. Cutting and Packing;

4. Planning and Scheduling;

5. Vehicle Routing and Distribution;

6. Optimization in Healthcare.

The main research activity is within the scope of mathematical programming and optimization methods, heuristic techniques and Decision Support Systems.
The Unit has a very strong and well-known group in Operations Research, with consistent research activities for many years, and a regular participation in several national and international associations and initiatives.

Some of these research activities have been framed by nationally funded projects and were developed around several doctoral dissertations. They cover areas such as: Mathematical Programming; Multi-Criteria Decision Analysis; Combinatorial Optimization and Meta-heuristics; Hybridisation of Metaheuristics and exact optimisation methods; Simulation; Decision Support Systems.

Applications cover a broad range of problems, including: planning and scheduling problems; cutting and packing problems; vehicle routing and distribution and layout design.

Operations Management and Logistics: the main topics covered by this research vector are the following:
1. Operations Strategy;

2. Operations Management;

3. Performance management;

4. Layouts design;

5. Supply Chain Management;

6. Logistics.

The research of the group is focused on the design and development of models and innovative techniques for operations management and logistics, including the definition of strategies for the manufacturing of complex and customized products.

6.2.2 Main Achievements (4000 ca)

In total, eight European projects were active during 2011. An important critical mass has been achieved in the fields of Enterprise Collaboration Networks and Operations Management. Moreover the very active participation in the Manufuture and Footwear European Technology Platforms allowed the establishment of important partnerships at a European level.

During 2011 the following important achievements can be highlighted:

• The Unit has coordinated the Net-Challenge European project, aiming at the design, development and validation of an integrated framework consisting of a methodology, reference collaboration

processes and an ICT platform to support SMEs in the creation and management of non-hierarchical networks for complex products manufacturing. The design and development of the framework was completed and its validation was started. The Unit was responsible for the overall system design and for the collaborative planning and performance management decision support tools.

• In the VFF (Virtual Factory Framework) project, a new framework was designed and developed, to define and implement hierarchic and compound performance measurement systems.

• In the H-Know project, an innovative methodology and an ICT platform have been developed, to support knowledge and information management and to promote collaboration in business communities from the construction sector.

• In the Autogration project (Assisting SMEs to participate in global digital supply chains in the automotive sector in the Single Market) INESC Porto was responsible for the design and development of an infrastructure to facilitate the integration of SMEs in the digital automotive supply chain. This new concept is supported by an efficient, simplified interface with the SME ERPs, facilitating the electronic integration of these companies in the supply network.

• A project was launched to design a new approach to allow SMEs to participate in the global digital food chain, similarly to the Autogration project. This project will start in January 2012 with the direct support from the European Commission.

• An innovative methodology and a decision support system have been designed by the European project Fit4U, to support the balancing of production lines for customized fashion products.

• A new concept and several tools to support managing footwear supply networks, based on the use of RFID technology, have been developed in the scope of the Shoe-ID national project. This has been complemented by a system to support sales forecasting.

• The multi-objective optimisation “scheduler”, developed by INESC Porto and integrated in the IZARO-GREY system, has been marketed by SOFTI9 and I68 (Spain) with a considerable commercial success. More than 30 licences have already been sold internationally by I68, in countries such as Portugal, Spain, Germany, Austria, Poland, Peru and Brazil.

• A very large national RTD project was launched in the field of Production Technologies, in the scope of the PRODUTECH competitiveness pole. This project includes several research lines, involving intelligent production technologies, support to the design of production systems and internal logistics for customized products environments, production planning and scheduling, factory simulation and new business models for production technologies.

In 2011, 2 PhD theses were successfully finished, 7 papers were published in peer review journals, and 31 in international conference proceedings subject to a refereeing process.

10 papers have been accepted for publication in peer review journals, and 8 out of these are expected to be published during 2012. Due to a significant increase of PhD students in recent years, there are currently 23 on-going doctoral projects, with 4 expected to be concluded during 2012.

During the year, several initiatives have been launched to strengthen the interaction with other research groups within the INESC TEC universe, as reported in other points of this document.

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6.3 Productivity

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 6
The complete list can be consulted in: http://profile.inescporto.pt

Azevedo, A, Almeida, A H, "Factory Templates for Digital Factories Framework", Robotics and Computer-Integrated Manufacturing , 2011.

Castro, P, Oliveira, J F, "Scheduling inspired models for two-dimensional packing problems", European Journal of Operational Research, vol. 215, pp. 45-56, 2011.

Ferreira, R, Silva, J, Strauhs, F, Soares, A L, "Performance Management in Collaborative Networks: a Methodological Proposal". International Journal of Universal Computer Science 17 (6), 2011.

Pedroso, J P, "Metaheuristics for the Asymmetric Hamiltonian Path Problem", Lecture Notes in Computer Science, In I. Dimov et al., editors, Numerical Methods and Applications 2010, LNCS, Heidelberg, vol. 6046, 2011.

Madeira, A C, Carravilla, M A, Oliveira, J F, Costa, C A, "Methodology for Sustainability Evaluation and Reporting in Higher Education Institutions", Higher Education Policy, vol. 24, pp.459-479, 2011.

Rais, A, Viana, A, "Operations Research in Healthcare: A survey", International Transactions in Operational Research, vol. 18, no. 1, pp. 1-31, 2011.

6.3.2 Other international publications (6000 ca.)

Total number of publications: 31
The complete list can be consulted in: http://profile.inescporto.pt

Aguiar, T B, Carravilla, M A, Oliveira, J F, "Vehicle routing for mixed solid waste collection - comparing alternative hierarchical formulations", VII ALIO/EURO Workshop on Applied Combinatorial Optimization, Porto, May 2011.

Albuquerque, A, Soares, A L, "Corporate social networking as an intra-organizational Collaborative Networks manifestation", PRO-VE' 11 - 12th IFIP Working Conference on VIRTUAL ENTERPRISES, São Paulo, Oct 2011.

Almeida, A H, Francisco, R P, Bastos, J, Azevedo, A, Ávila, P, "Performance and risk assessment framework for sustainable networks", BS2011 – 2nd International Conference on Business Sustainability, Póvoa de Varzim, Portugal, June 2011.

Almeida, R O, Toscano, C, Azevedo, A, Carneiro, L, "Collaborative Planning approach for non-hierarchical networks environments", ICE 2011 - 17th International Conference on Concurrent Enterprising, Aachen, Germany, June 2011.

Almeida, R J, Toscano, C, Carneiro, L, Azevedo, A, "Aggregate collaborative planning in non-hierarchical business networks", PRO-VE' 11, São Paulo, Oct 2011.

Azevedo, A, Almeida, A H, Caldas, A G, "Factory Templates: A Decision Support Framework for Manufacturing Processes Management", Actas de CISTI'2011 - Conferência Ibérica de Sistemas e Tecnologias de Informação, Chaves, Portugal, 2011.

Azevedo, A, Bastos, J, Almeida, A H, Soares, C, "Customer-Oriented and Eco-friendly Networks for Health Fashionable Goods - CoReNet Approach", PRO-VE' 11, São Paulo, Oct 2011.

Bastos, J, Almeida, A H, Azevedo, A, Ávila, P, "A Flexibility Reference Model to Achieve Leagility in Virtual Organizations", ViNOrg '11 - First International Conference on Virtual and Networked Organizations Emergent Technologies and Tools, Ofir, Portugal, July 2011.

Bianchi-Aguiar, T, Carravilla, M A, Oliveira, J F, "The Retail Shelf Space Allocation Problem -- a Review", 8th ESICUP - 8th ESICUP Meeting (EURO Special Interest Group on Cutting and Packing), Copenhagen 2011.

Brandão, F, Pedroso. J P, "A complete search method for the relaxed traveling tournament problem", VII ALIO/EURO Workshop, Porto, May 2011.

Carvalho, M, Pedroso. J P, Saraiva, J, "Nash equilibria in electricity markets", VII ALIO/EURO Workshop, Porto, May 2011.

Cunha, P F, Ferreira, P S, Rintala, S, Shamsuzzoha, A, Carneiro, L, "A Framework for Event Management within Networks of SMEs for Complex Products Manufacturing", iCE 2011, Aachen, Germany, June 2011

Ferreira, P, Cunha, C, Sá, A, Carneiro, L, "An approach to performance management in collaborative networks based on stakeholders' key success factors", PRO-VE' 11, São Paulo, Oct 2011.

Francisco, R P, Azevedo, A, Bastos, J B, Almeida, A H, "Using key alignment indicators for evaluating performance in collaborative networks", PRO-VE' 11, São Paulo, Oct 2011.

Gomes, A M, Oliveira, M J, Ferreira, E P, "A multiobjective methaheuristic to the area and distance minimization rectangle packing problem", IFORS 2011 - International Federation of Operational Research Societies (IFORS), Melbourne, 2011.

Junqueira, L, Oliveira, J F, Carravilla, M A, Morabito, R, "An Optimization Model for the Traveling Salesman Problem with Three-dimensional Loading Constraints", VII ALIO/EURO Workshop, Porto, May, 2011.

Neto, T, Constantino, M, Pedroso. J P, Martins, I, "A tree search procedure for forest harvest scheduling problems addressing aspects of habitat availability", VII ALIO/EURO Workshop, Porto, May 2011.

Oliveira, M J, Ferreira, E P, Gomes, A M, "A configurable constructive heuristic to solve the rectangle packing area minimization problem", 8th ESICUP - 8th ESICUP Meeting, Copenhagen, 2011.

Oliveira, J F, Rocha, P F, Gomes, A M, "Heuristic Approaches to the Complete Coverage Path Planning Problem", IFORS 2011, Melbourne, 2011.

Parragh, S, Almada Lobo, B, Sousa, J P, "The dial-a-ride problem with split requests and profits", OR 2011 - International Conference on Operations Research - Sustainable OR 2011, Zurich, 2011.

Parragh, S, Doerner, K F, "Hybridization strategies for routing problems with synchronization constraints", MIC 2011 - 9th Metaheuristics International Conference, Udine, Italy, 2011.

Parragh, S, Schmid, V, "Hybrid large neighborhood search for the dial-a-ride problem", VII ALIO/EURO Workshop, Porto, 2011.

Rocha, P F, Gomes, A M, "A Hierarchical Approach to the Circle Covering Problem", 8th ESICUP - 8th ESICUP Meeting, Copenhagen, 2011.

Rocha, M S, Oliveira, J F, Carravilla, M A, "Insights on the exact resolution of the rostering problem", VII ALIO/EURO Workshop, May 2011.

Santos, N, Pedroso. J P, "A tabu search approach for the hybrid flow shop", VII ALIO/EURO Workshop, Porto, May 2011.

Sousa, J A, Ramos, P, Rebelo, R D, "Previsão de vendas de calçado usando redes neuronais artificiais", ACIM 2011 - XIII Congresso of Accounting and Auditing, Porto, May 2011.

Shamsuzzoha, A, Kankaanpää, T, Carneiro, L, "Collaborative customization strategy based on platform-based product families and white spots", ICE 2011, Aachen, Germany, June 2011.

Shamsuzzoha, A, Kankaanpää, T, Carneiro, L, Helo, P, "Collaborative product design and engineering - prospects for engineer-to-order and customized-to-order production scenarios", PRO-VE' 11, São Paulo, Oct 2011.

Shamsuzzoha, A, Rintala, S, Kankaanpää, T, Luís Carneiro, L, Ferreira, P S, Cunha, P F, "Methodology for Monitoring and Managing The Abnormal Situation (Event) in Non-Hierarchical Business Network", DET2011 - 7th International Conference of Digital Enterprise Technology , Athens, Sep 2011.

Viana, A, Pedroso. J P, "A new MIP based approach for unit commitment in power production planning", VII ALIO/EURO Workshop, Porto, May 2011.

Yevseyva, I, Sousa, J P, Ana Viana, A, "Solving multiobjective flowshop scheduling problems by GRASP with path-relinking", VII ALIO/EURO, Porto, 2011.

6.3.3 Ph.D. thesis completed *(3000 ca.)*

Bruno Prata, Multiobjective metaheuristics for the integrated planning of vehicles and drivers, PhD thesis, April 2011 (supervisors: Teresa Galvão, Jorge Pinho de Sousa).

Hugo Miguel Ferreira, Automatic Plan Generation and Adaptation by Observation: Supporting Complex Human Planning, PhD thesis, Nov 2011 (supervisors: Rui Camacho, João J Pinto Ferreira).

On-going PhD work:

Collaborative Networks

Multi-perspective performance and risk estimation for complex manufacturing network environments, António Almeida.

Semantics in large-scale/complex projects, Cristovão Sousa.

Dynamic supply networks: Models, Organizational Issues and Supporting Technologies, João Bastos.

Flexible information technologies for complex and non-hierarchical supply chain networks, Ricardo Almeida.

Performance Management and Alignment on Collaborative Networks of SME, Roberto Piedade.

Information Management and knowledge sharing in complex projects, Vitor Santos.

Increasing flexibility and collaboration in the automotive supply chain network, Lia Oliveira.

Managing Dynamic Supply Networks through SME Collaboration, Senay Sadic.

Support to the synthesis of New Ideas in Innovation Networks through the Integration of Socio-Semantic Structures, José Augusto Monteiro.

Optimization and Decision Support

Combinatorial Optimization with Metaheuristics, Ana M Rodrigues.

Development and application of an integrated supply chain planning methodology for the coffee idustry, Diana Lopez

Retail Shelf Space Allocation, Teresa Bianchi de Aguiar

Mathematical models and algorithms for forest management, Teresa Neto.

Multiobjective approaches to the rectilinear polygon placement problem, Marisa Oliveira.

Staff scheduling - optimization and heuristic algorithms, Marta Rocha.

Geometrical Models and Algorithms for Nesting Problems, Pedro Rocha.

Multi-agent discrete mathematical programming, Margarida Carvalho.

Operations Management and Logistics

Assessment of the value creation in management models of hospitals – a conceptual framework for a multiobjective and multi-perspective alignment, Ana Simões.

Reconfiguration of facilities and supply networks for higher levels of flexibility, Manuela Azevedo.

Dynamic Vehicle Routing for Demand Responsive Transportation Services, Rui Jorge Gomes.

Simulation and Optimization for Production Planning, Rui Rei.

Supporting the definition of strategies in the configuration of health care supply chains, Nazaré Rego.

Optimization of test and inspection strategies in car tire manufacturing lines by the usage of manufacturing and quality cost models, Michael Donauer.

6.3.4 Patents/prototypes *(2000 ca.)*

- **List of Patents**

Name: Modular multi-ring system for flexible supply of workstation

Developed under the project: CEC-Made-Shoe

Demo Place: Kyaia

Type: International

Approval Date: October 2011

- **List of Prototypes**

Name: Platform for the creation and management of collaborative projects for complex products design and manufacturing

Developed under the project: Net-Challenge

Demo Place: Riopele

Development Period: 2009-2011

Name: Innovative methodology and ICT platform to support knowledge and information management and promote collaboration in business communities from the construction sector

Developed under the project: H-Know

Demo Place: INESC Porto

Development Period: 2009-2011

Name: New framework to define and implement complex (hierarchic and compound) performance measurement systems

Developed under the project: VFF – Virtual Factory Framework

Demo Place: VW - AutoEuropa

Development Period: 2009-2011

Name: A system for reliable exchange of business documents in the automotive industry

Developed under the project: Autogration

Demo Place: INESC Porto, Supply ON

Development Period: 2010-2011

Name: A multi-objective optimization system for production scheduling –updated version enhanced with new functionality

Developed under the project: Izaro Grey

Demo Place: INESC Porto, Softi9

Development Period: 2007-2011

Name: A system for the management of standard technical processes in the construction industry at national level (improved version)

Developed under the project: Parque Escolar

Demo Place: Parque Escolar

Development Period: 2009-2011

Name: Performance management with automated shop floor data collection

Developed under the project: MIB-PET

Demo Place: Inovultus

Development Period: 2008-2011

Name: conceptME - a modelling environment for collaborative development of conceptual models

Developed under the project: cogniNet (FCT PTDC/EIA-EIA/103779/2008)

Demo Place: INESC Porto

Development Period: 2010-2011

6.3.5 Organization of Conferences (2000 ca.)

Carneiro, Luis, Co-organizer, iNet-IMS Workshop: Intelligent Non-Hierarchical Manufacturing Networks, in parallel with the ICE 2011 – 17th International Conference on Concurrent Enterprising, Aachen, Germany), 21 June 2011.

Carravilla, Maria Antónia; Gomes, António Miguel; Oliveira, José Fernando; Organising Committee members; IX International Workshop on Cutting, Packing and Related Topics, Porto, Portugal, 14-17 Sep 2011.

Oliveira, José Fernando, Program Committee Chair / Gomes, António Miguel, Program Committee Member, 8th ESICUP (EURO Special Interest Group on Cutting and Packing) Meeting, Copenhagen, Denmark, 19-21 May, 2011.

Sousa, Jorge Pinho, Azevedo, Américo, Soares, António L, Program Committee Member, PRO-VE'11 - 12th IFIP Working Conference on Virtual Enterprise, São Paulo, Brazil, Oct 2011.

Oliveira, José Fernando; Program Committee Member; IO 2011 – 15º Congresso da APDIO, Coimbra, Portugal, 18-20 April 2011.

Viana, Ana, Organizing and Program Committee Chair, VII ALIO-EURO Workshop in Applied Combinatorial Optimization, Porto, Portugal, 4-6 May 2011.

Viana, Ana, Program Committee, MIC 2011- the 9th Metaheuristics International Conference, Udine, Italy, July 2011.

Viana, Ana, Program Committee, 16th Online World Conference on Soft Computing in Industrial Applications (WSC16), 5-16 Nov 2011.

6.3.6 Industry contract research *(2000 ca.)*

National direct RTD contracts: 16

The Unit has a very strong link with industry and regular collaboration with technology suppliers. The Unit provides consultancy services on industrial management, requirements analysis and selection of technical solutions. For suppliers of technologies for industry, the group offers RTD services on the design and development of new products they put on the market, in fields such as production planning and scheduling, optimization of cutting and packing, automation and logistics, enterprise collaboration and interoperability.

The main industry related research, consultancy and technology transfer projects during 2011 were:

under the MIB-PET project, a new approach to performance management and shop floor data collection was developed - the process for key performance indicators (KPI) definition and their monitoring and control has been integrated and largely automated;

Izaro Grey – design, development and implementation of several enhancements of the scheduling optimization engine, according to a plan previously established with our partners;

definition of a roadmap and strategic research lines in the areas of Information Technology and Electronics, for the footwear sector in Portugal;

Pronic – an innovative system for the management of standard technical information for the specification of building works, to be used in all phases of the construction process, from specification and quotation to production and maintenance (improved version);

consultancy contracts to support several companies (Lucios; 3M2P - Construção e Reabilitação de Edifícios Lda; Confeitaria Mirene SA; Metalfer; Padinho; SopSec; Waldemar Fernandes da Silva SA; YAH Design; EVOLEOTECH and PENTALINE) in analyzing their business processes, identifying their IT requirements, supporting the selection and implementation of solutions;

technical support for the implementation of internal logistic systems produced and marketed by the partner company Flowmat.

6.3.7 Internationalization *(2000 ca.)*

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

International projects: 8; International consultancy: 1

- Net-Challenge (Innovative networks of SMEs for complex products manufacturing) - project launched and coordinated by INESC Porto.;
- H-Know (Advanced Infrastructure for Knowledge Based Services for Buildings Restoring);
- VFF (Holistic, extensible, scalable and standard Virtual Factory Framework) – developing a simulation framework to support the design and reconfiguration of factories;
- FIT4U (Framework of Integrated Technologies for User Centred Products) – support for the manufacturing of customized consumer goods;
- CORENET (Customer-ORiented and Eco-friendly NETworks for healthy fashionable goods);
- ADVENTURE (ADaptive Virtual ENTerprise ManufacTURing Environment)
- PROsumer.NET (Networking European Technology Platforms addressing Design-based Consumer Goods Industries and Related Research and Technology Fields);
- FoodManufuture (Conceptual Design of a Food Manufacturing Research Infrastructure to boost up innovation in Food Industry).;
- Autogration (Assisting SMEs to participate in global digital supply chains in the automotive sector in the Single Market) - consultancy project for the EC.

International educational programs

Active participation in the MIT Portugal Program (MPP), namely in the doctoral programs in Engineering Design and Advanced Manufacturing (EDAM) and Transportation Systems. These participations are an important opportunity for the exchange of information and experiences.

International Associations

Coordination of the EURO Special Interest Group on Cutting and Packing of EURO, the Association of European Operational Research Societies (A M Gomes and J F Oliveira).

Executive Board of EURO – J F Oliveira, appointed as Vice-President 2, in charge of the 28 EURO Working Groups, the young researchers training initiatives (EURO Summer/Winter Institutes, ORP3 Conferences) and EURO Education Initiative.

Number of papers in journals in cooperation with authors from foreign institutions: 01

6.3.8 Other national publications *(6000 ca.)*

Ferreira, H, Camacho, R C, Pinto Ferreira, J J, "A New Algorithm for Learning Planning Operators from Unlabelled Execution Traces", Proceedings, 15th Portuguese Conference on Artificial Intelligence, Luis Antunes, H. Sofia Pinto, Rui Prada, Paulo Trigo (eds.), Lisbon, Oct 2011.

Silva, P, Alves, A, Modelo de Organização da Manutenção Produtiva Total (TPM) Aplicado a Sistemas de Produção Lean em Cenários de Fabrico por Encomenda, Proceedings, 11º Congresso Nacional da Manutenção, Tomar, Portugal, May 2011.

6.3.9 Government/Organization contract research (2000 ca.)

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

National programs – FCT: 5

QREN: 8

The Unit participated in a total of 14 projects with support or collaboration with national agencies. Some of the main national projects during 2011 were:

1. Shoe-ID - a new and integrated concept, along with several support tools for managing the complete footwear value chain, taking advantage of the use of the RFID technology; the project leader is a technological company - Creative Systems, and the footwear producer Kyaia and the Shoe Technological Centre are project partners;

2. MINERVA - aims at designing and developing an innovative Maintenance Management solution for industrial companies; the project leader is Primavera Software, and a consultancy company (MIIT) is also a partner;

3. FADIS (in partnership with UITT) - the project goal is to design innovative decision support tools for the internationalization of technical services; the consortium includes Sistrade (a software house), CATIM (machine tool technological centre) and INESC Porto;

4. CogniNET - Cognitive Semantics in Collaborative Networks;

5. KEP - New models for the kidney transplantation process;

6. CPackBenchFrame - a framework for comprehensive computational experiments on cutting and packing problems;

7. EaGLeNest - an Efficient Geometric Library for Nesting Problems.

8. COORDINATOR - High-performance hybrid algorithms for wind-hydro-thermal power production coordination.

Participation in sectorial initiatives

The following are some key inititatives in which members of the group participate actively:

1. MANUFUTURE ETP and EFFRA Association;

2. Footwear ETP;

3. PRODUTECH – Competitiveness Pole for Production Technologies;

4. NEWALK – Mobilization R&D project for the footwear sector (promoted by the associated Competitiveness Pole);

5. PowerTextilesXXI – Mobilization R&D project for the textile sector (promoted by the associated Competitiveness Pole).

6.1 Group Description - UTM

Research Group Title	**TELECOMMUNICATIONS AND MULTIMEDIA**
Principal Investigator	José António Ruela Simões Fernandes
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 267.813,00

European Commission: 257.499,00

QREN: 344.402,00

TOTAL: 869.714,00

6.2 Objectives & Achievements - UTM

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 were Prof. José Ruela, together with Dr. A. Olivier.

OBJECTIVES

The Telecommunications and Multimedia Unit carries out research and development, consulting, technology transfer and advanced training in the convergence between the traditional telecom and broadcast worlds, the Internet and multimedia. Most of its activities are carried under research contracts with industrial partners or in the framework of research programmes funded by the EU, FCT or QREN.

The Unit has a multidisciplinary nature, covering a diversity of research areas, as detailed next.

INFORMATION PROCESSING AND PATTERN RECOGNITION

The main goal of this area is to develop intelligent automatic or semi-automatic audiovisual applications that enhance people's life across different dimensions. This requires investigating techniques for efficient automatic extraction of high-level features of video, audio and image signals and the generation of additional knowledge and rich models from the extracted data.

These aspects are addressed by combining fundamental and applied research in machine learning, signal processing and human-computer interaction, with applications in computer vision, image and video processing (medical images, manuscript documents and video object tracking), sound and music computing (music information retrieval, interactive music systems and musical robotics) and network information processing.

MULTIMEDIA COMMUNICATIONS TECHNOLOGIES

The main goal of this area is developing systems that ease the access to distributed multimedia resources in heterogeneous environments to any user in a seamless, adaptable and personalised way. This includes multimedia content management and distribution, context-aware multimedia services, recommendation systems for multimedia content and adaptable mobile multimedia applications.

The main research topics focus on the adaptation of multimedia content according to its contexts of use and interoperability between content description systems and access systems for content repositories. Strategic lines of research include the use of middleware, semantic metadata and ontologies and intelligent data analysis techniques that can be applied in the development of transparent and non-intrusive systems.

COMMUNICATIONS NETWORKS

The main goal of this area is designing and evaluating new architectural solutions (protocols and algorithms) suitable for next generation networks. The focus is on wireless networks and mobile communications, extending infrastructure networks and enabling the emergence of networks of "things". It requires modelling, performance analysis and implementation of communications networks and their elements.

The main research topics include the development of solutions for network self-configuration, routing in vehicular networks, large scale networks, network congestion control, optimisation using

cross-layer techniques, machine to machine communications and network management solutions using machine learning methods.

OPTICAL TECHNOLOGIES AND ELECTRONICS

The main goal of this area is to integrate advanced skills in optical communications and microwaves and microelectronics and programmable logic.

Research activities in optical communications and microwaves include the design of fibre supported microwave / radio systems, compact multiband antennas, signal processing techniques applied to optical communication systems, and passive optical access networks.

Research in microelectronics and programmable logic addresses design and testability of circuits, characterisation and adaptive correction of performance, analogue computing, A/D and D/A conversion, dedicated computing applications in reconfigurable logic, methodologies for dynamic reconfiguration, hardware/software co-design and VLSI design.

6.2.2 Main Achievements (4000 ca)

The main scientific results (algorithms, methods, tools and systems) listed below are described in scientific papers, project reports and theses; associated prototypes, developed as a proof of concept, are presented in a separate section.

INFORMATION PROCESSING AND PATTERN RECOGNITION
Rhythm generation and recombination algorithms
New method for classification of music genres based on image features
Methods for automatic music annotation in genres and arbitrary keywords
Results on correlation between human perception of Groove and low-level audio features
New metric for the evaluation of ordinal data classification
New learning methodology based on max coupling ordinal data classification
Kinect Based Method for the Breast Cancer Conservative Treatment aesthetic evaluation
Ensemble of Decision Trees with Global Constraints for Ordinal Classification
A Method for Music Symbols Extraction based on Musical Rules

MULTIMEDIA COMMUNICATIONS TECHNOLOGIES
Performance evaluation of content recommendation algorithms
Techniques for characterizing TV content using external metadata sources
User profiling for content-based recommendation in IPTV environments
Techniques for collecting contextual data from an Android terminal
Content recommendation in mobile environments
Ontology for resources inter-relationships
Middleware for packaging and distributing multimedia resources

COMMUNICATIONS NETWORKS
ns-2 simulation framework for multi-technology PANs (Personal Area Networks)
Multicast routing metric for WMNs (wireless mesh networks)
Multicast mechanism for fast WMN topology reconfiguration
Auto-configuration mechanism for multi-technology PANs
Simple and flexible auto-configuration framework for WMNs
ns-3 simulation framework for WMN in Smart Grids
Secure mobility management mechanism for cooperative Wi-Fi networks with fast seamless handover
ns-3 simulation framework for scalable multi-technology mobile WMNs
Technique for the fast prototyping of wireless communications systems from ns-3 simulation models

Methodology for evaluating the impact of network topology on the performance of multi-channel single-radio WMNs
Hybrid multicast management mechanism for a context-aware multi-domain network
Group Key Exchange Protocol for SVC-content encryption
3D Simulation Framework for Safe Ambient-Assisted Home Care
Graph-based Approach for Intra-system Interference Free Integration of Pervasive Applications
Multistage SPIT Detection Framework in Transit VoIP
Hidden Markov Model clustering framework to distinguish anomalous DSL behaviour

OPTICAL TECHNOLOGIES AND ELECTRONICS
Experimental evaluation of WLAN over a fiber radio system based on an R-EAM modulator
Signal-to-noise analysis of photon counting
Assessment of noise impact on UWB signals in R-EAM based optical links
Inverted-L Antenna Array in a Wireless USB Dongle for MIMO Application
Invert-L Antenna Design Using Fractal for WLAN USB Dongle
Performance Analysis of WDM-PON Architecture for Wireless Services Distribution
Monopole Antenna with Chip Inductor for WLAN
Multiband Printed Monopole Antenna for Mobile Phone Applications
Cooperative Clustered Architecture and Resource Reservation Proposal for OBS Networks
Clock Recovery of an Injection-Locked Resonant Tunnelling Diode Microwave-Photonics Oscillator
In-circuit test and correction of non-linearities of adaptive RF transmitters
On-chip measurement of RF true-power sensor
Design of radiation hard analog and mixed-signal ICs
Design, simulation and electrical characterization of biomedical sensors
Stereo image processing for real-time depth-map calculation on FPGA
Tools for runtime generation of partial FPGA configurations for embedded systems
Hardware infrastructure for transparent binary acceleration of embedded systems
Routing protocol for power-aware sensor networks

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report.

6.3 Productivity - UTM

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 21
The complete list can be consulted in: http://profile.inescporto.pt

ABRANTES, F., ARAÚJO, J., RICARDO, M., "Explicit Congestion Control Algorithms for Time Varying Capacity Media", IEEE Transactions on Mobile Computing, January 2011, vol.10, no.1, p.81-93.

CAETANO, E., SILVA, S.R., BATEIRA, J., "A Vision System for Vibration Monitoring of Civil Engineering Structures", Experimental Techniques, July / August 2011, vol.35, no.4, p.74-82.

CAMPOS, R., DUARTE, R., SOUSA, F., RICARDO, M., RUELA, J., "Network infrastructure extension using 802.1D-based wireless mesh networks", Wireless Communications and Mobile Computing, January 2011, vol.11, no.1, p.67-89.

CARDOSO, J., SOUSA, R.J., "Measuring the performance of ordinal classification", International Journal of Pattern Recognition and Artificial Intelligence, December 2011, vol.25, no.8, p.1173-1195.

CARNEIRO, G.J., FONTES, H.M., RICARDO, M., "Fast prototyping of network protocols through ns-3 simulation model reuse", Simulation Modelling Practice and Theory, October 2011, vol.19, p.2063-2075.

CIOBANU, L., CORTE REAL, L., "Iterative filtering of SIFT keypoint matches for multi-view registration in Distributed Video Coding", Multimedia Tools and Applications, December 2011, vol.55, no.3, p.557-578.

DOMINGUES, M.A., "Exploiting multidimensional data for web site automation", AI Communications, November 2011, vol.24, no.3, p.289-290.

GOMES, R., JÚNIOR, W., CERQUEIRA, E., ABELEM, A., "Using fuzzy link cost and dynamic choice of link quality metrics to achieve QoS and QoE in wireless mesh networks ", Journal of Network and Computer Applications, March 2011, vol.34, no.2, p.506-516.

GONÇALVES, H., CORTE REAL, L., GONÇALVES, J.A., "Automatic Image Registration Through Image Segmentation and SIFT", IEEE Transactions on Geoscience and Remote Sensing, July 2011, vol.49, no.7, p.2589-2600.

GONÇALVES, H., GONÇALVES, J.A., CORTE REAL, L., "HAIRIS: A method for automatic image registration through histogram-based image segmentation", IEEE Transactions on Image Processing, March 2011, vol.20, no.3, p.776-789.

HEIL, J., DAHLKAMP, J., GOLATTA, M., ROM, J., DOMSCHKE, C., RAUCH, G., CARDOSO, M.J., SOHN, C., "Aesthetics in Breast Conserving Therapy: Do Objectively Measured Results Match Patients' Evaluations?", Annals of Surgical Oncology, January 2011, vol.18, no.1, p.134-138.

LUO, Q., ROCHA PEREIRA, J., SALGADO, H., "Compact Printed Monopole Antenna With Chip Inductor for WLAN", IEEE Antennas and Wireless Propagation Letters, October 2011, vol.10, p.880-883.

MADISON, G., GOUYON, F., ULLÉN, F., HÖRNSTRÖM, K., "Modeling the tendency for music to induce movement in humans: First correlations with low-level audio descriptors across music genres", Journal of Experimental Psychology: Human Perception and Performance, October 2011, vol.37, no.5, p.1578-1594.

MARQUES, G., LANGLOIS, T., GOUYON, F., LOPES, M., DOMINGUES, M.A., "Short-term feature space and Music Genre Classification", Journal of New Music Research, June 2011, vol.40, no.2, p.127-137.

NAVEDA, L., GOUYON, F., GUEDES, C., LEMAN, M., "Microtiming patterns and interactions with musical properties in samba music", Journal of New Music Research, October 2011, vol.40, no.3, p.225-238.

PINTO, A., RICARDO, M., "On performance of group key distribution techniques when applied to IPTV services", Computer Communications, September 2011, vol.34, no.14, p.1708-1721.

ANDRADE, M.T., DOGAN, S., CARRERAS, A., BARBOSA, V., ARACHCHI, H., DELGADO, J., M. KONDOZ, A., "Advanced delivery of sensitive multimedia content for better serving user expectations in Virtual Collaboration applications", Multimedia Tools and Applications, February 2011.

CARNEIRO, G.J., FORTUNA, A.P., SOUSA DIAS, J., RICARDO, M., "Transparent and Scalable Terminal Mobility for Vehicular Networks", Computer Networks, October 2011.

CIOBANU, L., CORTE REAL, L., "Sprite-based generation of side information for multi-view Distributed Video Coding", Multimedia Tools and Applications, June 2011.

MOREIRA, I., AMARAL, I., DOMINGUES, I.C., CARDOSO, A., CARDOSO, M.J., CARDOSO, J., "INbreast: Towards a Full Field Digital Mammographic Database", Academic Radiology, November 2011.

SILVA, M.L., CANAS FERREIRA, J., "Run-time Generation of Partial FPGA Configurations", Journal of Systems Architecture, October 2011.

6.3.2 Other international publications (6000 ca.)

Total number of publications: 47
The complete list can be consulted in: http://profile.inescporto.pt

AZAD, M.A., MORLA, R., "Multistage SPIT Detection in Transit VoIP", SoftCOM 2011 - 19th Int. Conf. on Software, Telecommunications and Computer Networks, Aug. 2011, Split, Croacia.

CALÇADA, T., RICARDO, M., "The impact of network topology on the performance of multi-channel single-radio mesh networks", NAEC 2011 - Networking and Electronic Commerce Research Conference, Oct. 2011, Riva del Garda, Italy.

CAMPOS, R.L., OLIVEIRA, C., RUELA, J., "WiFIX+: A Multicast Solution for 802.11-based Wireless Mesh Networks", WONS 2011 - 8th Int. Conf. on Wireless On-demand Network Systems and Services, Jan. 2011, Bardonecchia, Italy.

CARDOSO, J., DOMINGUES, I.C., "Max-Coupled Learning: Application To Breast Cancer", ICMLA2011 - Tenth Int. Conf. on Machine Learning and Applications, Dec. 2011, Honolulu, USA.

CARDOSO, T., NEVES, P., RICARDO, M., SARGENTO, S., "Media Independent Handover Management in Heterogeneous Access Networks - An Empirical Evaluation", VTC2011-Spring - IEEE 73rd Vehicular Technology Conference, May 2011, Budapest, Hungary.

CARVALHO, P.M., PINHEIRO, M., CARDOSO, J., CORTE REAL, L., "A Shortest Path Approach for Vibrating Line Detection and Tracking", IbPRIA2011 – Fifth Iberian Conf. on Pattern Recognition and Image Analysis, June 2011, Las Palmas Gran Canaria, Spain.

CASTRO, H.F., ANDRADE, M.T., ALMEIDA, F.L., TROPEA, G., MELLAZI, N., CHIARIGLIONE, L., et al., "Exploring Semantic Relationships Across Internet Resources", NWeSP 2011 - 7th International Conference on Next Web Services Practices, Oct. 2011, Salamanca, Spain.

CASTRO, J., SALGADO, H., "A Photon Counting Estimates Distribution of the Average Number of Photons in Coherent Pulses", ICTON 2011 - 13th Int. Conf. on Transparent Optical Networks, June 2011, Stockholm, Sweden.

COSTA, Y., OLIVEIRA, L., KOERICH, A., GOUYON, F., "Music Genre Classification using Spectrograms", IWSSIP – Int. Conf. on Systems, Signals and Image Processing, June 2011, Sarajevo, Bosnia and Herzegovina.

DE AQUINO, L., GIRALDI, G., RODRIGUES, P., JUNIOR, A., CARDOSO, J., SURI, J., "Surface Reconstruction and Geometric Modeling for Digital Prosthesis Design", March 2011, Multi Modality State-of-the-Art Medical Image Segmentation and Registration Methodologies, Volume II, p.187-225.

DIAS, A., DUARTE, C., COKE, P., GRADE TAVARES, V., GUEDES DE OLIVEIRA, P., "An Impulse-Radio UWB Transmitter for Short-Range Communication Systems", DCIS 2011 – 26th Conference on Design of Circuits and Integrated Systems, Nov. 2011, Albufeira, Portugal.

KOUMARAS, H., NEGRU, D., BORCOCI, E., PINTO, A., et al, "Media ecosystems: A novel approach for content-awareness in future networks", Lecture Notes in Computer Science, June 2011, The Future Internet, vol.6656, p.369-380.

MARQUES, G., DOMINGUES, M.A., LANGLOIS, T., GOUYON, F., "Three current issues in music autotagging", ISMIR2011 - 12th International Society for Music Information Retrieval Conference, Oct. 2011, Miami, USA.

MIYANDOAB, F.D., CANAS FERREIRA, J., GRADE TAVARES, V., "A Routing Protocol for WSN Based on the Implementation of Source Routing for Minimum Cost Forwarding Method", SENSORCOMM 2011 - TFifth Int. Conf. on Sensor Technologies and Applications, Aug. 2011, Nice, France.

OLIVEIRA, C., MACHADO DA SILVA, J., ROCHA, L.A., "Test of a Stent-Graft Endoleakage Monitor", DCIS 2011 - 26th Conference on Design of Circuits and Integrated Systems, Nov. 2011, Albufeira, Portugal.

OTEBOLAKU, A., ANDRADE, M.T., "Context Representation for Context-Aware Mobile Multimedia Content Recommendation", IMSA 2011 - 15th IASTED Int. Conf. on Internet and Multimedia Systems and Applications, May 2011, Washington, USA.

PESSOA, L.M., COELHO, D.V., BARBOSA OLIVEIRA, J., CASTRO, J., SALGADO, H., "Assessment of noise impact on UWB signals in R-EAM based optical links", AVFOP 2011 - Avionics, Fiber-Optics and Photonics Technology Conference, Oct. 2011, San Diego, USA.

PESSOA, L.M., COELHO, D.V., BARBOSA OLIVEIRA, J., CASTRO, J., SALGADO, H., "Wireless Services Distribution over GPON for Avionics", ECOC 2011 - 37th European Conference and Exhibition on Optical Communication, Sept. 2011, Geneva, Switzerland.

PESSOA, L.M., COELHO, D.V., BARBOSA OLIVEIRA, J., CASTRO, J., SALGADO, H., "Experimental Evaluation of R--EAM Performance in RoF Networks", GROWAN 2011 – Int. Symposium on Green Radio over Fibre & All Optical Technologies for Wireless Access Networks, June 2011, Brest, France.

REBELO, A.M., TKACZUK, J., SOUSA, R.J., CARDOSO, J., "Metric Learning for Music Symbol Recognition", ICMLA2011 - Tenth Int. Conf. on Machine Learning and Applications, Dec. 2011, Honolulu, USA.

ROMEIRA, B., PESSOA, L.M., SALGADO, H., SILVA, S., FIGUEIREDO, J.M.L., "Clock Recovery of an Injection-Locked Resonant Tunneling Diode Microwave-Photonics Oscillator", ICTON 2011 - 13th Int. Conf. on Transparent Optical Networks, June 2011, Stockholm, Sweden.

SIOROS, G., GUEDES, C., "Automatic Rhythmic Performance in Max/MSP: the kin.rhythmicator", NIME 2011 - 11th Int. Conf. on New Interfaces for Musical Expression, May 2011, Oslo, Norway.

SIOROS, G., GUEDES, C., "Complexity Driven Recombination of MIDI Loops", ISMIR2011 - 12th International Society for Music Information Retrieval Conference, Oct. 2011, Miami, USA.

SOUSA, F.J., MOREIRA, P., MACHADO DA SILVA, J., "Radiation Tolerant Low Power 12-bit ADC in 130 nm CMOS Technology", DCIS 2011 - 26th Conference on Design of Circuits and Integrated Systems, Nov. 2011, Albufeira, Portugal.

SOUSA, R.J., CARDOSO, J., "Ensemble of decision trees with global constraints for ordinal classification", ISDA2011 – Int. Conf. on Intelligent Systems Design and Applications, Nov. 2011, Cordoba, Spain.

TEIXEIRA, F.B., CALÇADA, T., RICARDO, M., "Protocol for Centralized Channel Assignment in WiFIX Single-radio Mesh Networks", MONAMI 2011 - 3rd International ICST Conference on Mobile Networks & Management, Sept. 2011, Aveiro, Portugal.

6.3.3 PhD thesis completed (3000 ca.)

PhD THESES AUTHORED BY MEMBERS OF THE UNIT

PESSOA, L.M., "Compensation of Fibre Impairments in Coherent Optical Systems", July 2011.

CAMPOS, R.L., "Joint Path and Address Auto-configuration: an Approach to Multi-technology Personal Area Networks and 802.11-based Stub Wireless Mesh Networks", July 2011.

MONEGO, H.D., "Radio Resource Management in 4G Networks: A Strategy Based on Mobility Tendency and Packet Length Sensibility", July 2011.

CIOBANU, L., "Video coding with low encoder complexity for systems with multiple cameras", July 2011.

MOTA, P., “In-Circuit Test and Linearisation of RF Power Amplifiers”, December 2011.

PhD THESIS (of a Unit non-member) SUPERVISED BY MEMBERS OF THE UNIT

SOUSA, R.J., “Methodologies for perceptual and acoustic evaluation of the voice signal in singing lessons and speech diagnosis and rehabilitation” (in Portuguese), October 2011.

6.3.4 Patents/prototypes (2000 ca.)

PROTOTYPES

Dancing robot on a new platform (HARK from Honda)

Enhanced version of RAMA (with connection to YouTube)

iPod and iPad versions of the GimmedaBlues iOS app

"Rhythmicator" automatic rhythm performance generator in Max/MSP

"Recombinator" of MIDI drum loops in Max/MSP

Beat tracking plug-ins for Max/MSP and Sonic Visualiser

Music recommender implemented in client web platform

Workstation for computer assisted breast cancer diagnosis

Module for ordinal data classification

Computational system for automatic assessment of aesthetic results of Breast Cancer Treatments with Kinect Data

Framework for contextual data manipulation on the Android platform

Mobile terminal with content recommendation for the Android platform

Content recommendation system for the hospitality market

Implementation and evaluation of content and collaborative based recommendation algorithms

Distribution of multimedia resources in a content-based publish-subscribe approach

Smart WMN for extending infrastructure networks with multicast support

ns-3 simulator for WMN in Smart Grids

ns-2 simulator for routing in multi-technology PANs

ns-3 wireless routing bridge

OpenBOX – secure cooperative Wi-Fi networking with fast seamless handover

Mobile application integrated with an electric vehicle navigation system

P3 web site for younger readers

Inverted-L Antenna Array in a Wireless USB Dongle for MIMO Application

Invert-L Antenna Design Using Fractal for WLAN USB Dongle

Monopole Antenna with Chip Inductor for WLAN

Multiband Printed Monopole Antenna for Mobile Phone Applications

R-EAM remote node for radio over fiber applications

On-board characterization and correction of RF power amplifiers' non-linearities

RF Testable Power Amplifier IC and RF true power sensor in 0.35 um CMOS

Radiation-hard 12-bit ADC in 130 nm CMOS

Wired sensor network for wireless capture of human locomotion signals

Programmable pulse-shaper and driver for UWB in 0.18 um technology

TFT a-GIZO Model

MPPT and DC/DC converter for solar panels

6.3.5 Organization of Conferences (2000 ca.)

ISMIR 2011 – Int. Society for Music Information Retrieval Conference, Miami, USA, Oct. 2011 (F. Gouyon – member of TPC)

WOMRAD 2011 – Workshop on Music Recommendation and Discovery, ACM Recommender Systems 2011, Chicago, USA, Oct. 2011 (F. Gouyon – member of TPC)

ICMC 2011 – Int. Computer Music Conference, Univ. Huddersfield, England, July-Aug. 2011 (F. Gouyon – member of TPC)

SMC 2011 – Sound and Music Computing Conference, Padova, Italy, July 2011 (F. Gouyon – member of TPC)

DCIS 2011 – XXVI Conf. on Design of Circuits and Integrated Systems, Albufeira, Portugal, Nov. 2011 (J.S. Matos – member of Steering Committee; J. M. Silva – General Chair; J. C. Ferreira, A. J. Araújo, V. G. Tavares – members of Organising Committee)

ICDT 2011 – Sixth Int. Conf. on Digital Telecommunications, Budapest, Hungary, April 2011 (M. T. Andrade – member of TPC)

VTC2011 – IEEE 73rd Vehicular Technology Conference, Budapest, Hungary, May 2011 (M. T. Andrade – member of TPC)

ICIAR 2011 – Int. Conf. on Image Analysis and Recognition, Burnaby, Canada, June 2011 (L. Corte-Real, J. Cardoso – members of TPC)

CETC2011 – Conference on Electronics, Telecommunications and Computers, Lisbon, Portugal, Nov. 2011 (P. Viana – member TPC)

IJCNN 2011 – Int. Joint Conference on Neural Networks, San Jose, USA, July-Aug. 2011 (J. Cardoso – member of TPC)

MONAMI 2011 – 3rd Int. ICST Conference on Mobile Networks and Management, Aveiro, Portugal, Sept. 2011 (M. Ricardo – member of TPC)

IMS3TW 2011 – IEEE Int. Mixed Signals, Sensors and Systems Testing Workshop, Santa Barbara, California, June 2011 (J.M. Silva – member of TPC)

DTIS 2011 – Conf. on Design and Technology of Integrated Systems, Athens, Greece, April 2011 (J.M. Silva - member of TPC)

ReConFig 2011 – International Conference on ReConFigurable Computing and FPGAs, Cancun, Mexico, Nov.-Dec. 2011 (J. C. Ferreira – member of TPC / Track on Reconfiguration Techniques)

Plus organisation or TPC membership on another 20 international and national events.

6.3.6 Industry contract research (2000 ca.)

Research contracts with PT Inovação aimed at technology development and transfer and advanced training:

Contextaware – Context-based multimedia intelligent services

MRA – Multi Radio Access

Projects with industrial partners in the framework of QREN (Quadro de Referência Estratégico Nacional), either in partnership or under contract:

PALCO 3.0 – Intelligent Web system for supporting the management of music social networks, with Palco Principal

SEMANTIC PACS – Semantic Picture Archiving Communication System, with Emílio Azevedo Campos

RECOOP – Cooperative wireless networks, with NONIUS Software

MOBILES – Sustainable electric mobility (with electric vehicles), with Ndrive, Inteli and CEIIA

RobVigil – Surveillance Robot, with Strong Segurança, Clever House, Sinepower Consultoria

SITME – Metropolitan multi-technology wireless network for public transportation systems, with Xarevision and STCP (public transportation company)

Hotel 3.0 – Personalized multimedia services for the hospitality market, with NONIUS Software

LUL – Living Usability Lab, with MSFT, MICRO I/O, PLUX, IEETA, Univ. Aveiro

P3.Net – On-line daily news platform for young people, with Público (newspaper) and Univ. Porto

SWIOP – Intelligent and secure webmail system, with Portugalmail

UserTracking 2.0 – User tracking of Web traffic, with Auditmark

CNG – Content for Next Generation Networks, with I.Zone Interactive Media, I.Zone Knowledge Systems, Microsoft Portugal, Diferente Jogo, Univ. Aveiro

Escolinhas Criativas – Creative Spaces for Creative Kids, with Tecla Colorida, Univ. Minho, FBAUP, RTP, Microsoft, Colégio Paulo VI

6.3.7 Internationalization (2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

The participation in a number of projects funded by research programmes of the European Union (listed below) allowed consolidating the position of the Unit at international level and establishing strategic partnerships with leading R&D institutions in Europe.

ACEOLE – Data Acquisition, Electronics, and Optoelectronics for LHC Experiments (with CERN), Marie Curie Initial Training Network programme

DAPHNE – Developing Aircraft PHotonic Networks, FP7 ICT programme

ALICANTE – Media Ecosystem Deployment Through Ubiquitous Content-Aware Network Environments, FP7 ICT programme

CONVERGENCE – Content-centric, publish-subscribe service model for the Internet, FP7 ICT programme

TOETS – Towards One European Test Solution, CATRENE (Cluster for Application and Technology Research in Europe on NanoElectronics) / EUREKA programme

MIRES – Roadmap for Music Information Research, FP7 ICT programme (Coordination and support actions)

Senseiver – Low-cost and energy-efficient LTCC sensor/IR-UWB transceiver solutions for sustainable healthy environment, Marie Curie programme

INESC TEC participated in bilateral short-term scientific missions via the SID (Sonic Interaction Design) COST Action and the FCT/CAPES convention (involving some Brazilian research institutions) and hosted senior researchers from foreigner institutions in the framework of joint research collaborations.

Fifteen joint papers with researchers of other institutions were published as a result of research activities carried out on international projects and collaborations mentioned above.

6.3.8 Other national publications *(6000 ca.)*

Total number of publications: 14
The complete list can be consulted in: http://profile.inescporto.pt

LUO, Q., SALGADO, H., PEREIRA, J., "Compact Printed Monopole Anntenna Array for Dual-band WLAN Application", CONFTELE 2011 - 8th Conference on Telecommunications, April 2011, Lisboa, Portugal.

MARQUES, B.F., RICARDO, M., "Application-Driven design to extend WSN lifetime", CNRS 2011 - The 1st Portuguese Conference on Wireless Sensor Networks, March 2011, Coimbra, Portugal.

MAGALHÃES, T., MORLA, R., "A New Splitting assignment criterion for clustering data streams with the ODAC system", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

SOUSA, R.J., CARDOSO, J., "Aggregation of Decision Trees with Global Constraints for Ordinal Data", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

CARVALHO, P.M., VIEIRA SANTOS, P., CIOBANU, L., CARDOSO, J., CORTE REAL, L., "An Integrated Tracking Approach to the Assessment of Object Description Models", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

SOUSA, P., LOBATO OLIVEIRA, J., REIS, L.P., GOUYON, F., "Humanized Robot Dancing: Humanoid Motion Retargeting based in a Metrical Representation of Human Dance Styles", EPIA 2011 - 15th Portuguese Conference on Artificial Intelligence, October 2011, Lisboa, Portugal.

OLIVEIRA, H.F., CARDOSO, J., "Kinect Based Method for the BCCT Quantitative 3D Evaluation", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

DOMINGUES, I.C., CARDOSO, J., "Max-Coupled Ordinal Classification", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

REBELO, A.M., CARDOSO, J., "Music Symbols Extraction Based on Domain Knowledge ", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

SIOROS, G., GUEDES, C., "Generation and control of automatic rhythmic performances in Max/MSP", INForum 2011 - Simpósio de Informática, September 2011, Coimbra, Portugal.

DIAS, R., MARQUES, T., SIOROS, G., GUEDES, C., "Gimme 'Da Blues: A Jazz/Blues Player And Automatic Comping Generator For iOS Multitouch Devices", INForum 2011 - Simpósio de Informática, September 2011, Coimbra, Portugal.

COSTA, Y., OLIVEIRA, L., KOERICH, A., GOUYON, F., "Classificação de Géneros Musicais por Texturas no Espaço de Frequência", SEMISH - XXXVIII Seminário Integrado de Software e Hardware, Congresso da Sociedade Brasileira de Computação, July 2011, Natal, Brasil.

HAQ, I., SALGADO, H., CASTRO, J., "Clustered Cooperative Architecture for OBS Networks", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

COELHO, D.V., OLIVEIRA, J.B., PESSOA, L.M., SALGADO, H., CASTRO, J., "Performance Analysis of WDM-PON Architecture for UWB Distribution in Aircraft Networks", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

6.3.9 Government/Organization contract research (*2000 ca.*)

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

Projects funded by FCT:

MuMoMgt – Multicast and mobility management in heterogeneous access networks

KINETIC – Controller driven adaptive and dynamic music composition systems (UTA programme)

SHHC – Safe Home Health Care

OSP-HNLF – Optical Signal Processing Using Highly Nonlinear Fibers

Pro Limb – Electronic sensing for the prophylaxis of lower limb pathologies

SELF-PVP Self-organizing power management for photo-voltaic power plants (CMU programme)

ImTV – On-Demand Immersive-TV for Communities of Media Producers and Consumers (UTA programme)

WOWI – Wireless-optical-wireless interfaces for picocellular access networks

NeTS – Next Generation Network Operations and Management (CMU programme)

Steering – Steering of light in nonlinear waveguides with resonant interactions

CASA – Computational Auditory Scene Analysis Framework for Sound Segregation in Music Signals

SHAKEIT – Mechanisms of Musical Groove and applications

3D BCT – 3 D Models for Aesthetic and Prediction of Breast Cancer Interventions

SUM – Sensing and Understanding human Motion dynamics

Projects funded by FAI (Fundo de Apoio à Inovação)

REIVE – Smart Vehicle to Grid, with Power Systems Unit (INESC Porto), EDP, EFACEC, REN, LOGICA, GALP Energia, CONTAR, LNEG, CEEETA

6.1 Group Description – UOSE

Research Group Title	**OPTOELECTRONICS AND ELECTRONIC SYSTEMS**
Principal Investigator	Paulo Vicente Silva Marques
Research Area	Physics
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 184.999,00

European Commission: 17.273,00

QREN: 24.433,00

TOTAL: 226.705,00

6.2 Objectives & Achievements - UOSE

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 was Prof. Paulo Marques.

OBJECTIVES

The roots of this Unit (named UOSE) go back to 1985, when INESC in Porto was funded in the context of the realization of a large project in optical communications. Along the years the activity was developed along several research areas following its established mission to perform internationally recognized research, development and training in Optoelectronics.

The research objectives embrace modelization, design, process development and Optoelectronics integration. The following areas were addressed in a chain that proceeded from technology to systems and applications:

- Fabrication of thin films, planar optical devices and fibre optics components;
- optical imaging;
- Optical sensing heads and some types of electrical sensing heads based on thin films;
- Optical sensors for real-time dosimetry
- Synthesis of novel glasses for sensing
- Optofluidics sensor system
- Development of chemical (gases) and biochemical (cyanobacteria, for example) sensors
- Fibre lasers for sensing;
- Optical fibre sensing systems; field tests and applications.
- Photovoltaics technologies: thin films for conventional and concentrated systems and organic dyes for BIPV (building integrated photovoltaics) applications
- Harvesting technologies and wireless power transfer for remote and unattended sensors

Specific objectives involved the acquisition of operational competences in those areas, the establishment of attractive post-graduated programmes, and the development of consultancy and technology transfer initiatives.

The field of optical sensors has been again the main topic of research during 2011. In addition, the cooperation within the group between the several areas of expertise has been enhanced. The scientific objectives remain broadly the same but have been a larger effort to create internal critical mass around the projects considered to be the most relevant for the future. The traditional fields of research in traditional fiber sensors (strain, temperature, curvature, etc) has been performing extremely well, the efforts in recent years to enhance the progress in chemical and bio-chemical sensors is showing consistent results, as a result of the acquisition of several multidisciplinary competencies (fibers optics and optoelectronics, materials science, chemistry, microfabrication and instrumentation).

During the last year UOSE has been also focused in the implementation of a large microfabrication infrastructure within Porto University. This include a 180m2 cleanroom ISO6/7 which will have all the microfabrication techniques available (lithography, dry-etching, deposition, mask production, etc).

This facility has been design under the responsibility and guidance of INESC Researchers, together with other from UP.

In the last couple of years the Group was particularly active in pursuing another important objective which is related to the enhancement of relations with the local industry, following the nature of the institution centered in the interface between academia and industry. During 2011 several projects were still running: monitoring of structural health in completion Kayaks, development of concentrator solar cells, and sensor systems (temperature and inclination) for high voltage power cables (international project in Brasil). In addition, and despite the economical downturn other initiatives where started with other companies during 2011 which are expected to be realized during 2012.

In addition, the relation with the Group with the other research units has been increased strongly and has a result several joint projects submitted and other running.

The group feels the need to increase the participation in European projects and several proposals where concluded and submitted during the last semester of 2011.

Broadly, for the next three year period, the objectives is to continue to maintain a good balance between research and development; the success is achieved if the Group maintains a good level of participation in international conferences and a high standard of scientific publications allied to a good number of industrial contracts.

6.2.2 Main Achievements (2000 ca)

The R&D activity resulted in a publication highest level ever of the Unit in this period, with 54 works published in international journals and 52 presentations in international and national conferences.

However, 2011 was essentially a year when a consolidation of previously started areas of research was achieved. Improvements, as well as novel configurations were obtained in the following areas:

- Implementation of a Brillouin-Raman fiber laser
- Ultra long fiber sensors
- Integrated refractometers based on single and multimode interference
- Demonstration of utility of suspended core fibers in the implementation of high sensitivity optical sensors
- Ultralong (world record breaking) Raman laser
- Temperature independent sensor based on non-linear effects
- Demonstration of smart PVC skins
- Sensors based on plasmonic resonances
- Development of new interrogation schemes with long period gratings
- Demonstration of an optical flowmeter
- Synthesis of rare-earth doped manganites via sol-gel routes
- Fabrication of polymeric structures on the tip of optical fibers through self-polymerization
- Sensors based on hyperspectral processing
- Broadband optical sources for optical coherence tomography
- optical fibre based dosimeter for in-vivo real-time dosimetry in Radiotherapy applications
- Laser direct writing of integrated polarizers with femtosecond pulses

- Demonstration of optical coherence tomography in different application areas
- Preparation of key layers of photovoltaic cells through RF sputtering
- Cyanobacteria detection in water for consumption
- Large scale test facility for long-term reliability evaluation of FBG strain sensors embedded in concrete
- Fibre Bragg Gratings as Interrogation Elements for Surface Plasmon Resonance Sensors
- All-fiber hybrid interferometers
- Novel optical fiber geometry designs for sensing purposes (H-shaped, suspended twin core fiber, as examples)
- Development of quantum dot based analytical imaging techniques
- Fabrication of waveguides in pure silica through femtosecond laser writing
- Fabrication of integrated polarizers based on directional couplers fabricated in pure silica plates by direct writing
- Fabrication of refractive index sensors in slotted multimode integrated devices for chemical and biochemical sensing
- Optical fiber sensor for hydrogen and metals
- Development of glasses for biomedical applications (prosthesis)

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - UOSE

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 54 [an increase of 22% relative to the previous year has been achieved] The complete list can be consulted in: http://profile.inescporto.pt

D. A. Pereira , F. Araújo , L.A. Ferreira , J.L. Santos , M.J. Marques , J. P. Carmo , "Development of an integrated narrowband tunable filter for LIDAR applications", Optical Engineering, vol.50, no.12, December 2011, pp.124403-8.

H.F. Martins, M.J. Marques, O. Frazão , "Comparison of Brillouin-Raman comb fiber laser in two different configurations", Laser Physics, vol.21, no.11, November 2011, pp.1925-1931.

K. Dolgaleva , A. Malacarne , P. Tannouri , L.A. Fernandes , J.R. Grenier , J.S. Aitchison , J. Azaña , R. Morandotti , P.R. Herman , P.V. Marques , "Integrated optical temporal Fourier transformer based on a chirped Bragg grating waveguide", OPTICS LETTERS, vol.36, no.22, November 2011, pp.4416-4418.

M.S. Ferreira , L.C. Coelho , K. Schuster , J. Kobelke , J.L. Santos , O. Frazão , "Fabry-Pérot Cavity Based on a Diaphragm Free Hollow Core Silica Tube", OPTICS LETTERS, vol.36, no.20, October 2011, pp.4029-4031.

R.M. Silva , M.S. Ferreira , J. Kobelke , K. Schuster , O. Frazão , "Simultaneous Measurement of Curvature and Strain using a Suspended Multicore Fiber", OPTICS LETTERS, vol.36, no.19, October 2011, pp.3939-3941.

H.F. Martins , M.J. Marques , O. Frazão , "300 km-Ultralong Raman Fiber Lasers using a Distributed Mirror for Sensing Applications", OPTICS EXPRESS, vol.19, no.19, September 2011, pp.18149-18154.

M.I. Zibaii , O. Frazão , H. Latifi , P. Jorge , "Controlling the Sensitivity of Refractive Index Measurement using a Tapered Fiber Loop Mirror", Photonics Technology Letters, vol.23, no.17, September 2011, pp.1219-1221.

L.A. Fernandes , J.R. Grenier , P.R. Herman , J.S. Aitchison , P.V. Marques , "Femtosecond laser writing of waveguide retarders in fused silica for polarization control in optical circuits ", Optics Express - The International Electronic Journal of Optics, vol.19, no.19, September 2011, pp.18294-18301.

J.M. Coelho , G. Hugerford , N. Hussain , "Structural and time resolved emission spectra of Er3+: silver lead borate glass,Chemical Physics Letters, July 5,2011 Accepted", Chemical Physical Letters, vol.512, no.1, August 2011, pp.70-75.

M. Erdmanis , D. Viegas , M. Hautakorpi , S. Novotny , J.L. Santos , H. Ludvigsen , "Comprehensive numerical analysis of a surface-plasmon-resonance sensor based on an H-shaped optical fiber", OPTICS LETTERS, vol.19, no.15, July 2011, pp.13980-13988.

G. Statkiewicz-Barabach , J.P. Carvalho , O. Frazão , J. Olszewski , P. Mergo , J.L. Santos , W. Urbanczyk , "Intermodal interferometer for sensing applications fabricated in birefringent boron doped microstructured fiber", APPLIED OPTICS , vol.50, no.21, July 2011, pp.3742-3749.

G. Statkiewicz-Barabach , J.P. Carvalho , O. Frazão , J. Olszewski , P. Mergo , J.L. Santos , W. Urbanczyk , "Intermodal interferometer for strain and temperature sensing fabricated in birefringent boron doped microstructured fiber", APPLIED OPTICS , vol.50, no.21, July 2011, pp.3742-3749.

L.A. Fernandes , J. R. Grenier , P. R. Herman , J. S. Aitchison , P.V. Marques , "Femtosecond laser fabrication of birefringent directional couplers as polarization beam splitters in fused silica", Optics Express - The International Electronic Journal of Optics, vol.19, no.13, June 2011, pp.11992-11999.

P. Caldas , P. Jorge , G. Rego , O. Frazão , J.L. Santos , L.A. Ferreira , F. Araújo , "Fibre Optic Hot-Wire Flowmeter Based on a Metallic Coated Hybrid LPG-FBG Structure", APPLIED OPTICS , vol.50, no.17, June 2011, pp.2738-2743.

R.B. Queirós , S. Oliveira Silva , J. P. Noronha , O. Frazão , P. Ribeiro , G. Aguilar , P.V. Marques , M. G. F. Sales , "Microcystin-LR detection in water by the Fabry-Perot interferometer using an optical fibre coated with a sol-gel imprinted sensing membrane", Biosensors and Bioelectronics, vol.26, no.9, May 2011, pp.3932-3937.

A. Guerreiro , A. Ferreira , J. T. Mendonça , "Production of bright entangled photons from moving optical boundaries", Physical Review A, vol.83, no.5, May 2011, pp.52302.
P. Jorge , C.D. Maule , O. Soppera , P.V. Marques , "Rapid fabrication of dual analyte luminescent optrodes by self-guiding photo-polymerization", IEEE Photonics Technology Letters, vol.23, no.8, April 2011, pp.492-494.

M.S. Ferreira , J.M. Baptista , P. Roy , R. Jamier , S. Février , O. Frazão , "Highly-birefringent photonic bandgap Bragg fiber loop mirror for simultaneous measurement of strain and temperature", OPTICS LETTERS, vol.36, no.6, March 2011, pp.993-995.

S. Oliveira Silva , J.L. Santos , F. Xavier Malcata , J. Kobelke , K. Schuster , O. Frazão , "Optical Refractometer based on Large-Core, Air-Clad Photonic Crystal fibers", OPTICS LETTERS, vol.36, no.6, March 2011, pp.852-854.

F.T. Magalhães , F. Araújo , M. Velhote Correia , M. Abolbashari , F. Farahi , "Active Illumination Single-Pixel Camera Based on Compressive Sensing", APPLIED OPTICS , vol.50, no.4, February 2011.

S. Oliveira Silva , L.A. Ferreira , F. Araújo , J.L. Santos , O. Frazão , "Fibre Bragg Grating Structures with Fused Tapers ", FIBER AND INTEGRATED OPTICS, vol.30, no.1, February 2011, pp.9-28.

O. Frazão , J.L. Santos , R.M. Silva , "High-Birefringent Fiber Loop Mirror Sensors with an Output Port Probe", Photonics Technology Letters, vol.23, no.2, January 2011, pp.103-105.

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I. Trifanov , P. Caldas , L. Neagu , R. Romero , M.O. Berendt , J.A.R. Salcedo , A.G. Podoleanu , A.B.L. Ribeiro , "Combined Neodymium-Ytterbium-Doped ASE Fiber-Optic Source for Optical Coherence Tomography Applications", IEEE Photonics Technology Letters, vol.23, no.1 2011, pp.21-23.

6.3.2 Other international publications (6000 ca.)

Total number of publications: 38.

The complete list can be consulted in: http://profile.inescporto.pt

H. El-Hosiny Ali , Ricardo Jimemez , Jesús Ricote , Javier Cruz , José Ramiro Fernandes , Lourdes Calzada , "FERROELECTRIC AND PIEZOELECTRIC PROPERTIES OF MULTILAYER COMPOSITE THIN FILMS BASED ON MPB Pb(Mg1/3Nb2/3)O3-PbTiO3", ISIF2011 - International Symposium on Integrated Functionalities, July, 2011.

Carlos Jesus Gouveia , Pedro Jorge , José Manuel Baptista , Orlando Frazão , "Cladding modes FBG curvature sensor based on a core misaligned splice", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

Orlando Frazão , Ricardo Manuel Silva , José Luís Santos , "High-Birefringent Fiber Loop Mirror with an Output Port Probe for Sensing Applications", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

Marta Sofia Ferreira , José Manuel Baptista , P. Roy , R. Jamier , S. Février , "Highly-Birefringent Photonic Bandgap Bragg Fiber Loop Mirror for Sensing Applications", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

Susana Oliveira Silva , José Luís Santos , F. X. Malcata , J. Kobelke , K. Schuster , Orlando Frazão , "Multimodal Interference Based on Large-core Air-clad Photonic Crystal fibres for Simultaneous Measurement of Multiparameters", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

M. K. Szczurowski , Orlando Frazão , José Manuel Baptista , K. Nielsen , O. Bang , W. Urbańczyk , "Sensing characteristics of birefringent microstructured polymer optical fiber", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

H. F. Martins , Manuel Joaquim Marques , Orlando Frazão , "Temperature-Independent Strain Sensor based on Four-Wave Mixing using Raman FBG Laser Sensor with Cooperative Rayleigh Scattering", OFS-21 - 21st International Conference on Optical Fiber Sensors, May, 2011.

Ana Sofia Silva , António José Salazar , Carla Mariana Silva , Miguel Velhote Correia , "WIMU: WEARABLE INERTIAL MONITORING UNIT - A MEMS-based device for swimming performance analysis", BIOSTEC2011 - 4th International Joint Conference on Biomedical Engineering Systems and Technologies, February, 2011, pp.87-93.

Filipe Tiago Magalhães , Mehrdad Abolbashari , Faramarz Farahi , Francisco Araújo , Miguel Velhote Correia , "A compressive sensing transmissive single-pixel camera", AOP 2011 - International Conference on Applications of Optics and Photonics, 2011.

Carlos Jesus Gouveia , Akos Markovics , José Manuel Baptista , Barna Kovács , Pedro Jorge , "Colorimetric and refractometric measurements of carbon dioxide", AOP 2011 - International Conference on Applications of Optics and Photonics, 2011.

Hugo Fidalgo Martins , Manuel Joaquim Marques , Orlando Frazão , "Comparison between two different configurations of Brillouin-Raman comb fiber laser", OPTOEL'2011 - 7ª Reunión Española de Optoelectrónica, 2011.

Mohammad Ismail Zibaii , Pedro Jorge , Orlando Frazão , H. Latifi , "Controlling the sensitivity of a Non-adiabatic tapered optical fiber for measuring the refractive index using all fiber Sagnac loop Interferometer", AOP 2011 - International Conference on Applications of Optics and Photonics, 2011.

Luís André Fernandes , Jason R. Grenier , Nome Apelido , Jin H. Kim , Peter R. Herman , J. S. Aitchison, Paulo Vicente Marques , "Femtosecond laser direct fabrication of integrated optical wave plates in fused silica", in CLEO: 2011, paper CWO6, 2011.

Sandra Silva Mouta , B Aragão , L Fontes , J A Santos , E Soares , Miguel Velhote Correia , "From human motion capture to biological motion visualization: a new methodology", Fourth Iberian Conference - Fourth Iberian Conference on Perception, 2011.

Daniel Alexandre , Paulo Marques , Carlos Brites , António Leite , Paulo Moreira , Askari Ghasempour, Paulo Garcia , José Luís Santos , "Integrated Optics for Astronomical Interferometry", AOP 2011 - International Conference on Applications of Optics and Photonics, 2011.

Ksenia Dolgaleva , Antonio Malacarne , Pamela Tannouri , Luís André Fernandes , Jason R. Grenier , J. S. Aitchison , Jose Azana , Roberto Morandotti , Peter R. Herman , Paulo Vicente Marques , "Integrated Temporal Fourier Transformer Based on Chirped Bragg Grating Waveguides", in CLEO: 2011, paper CThHH6, 2011.

Orlando Frazão , José Manuel Baptista , José Luís Santos , Mikel Bravo , M. López-Amo , "New Interrogation Technique for Multiplexing LPG-fiber Loop mirrors based displacement sensors using an OTDR", IEEE Sensors 2011 - IEEE Sensors 2011, 2011.

Orlando Frazão , "New Sensing Configurations Based on High-birefringent Fiber Loop Mirror", WFOPC 2011 - 7th Workshop on Fibre and Optical Passive Components, 2011.

Jason R. Grenier , Luís André Fernandes , Paulo Vicente Marques , J. S. Aitchison , Peter R. Herman , "Optical Circuits in Fiber Cladding: Femtosecond laser-written Bragg Grating Waveguides", in CLEO: 2011, paper CMZ1, 2011.

Marta Sofia Ferreira , J. C. Vieira , Clara Frias , Orlando Frazão , "Strain and temperature discrimination using FBG sensors embedded in hybrid composite laminates", ICCS16 - 16th International Conference on Composite Structures, 2011.

Carla Carmelo Rosa , "Twenty years of optical coherence tomography: chalenges for the future", AOP 2011 - International Conference on Applications of Optics and Photonics, 2011.

6.3.3 Ph. D. thesis completed (3000 ca.)

P. Caldas , "Fiber Optic Sensing by Evanescent Field Interaction", December 2011.

D. Alexandre , "Fabricação de dispositivos em fibra óptica para aplicação em redes de comunicação óptica e sensores ", PhD Thesis, February 2011.

6.3.4 Patents/prototypes (2000 ca.)

PATENTS

Multiplexagem de sensores interferométricos numa topologia em árvore, Multiplexing of interferometric sensors in a tree topology (?), National Provisional Patent Application, june 1st 2011

Cavidade de Fabry-Pérot em fibra óptica sem diafragma, Fabry-Pérot cavity in an optical fiber without diafragm, National Provisional Patent Application, 18th may 2011

PROTOTYPES

- Dosimeter for radiation theraphy
- Long cavity fiber laser
- Optical flowmeter
- Integrated polarization beam splitter
- Instrumented PVC foil for smart skin
- Many different types of sensor heads for temperature, strain, inclination, refractive index
- Broadband optical source for low coherence tomography

6.3.5 Organization of Conferences (2000 ca.)

The Research Group was involved through several of its members in the Committees of SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, that took place in Porto. The workshop had the participation of around 50 national and international researchers. The program included invited speakers and poster sessions.

Also, several UOSE researchers where involved in the organization of International Conference on Applications of Optics and Photonics (AOP'2011) which was held in Braga from 3-7 of May 2011. The event had the participation of researchers from Europe, USA, South Africa and Far East countries with distinguished papers and oral presentations from international researchers from both academia and industry.

6.3.6 Industry contract research (2000 ca.)

The Unit continued the contract with Fibersensing in the framework of its development. Consultancy in monitoring systems for aeronautical applications, namely in-flight structural health monitoring involving a dedicated measurement unit and athermal strain sensors, were the subjects considered.

SENSKANOE aims at including optical fibers sensors in kayaks to determine the distribution of strain in the structure (the partner company supplies the finest products to more than 80% of the Olympic teams).

CFC is oriented towards the development of environmental-friendly photovoltaic cells for concentrated applications aiming also a low cost of industrial production.

WaveTune is a project aimed at the development of Fabry-Perot technology for novel filters to be used in interrogation systems of biochemical optical fiber sensors with FiberSensing.

An international R&D contract, TECCON, with Brazilian universities and electrical power companies is the main achievement concerning industry contract research area.

6.3.7 Internationalization (2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

Two main actions were strategically adopted during 2010 and continued during 2011: active participation in COST actions (with group members in the respective management committees) and in bi-lateral cooperation schemes involving the group and other international research groups, with special focus on European groups.

As a result, several proposals are under evaluation/study and bilateral researchers exchange is common. Beyond that, 28 conference presentations and 47 papers were published with foreign institutions as result of this internationalization effort.

The strong collaboration with Brazilian groups continued, and an industrial contracted project is being carried out in Brazil.

LIST OF COST ACTIONS

- ICT 0806, Intelligent Monitoring, Control and Security of Critical Infrastructure Systems
- MP 0803, Plasmonic Components and Devices
- MP 0702, Towards Functional Sub-Wavelength Photonic Structures
- MP 0804, Highly Ionised Pulse Plasma Processes
- TD1001 - Novel and Reliable Optical Fibre Sensor Systems for Future Security and Safety Applications (OFSeSa)
- IC1101 - Optical Wireless Communications - An Emerging Technology
- MP1001, Ion Traps for Tomorrow's Applications
- MP1005, From nano to macro biomaterials (design, processing, characterization, modeling) and applications to stem cells regenerative orthopedic and dental medicine (NAMABIO)

BI-LATERAL ACTIONS

During 2011 there were six active integrated actions with other countries (2 with Brazil, 1 with Spain, 1 with France, 1 with USA and 1 with Hungary)

Under all the schemes above the Group received 9 researchers. Also, 4 researchers of our group spent some periods abroad.

One important reason for this effort is the need we feel to have more European projects running, and therefore, the cost actions and the bilateral exchange programs are a great opportunity to establish new partnerships and to fertilize ideas about future applications to funding. As a consequence of this activity several European proposals were submitted during the second semester of 2011.

6.3.8 Other national publications (6000 ca.)

Total number of publications: 20
The complete list can be consulted in: http://profile.inescporto.pt

Fernandes, L.A., Grenier, J.R., Herman, P.R., Aitchison, J.S., Marques, P.V., "Escrita de dispositivos ópticos integrados com laser de femtosegundos" [Femtosecond laser writing of integrated optical devices] 2011, Gazeta de Física, vol.34, no.1, p.17-21.

Frazão, O., Marques, M.J., "Novos Avanços em 'Random' Lasers em Fibra Óptica" [New advances in random fiber lasers], Gazeta de Física 2011.

Silva, C., Silva, C.M., Salazar, A.J., Silva, A.S., Velhote Correia, M., Santos, R., "Post-stroke patients functional task characterization through accelerometry data for rehabilitation intervention and monitoring.", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

Salazar, A.J., Silva, A.S., Velhote Correia, M., "Sensor characterization for portable and wearable applications", RecPad 2011 - The 17th edition of the Portuguese Conference on Pattern Recognition, October 2011, Porto, Portugal.

Nogueira Coelho, T., Pontes, M.J., P. Neves Cani, S., "Analytical Model for Raman Amplifiers Under Energy Conservation Constrains", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Tafulo, P.A., Jorge, P., Santos, J.L., Frazão, O., "Fabry-Pérot cavities based on chemical etching for high temperature and strain sensing", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Coelho, L.C., Oliveira Silva, S., Tafulo, P.A., Santos, J.L., Frazão, O., Xavier Malcata, F., "Hydrogen sensing based in optical fibre coated with Palladium", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Silva, R.M., Ferreira, M.S., Frazão, O., "Nanostrain Sensor using Chirped Bragg Grating ", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Nogueira Coelho, T., Guerreiro, A., Pontes, M.J., Jorge, P., "Remote Long Period Gratings/Fiber Bragg Gratings sensor based on Raman amplification", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Ferreira, M.S., Silva, R.M., Frazão, O., "Torsion sensor based on a high-birefringent Sagnac loop interferometer", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors, July 2011, Aveiro, Portugal.

Romaguera-Barcelay, Y., Rodrigues Santos, A., Tkach, A., Fernandes, J.R., Cruz, J., Agostinho Moreira, J., Almeida, A., "PLD processing and characterization of MTaO3 (M=K,Na,Li) thin films", IJUP'11 - Investigação Jovem na U.Porto 2011, February 2011, Porto, Portugal.

Marques, M.J., Darbrazi, S., Carmelo Rosa, C., "Tomographic optical extinction coefficient measurement", IJUP'11 - Investigação Jovem na U.Porto 2011, February 2011, Porto, Portugal.

Tafulo, P.A., Jorge, P., Frazão, O., "Fabry-Pérot cavity based on chemical etching for high temperature sensing", AOP 2011 - International Conference on Applications of Optics and Photonics 2011, Braga, Portugal.

Monteiro, J., Martins, R., Caldas, P., Rego, G., "Fiber Optic Sensor based on a Long Period Fiber Grating to Monitor Cryogenic Temperatures", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors 2011, Aveiro, Portugal.

J. S. Matos, H., Magalhães, F.T., Oliveira, H.F., Cardoso, J., "Hand Geometry Based Recognition System - A New Method with no Constraints on Image Acquisition", IJUP'11 - Investigação Jovem na U.Porto 2011 2011, Porto, Portugal.

André, R.M., Frazão, O., "Nanowires in Optical Fibers", IJUP'11 - Investigação Jovem na U.Porto 2011 2011, Porto, Portugal.

Gomes, P., Constante, D., Pires, E., Santos, J., C. Gonçalves, I., F. Amaral, I., Magalhães, F.T., "Quantitative image analysis of osteoblast behavior on SAMs of alkanethiols on gold: effect of surface wettability on adhesion and cytoskeleton organization", IJUP'11 - Investigação Jovem na U.Porto 2011 2011, Porto, Portugal.

Unas, M., Couto Marques, J., Restivo, T., Santos, J.L., "SeepTool - Small scale studies of groundwater flow", IJUP'11 - Investigação Jovem na U.Porto 2011 2011, Porto, Portugal.

Jorge, P., "Standard optical fiber technology for chemical and biological sensing", SEON 2011 - IX Symposium on Enabling Optical Networks and Sensors 2011, Comunicação Oral, Aveiro, Portugal.

Martins, H.F., Marques, M.J., Frazão, O., "Strain Sensor based on Four-Wave Mixing using Raman Fiber Bragg Grating Laser Sensor with Cooperative Rayleigh Scattering", IJUP'11 - Investigação Jovem na U.Porto 2011 2011, Porto, Portugal.

6.3.9 Government/Organization contract research (2000 ca.)

(Include here work carried out by the group that resulted in a pulication or report. Of particular importance are those involved in public policy advice)

During 2011 the Unit was involved in 12 R&D national projects. Six of these projects were concerned with optical fibre sensors principles and applications, two dealt with monitoring of biomedical signals, other two were dedicated to novel materials and the remaining two with medical physics. The sensors projects were dedicated to applications in composite materials systems, characterization of optical fiber sensing heads for civil engineering applications, measurement of dissolved oxygen by fluorescence and biochemical sensors and measurement of hydrogen. The biomedical signals projects intend to acquire meaning from physiological signals obtained from image processing and embedded smart textiles sensors. The novel materials projects were related to multiferroics and glasses for prosthesis applications. The medical physics projects were dedicated to the radiation monitoring in cancer treatments.

FCT projects (name and coordinator):

Bioswim - Miguel Velhote Correia

Biomotion - Miguel Velhote Correia

Hybrid - Pedro Jorge

Microphyte - José Luís Santos

SmartCoat - Orlando Frazão

SensFil - Orlando Frazão

MCP - Nandyala Hussain

Multiferroicos - Javier Cruz

FIBDOSE - Carla Carmelo Rosa

AQUAMONITOR - Pedro Jorge

Wood - Ramiro Fernandes

FLUOROCT - Carla Rosa

6.1 Group Description - USE

Research Group Title	**POWER SYSTEMS**
Principal Investigator	Manuel António Cerqueira Costa Matos
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 76.456,00

European Commission: 357.397,00

QREN: 396.501,00

TOTAL: 830.354,00

6.2 Objectives & Achievements - USE

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. Manuel Matos.

OBJECTIVES

The Power Systems Unit (USE), is the core research group for the line of research entitled "Sustainable Energy Systems and The Smart Grid".

The mission of the Power Systems Unit is centred on the development of advanced research in emergent modelling, optimization and control techniques applied to power systems characterized by large scale integration of renewable power sources, distributed generation and electric vehicles, under the Smart Grid paradigm.

In scientific terms, this corresponds to combining the traditional analytical models and tools of power systems with the emergent techniques of operational research and computational intelligence the group has been applying and with economic models of the new organization of the power sector, in order to develop multidisciplinary integrated models and tools useful for the relevant agents (system operators, producers, regulators, government) and for global understanding of the complex phenomena under research.

The more specific objectives can be clustered the following way:

EUROPEAN UNION GOALS ON ENERGY SUSTAINABILITY

(Support to the government, energy agencies, system operators and RES producers)

Development of knowledge, studies and tools to support the increase in the integration of renewable energy into the electric power system

Development of new control strategies for large scale integration of distributed generation and large off-shore wind farms

Development of knowledge and tools to forecast variable energy sources including energy produced in large off-shore wind farms

Design of decision support tools for sustainable, reliable and cost-effective energy strategies in cities and industrial complexes to evaluate various long-term energy strategies

IBERIAN ELECTRICITY MARKET

(Support to Regulatory Authorities, TSO and other agents acting in the market)

Conceptualisation of the remuneration of ancillary services using Distributed Generation

Development of new concepts and tools for operational reserve definition

Evaluation of the Security of Supply in the presence of variable energy sources

SMART GRID PARADIGM

(Support to Regulatory Authorities, DSO and manufacturing industry)

Conceptualisation of new organisation schemes for the electric sector including smart metering, microgrids and multi-microgrids, together with the integration of electric vehicles and dispersed stationary storage devices

Conceptualisation of innovative SCADA systems for low-level control and data acquisition

Knowledge extraction from newly available information on detailed consumption and microgeneration

Development and testing of prototypes of control devices in laboratorial environments and pilot sites

Development of new concepts and definitions of aggregation agents for mass electric vehicle deployment

Development of control and remuneration mechanisms for active load control and demand side integration

Development of new security assessment tools and advanced restoration strategies for the operation of the pan-European network

TECHNOLOGY TRANSFER

The USE Research Group has a strong tradition of technology and know-how transfer to utilities and manufacturing companies and advanced consulting and support to regulatory authorities, public sector and energy agencies. This effort forms an important part of its portfolio of activities and is supported by knowledge generated upstream in the scientific activity. This objective of knowledge valorisation will be pursued both at national and international level, namely in the European Union and Brazil

RESEARCH GROUP INTERACTION

In the framework of the Research line on Sustainable Energy Systems and the Smart Grid, the Power Systems Unit has the objective of enforcing synergies and incorporating skills available in other Research Groups of INESC TEC, such as UTM, USIG, LIAAD and possibly UOSE, HASLab and CISTER.

6.2.2 Main Achievements (4000 ca)

Main scientific results:

- A comprehensive approach to Electric Vehicles integration in electric networks, including a smart charging procedure that allows EV to participate in the provision of primary and secondary frequency control and the development of the concept of aggregator agent
- Simulation platforms of the dynamic and steady state behaviour of the system to prove the concept of the smart charging approach
- Algorithms for the optimized operation of hydro stations in market environment using simulated annealing
- Algorithms to perform long term transmission expansion planning studies using a discrete version of the Evolutionary Particle Swarm Optimization approach

- Dynamic model for the long term simulation of generation systems, enabling estimating the evolution of the demand, of the electricity price and of the capacity factors of the technologies in the generation mix
- Advances in reliability evaluation of generation systems via sequential population-based Monte Carlo simulation
- Algorithm for operating reserve assessment incorporating a stochastic electric vehicle model
- Contribution on general requirements for EV charging stations, namely through the impacts of having EV participating in primary frequency control on standard IEC61851-1.
- Multi-objective evolutionary particle swarm optimization algorithm applied to the assessment of the impact of distributed generation on distribution system
- Advances in agent-based technology applied to smart distribution grid operation
- Advances in Cross-entropy Method applied to generation capacity reliability evaluation
- Development and conceptualization of an ancillary services market framework for voltage control in multi-microgrid systems
- Optimization models for the Electric Vehicle Aggregation Agent Business
- Development of a stochastic model based on Markov chains and Monte Carlo simulation to simulate the electric vehicles behavior, the quantity of energy required from the grid and the resulting grid impacts
- Identification and development of innovative service restoration strategies in microgrids under unbalanced conditions and exploiting EV flexibility
- Development of a new a new bi-directional charger for vehicle-to-grid integration
- Enhancement of control concepts for the provision of frequency regulation services from off-shore wind farms
- Enhancement of control concepts in order to allow multi-terminal HVDC interconnections to be fault-ride through compliant
- New solution to the problem of recomposing missing information at the SCADA of energy/distribution management systems (EMS/DMS), through the use of offline trained autoencoders

Projects

- Consolidation of the existing results of the TWENTIES project regarding the provision of ancillary services from multi-terminal HVDC grids
- New results of project REIVE (Smart electrical grids with electrical vehicles: specification of advanced interfaces for EV and microgeneration units, development of tools for addressing EV and microgeneration impacts in the Portuguese electric power systems, development of a pre-prototype of a bi-directional charger for vehicle-to-grid integration, initial developments of pre-prototypes of interfaces for microgeneration units
- Conclusion of the EU MERGE project on the identification and development of smart control approaches, based on the smart grid concept, in order to specify the technology needed to allow the deployment of EVs and resulting impact quantification through extensive system studies
- Finishing the upgrade of Voltage Var Control for DMS/EMS contracted by EFACEC

Publications

- 13 papers in international peer review journals
- 78 papers in international conferences with peer review
- 1 PhD thesis approved, 5 theses submitted

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - USE

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 13

The complete list can be consulted in: http://profile.inescporto.pt

BESSA, R. J., MIRANDA, V., BOTTERUD, A., WANG, J., ""Good" or "Bad" Wind Power Forecasts: A Relative Concept ", Wind Energy, vol.14, no.5, pp.625-636, July, 2011.

DE ALMEIDA, S.A.B., MACIEL BARBOSA, F., ENGELBRECHT C. S. A., PESTANA, R., "Prediction of Faults Caused by Lightning for transmission System Operations", ELECTRA, no.254, pp.4-18, February, 2011.

FIDALGO, J., "Customized Neural Network System for Dynamic Security Preventive Control", International Journal of Power and Energy Systems, vol.31, no.1, pp.1-7, 2011.

LOPES, J.A.P., SOARES, F. J., ALMEIDA, P. M. R., "Integration of Electric Vehicles in the Electric Power System", THE PROCEEDINGS OF THE IEEE, vol.99, no.1, pp.168-183, January, 2011.

MADUREIRA, A., PEREIRA, J., GIL, N., LOPES, J.A.P., KORRES, G., HATZIARGYRIOU, N., "Advanced Control and Management Functionalities for Multi-MicroGrids", European Transactions on Electrical Power, vol.21, no.2, pp.1159-1177, March, 2011.

MATOS, M., BESSA, R. J., "Setting the Operating Reserve using Probabilistic Wind Power Forecasts", IEEE Transactions on Power Systems, vol.26, no.2, pp.594-603, May, 2011.

MIRANDA, V., KRSTULOVIC, J., KEKO, H., MOREIRA, C., PEREIRA, J., “Reconstructing missing data in State Estimation with autoencoders”, IEEE Transactions on Power Systems, 2011.

PEREIRA, A. J. C. , SARAIVA, J.T., "Generation Expansion Planning (GEP) - A Long-Term Approach Using System Dynamics and Genetic Algorithms", Energy International Journal, vol.36, no.8, pp.5180-5199, August, 2011.

SARAIVA, J.T., PEREIRA, M. L., MENDES, V. T., SOUSA, J.C., "A Simulated Annealing Based Approach to Solve the Generator Maintenance Scheduling Problem", Electric Power Systems Research, vol.81, no.7, pp.1283-1291, July, 2011.

RESENDE, F., GIL, N., LOPES, J.A.P., "Service restoration on distribution systems using Multi-MicroGrids ", European Transactions on Electrical Power, vol.21, no.2, pp.1327-1342, March, 2011.

SCHWEICKARDT, G., MIRANDA, V., WIMAN, G., “A comparison of metaheuristics algorithms for combinatorial optimization problems. Application to phase balancing in electric distribution systems”, Latin American Applied Research, vol.41, no.2, pp.113-120, 2011.

SILVA, S.M.S., FIDALGO, J., FONTES, D., "A Simulation Based Decision Aid Tool for Setting Regulation of Energy Grids with Distributed Generation", Operational Research International Journal, Volume 11, Issue 1, Pages 41-57, 2011.

WANG, J. , BOTTERUD, A. , BESSA, R. J. , KEKO, H., CARVALHO, L. , ISSICABA, D., SUMAILI, J., MIRANDA, V., "Wind Power Forecasting Uncertainty and Unit Commitment", Applied Energy, vol.88, no.11, pp.4014-4023, November, 2011.

6.3.2 Other international publications (6000 ca.)

Total number of publications: 78.

The complete list can be consulted in: http://profile.inescporto.pt

AGREIRA, C.I.F., PESTANA, R., FERREIRA, C.M.M., BARBOSA, F.P.M., "Portuguese transmission system contingencies analysis using the rough set theory", CIGRÉ, Recife 2011, April 2011.

ALMEIDA, P.R., LOPES, J.A.P., SOARES, F.J., SECA, L., "Electric Vehicles Participating in Frequency Control: Operating Islanded Systems with Large Penetration of Renewable Power Sources", IEEE PowerTech 2011, June 2011.

BESSA, R.J., BREMERMANN, L., MATOS, M., PESTANA, R., MACHADO, N., WALDL, H., WICHMANN,C., "Reserve and Congestion Management Using Wind Power Probabilistic Forecasting: A Real Case-Study ", European Wind Energy Association Annual Event (EWEA 2011), 2011.

BESSA, R.J., MATOS, M., SOARES, F.J., LOPES, J.A.P., "Models for the EV Aggregation Agent Business", IEEE PowerTech 2011, 2011.

BESSA, R.J., SUMAILI, J., MIRANDA, V.,BOTTERUD, A., WANG, J., CONSTANTINESCU, E.,"Time-adaptive kernel density forecast: a new method for wind power uncertainty modeling", PSCC'11, August 2011.

BOTTERUD, A., ZHOU, Z., WANG, J., VALENZUELA, J., SUMAILI, J., BESSA, R.J., KEKO, H., MIRANDA, V., "Unit Commitment and Operating Reserves with Probabilistic Wind Power Forecasts", IEEE PowerTech 2011, June 2011.

BOWER, B.T., LOPES, J.A.P., SOARES, F.J., RUA, D.E., HATZIARGYRIOU, N., STRUNZ, K., FERDOWSI, M., "MERGE - A European Commission Funded Project Addressing the Impact of the Roll-out of Electric and Plug-in Hybrid Vehicles on Gird Infrastructure", EVTeC''11 - 1st International Electric Vehicle Technology Conference 2011, May 2011.

CARVALHO, L.M., ROSA, M., MIRANDA, V., FERREIRA, R.J., "A Chronological Composite System Adequacy Assessment Considering Non-Dispatchable Renewable Energy Sources and Their Integration Strategies", PSCC'11, August 2011.

FERREIRA, H.L., FULLI, G., KLING, W.L., LOPES, J.A.P., "Storage Devices Impact on Electricity Distribution ", CIRED 2011 - The 21st International Conference and Exhibition on Electricity Distribution, 2011.

FERREIRA, R., MIRANDA, L.M., ARAÚJO, R.E., LOPES, J.A.P., "A new Bi-Directional Charger for Vehicle-to-Grid Integration" ,ISGT 2011 - IEEE PES ISGT 2011, Europe, December,2011.

GIL, N., ISSICABA, D., ALMEIDA, P.R., LOPES, J.A.P., "Hierarchical Frequency Control in Multi-MicroGrids: The Participation of Electric Vehicles", CIGRÉ SYMPOSIUM, September,2011.

ISSICABA, D., LOPES, J.A.P., ROSA, M., "Distribution Systems Performance Evaluation Considering Islanded Operation", PSCC'11, August 2011.

LEITE DA SILVA, A., ROSA, M., MATOS, M., "Long Term Evaluation of Operating Reserve with High Penetration of Renewable Energy Sources", IEEEGM2011 - IEEE Power & Energy Society General Meeting, July 2011.

MACIEL, R., PADILHA-FELTRIN, A., ROSA, M., MIRANDA, V., "A Multi-Objective Evaluation of the Impact of the Penetration of Distributed Generation" ISGT - IEEE PES Conference on Innovative Smart Grid Technologies Europe, December 2011.

MOREIRA, C., SILVA, B.A., SOARES, F.J., SECA, L., LOPES, J.A.P., "Inertial Control in Off-shore Wind Farms Connected to AC Networks through Multi-terminal HVDC grids with VSC", CIGRÉ SYMPOSIUM, September 2011.

MOREIRA, R., SILVA, N., LEITE, H., "Technical and Economic Assessment for Deployment of Distribution Automation Equipments - Enabling Self-Healing Strategies", ISGT - IEEE PES Conference on Innovative Smart Grid Technologies Europe, 2011.

PEREIRA, A.C., SARAIVA, J.T., "A Simulation Tool to Build Generation Expansion Plans in Competitive Electricity Markets", PSCC'11, August 2011.

PHULPIN, Y., ERNST, D., "Ancillary services and operation of multi-terminal HVDC grids", 10th International Workshop on Large-Scale Wind Integration into Power Systems, pp.1-6,October, 2011.

PHULPIN, Y., LUCANI, D., BARROS, J., "Network coding in smart grids" ,SmartGridComm 2011 - Second IEEE International Conference on Smart Grid Communications, pp.37-42, October 2011.

ROCHA, M.J.C., SARAIVA, J.T., "Discrete Evolutionary Particle Swarm Optimization for Multiyear Transmission Expansion Planning", PSCC'11, August 2011.

RODRIGUES, J.M., RESENDE, F., MOREIRA, C. "Contribution of PMSG based Small Wind Generation Systems to Provide Voltage Control in Low Voltage Networks", ISGT 2011 - IEEE PES ISGT 2011 Europe 2011.

RUA, D.E., PEREIRA, L.F., GIL, N.J., LOPES, J.A.P., "Impact of Multi-Microgrid Communication Systems in Islanded Operation", ISGT 2011 - IEEE PES ISGT 2011 Europe, December 2011.

SARAIVA, J.T., HEITOR, H., CORREIA, N., ARAÚJO, R., "Ancillary Services - The Current Situation in the Iberian Electricity Market and Future Possible Developments", IEEE PowerTech 2011, June 2011.

SILVA, A.M., LOPES, J.A.P., MATOS, M., "Multicriteria Decision Aid for Planning Energy Storage and Sustainable Mobility - The São Miguel Island Case Study", IEEE PowerTech, June 2011.

SOARES, F.J., LOPES, J.A.P., ALMEIDA, P.R., MOREIRA, C., SECA, L., "A Stochastic Model to Simulate Electric Vehicles Motion and Quantify the Energy Required from the Grid", PSCC'11, August 2011.

SUMAILI, J., KEKO, H., MIRANDA, V., ET AL., "Finding Representative Wind Power Scenarios and their Probabilities for Stochastic Models", ISAP 2011 - 16th International Conference on Intelligent System Applications to Power Systems, September 2011.

TOMIC, M., KONJIĆ, T., ROSA, M., MIRANDA, V., "Reliability Evaluation of Balkan Generation Systems Considering Planning Exercise of Wind Power Integration", Proceedings of the EEM 2011 - 8th International Conference on the European Electricity Markets, May 2011.

VALDEZ, M.M.T., FERREIRA, C.M., MACIEL BARBOSA, F., "Software Packages to Support Electrical Engineering Virtual Laboratories", exp.at11 - 1st Experiment@International Conference, 2011.

VASILJEVSKA, J., LOPES, J.A.P., "On the Micro-Grid and Multi Micro-Grid Impact Assessment: Cost and Benefits Evaluation.", CIGRÉ SYMPOSIUM, September 2011.

6.3.3 Ph. D. thesis completed (3000 ca.)

Theses supervised by members of the research group:

Approved
António José Ferreira da Silva, "Application of Artificial Intelligent techniques and Adaptive Control to Wind Parks Management", supervisor J. Nuno Fidalgo, co-supervisor Fernando Castro (ISEP/IPP), approved January 2011

Submitted
Pedro Miguel Pousada da Rocha Almeida, Impact of Vehicle to Grid in the Power System Dynamic Behaviour, supervisor J. Peças Lopes, submitted November 2011

Roque Filipe Mesquita Brandão, Assinatura Digital de Geradores Eólicos, supervisor F. Maciel Barbosa, submitted November 2011

Manuel José Costeira da Rocha, Transmission Expansion Planning – A Multiyear Approach Considering Uncertainties, supervisor J. Tomé Saraiva, submitted December 2011

Julija Vasiljevska, Evaluation of Technical, Economic and Environmental Impacts Resulting From Large Scale Integration of Microgrids, Including Responsive Demand, in Electrical Grids, supervisor J. Peças Lopes, co-supervisor Manuel Matos, submitted December 2011

Filipe Joel Nunes Soares, Impact of the deployment of electric vehicles in grid operation and expansion, supervisor J. Peças Lopes, submitted December 2011.

6.3.4 Patents/prototypes (2000 ca.)

Electricity Markets simulator with EV loads
Developed in the scope of the REIVE Project
Demo Place: INESC Porto
Development Period: 2011

Generation and Transmission Reliability Tool
Developed under PEst
Demo Place: INESC Porto
Development Period: 2011

Uncertainty Power Flow Platform
Developed under MERGE
Demo Place: INESC Porto
Development Period: 2011

Distribution System Reliability Tool

Developed under PEst

Demo Place: INESC Porto

Development Period: 2011

MEPSO and EPSO Platform

Developed under MERGE

Demo Place: INESC Porto

Development Period: 2011

Wind Power Forecasting Platform

Developed under MERGE

Demo Place: INESC Porto

Development Period: 2011

Tool for the Evaluation of multi-terminal HVDC grids and off-shore wind farms operation

Developed under TWENTIES

Demo Place: INESC Porto

Development Period: 2011

Tool for the Evaluation of Microgrids operation during islanding and black start under unbalanced conditions and including active EV participation

Developed under MERGE

Demo Place: INESC Porto

Development Period: 2011

Grid Interactive Charging Control for Plug-in Electric Vehicles

Developed under REIVE

Demo Place: INESC Porto

Development Period: 2010-2011

Grid Interactive Electronic Interface for micro wind generation units

Developed under REIVE

Demo Place: INESC Porto

Development Period: 2011

DMS/EMS new module - DOPF

Developed under EFACEC-DMS

Demo Place: EFACEC

Development Period: 2010-2011

DMS/EMS upgrade modules – Voltage Var Control, Topology Processor, Power Flow

Developed under EFACEC-DMS

Demo Place: EFACEC

Development Period: 2010-2011

6.3.5 Organization of Conferences (2000 ca.)

ELAB 2011 - Encontro Luso-Afro-Brasileiro para a Energia 2011, 20-21 October 2011, ENDIEL, Porto, joining together INESC TEC, Higher Education Institutions form Portugal, Brazil and other, members of the Board of most of the Power Companies of Portugal and the African Portuguese sepeaking countries plus some from Brazil.

6.3.6 Industry contract research (2000 ca.)

MECOORD – Efficient Methodology for Optimal Coordination of Directional Overcurrent Relay in Mashed Systems, P&D ANEEL, USE – USP São Carlos, Brazil, 2011 – 2013

REN-FACTS - Transient Stability and Voltage Control Studies in the Portuguese Transmission System, REN, 2011-2012

ONS-PREV – Roadmap about Wind Power Forecasting - Consultancy for the Independent System Operator of Brazil, ONS, 2011-2012

EEM-Dinâmica – Characterization of the Dynamic Behavior of the Madeira and Porto Santo Islands Regarding a Large Scale Integration of Renewable Energy Sources, EEM, 2011-2012

EDA-RENOV – Impact Studies for Large Scale Integration of Renewable Energy Sources in S. Miguel and Flores Islands, EDA, 2011-2012

EDP-Transf –Evaluation of the possibility of rescheduling generation between pairs of balancing areas of the Portuguese power system to deal with deviations from the market dispatch. EDP, 2010-11

NER 300 - Development of the specification of the Control Centers of Non-Interconnected Greek Islands, prepared under a consultancy contract for the Greek Operator of the Non Interconnected Islands, 2010-2011

MARTIFER CV - Consultancy studies regarding large scale renewable energy sources integration in Cape Verde Islands up to 2020. GeSto Energy, 2010-11 [collaboration USIG]

ENERCON - Consultancy studies regarding wind farms integration in the Portuguese transmission network, ENERCON, 2009-11

ASIRP – Analysis and selection of investments to reduce losses in the distribution system, EDP, 2009-2011

INOVGRID – Development of advanced telemetering systems able to support the technical and commercial management of distribution networks including micro-generation. EDP Distribution, 2007-2011.

REN-Recep, contracted with REN (Portuguese TSO) to estimate limits for the acceptance of new generation in the system nodes. REN 2007-2011

DMS - Development of new modules for the DMS/EMS system of EFACEC, in the framework of a sustained partnership of more than fifteen years. EFACEC 1997-2012

6.3.7 Internationalization (2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the international level)

EUROPEAN PROJECTS

- CitInES - Design of a decision support tool for sustainable, reliable and cost-effective energy strategies in cities and industrial complexes, 2011-2013
- MERGE – Mobile Energy Resources in Grids of Electricity, 2010-2011
- TWENTIES - Transmission system operation with large penetration of Wind and other renewable Electricity sources in Networks by means of innovative Tools and Integrated Energy Solutions, 2010-2012

INTERNATIONAL CONTRACTS

- PARAFUZZY – Development of fuzzy state estimation functions for online network analysis using paraconsistent logic. UNISANTA, Brazil, 2009-2011
- SIMULESP - System to support the operation of electric power sub-transmission grids in contingency situations, UNISANTA, Brazil, 2010-2013
- BiH - Technical Consultancy for Implementing a Load Research Program in Bosnia i Herzegovina, BiH, 2011-12
- PPC Tender - Definition and specification of the architecture of the Islands Operation Department Regarding Generation Scheduling and Dispatch Applications. PPC, 2010-2011
- NER 300 - Specification of the Control Centers of Non-Interconnected Greek Islands, Greek Operator of the Non Interconnected Islands,2010-2011
- ARGUS – Wind power prediction for the Argonne National Laboratory, USA

INTERNATIONAL TRAINING

- Coordination of the training activities of the European consortium EES-UETP
- Organization of the EES/UETP course “Impact of Large Scale Deployment of Electric Mobility in Power System Operation and Planning”, 3-4 October 2011, Porto
- Participation on the EES/UETP course “Smart Electricity Distribution Grids: Economics and Regulation” , 13-15 April 2011, U. Pontificia Comillas, Madrid
- MIT-Portugal programme
- Participation in the Scientific Committee and Direction of the PhD program on Sustainable Energy Systems (SES) at FEUP. Co-direction of the MPP SES PhD educational program.
- Hosting of several PhD students of the PhD Programme on SES
- CMU-Portugal programme
- Hosting a PhD student
- Project DYMONDS

No. of papers in cooperation with authors from foreign institutions: journal – 6, other int - 24

6.3.8 Other national publications (6000 ca.)

ARAÚJO, R. E., SAMPAIO, M., FERREIRA, J., DE CASTRO, R, ARAÚJO, R. E., “Smartphone's Potentials in Electric Vehicles Applications”, IJUP'11 - Investigação Jovem na U.Porto 2011, Porto, Portugal, Janeiro, 2011.

FERREIRA , R. A., ARAÚJO, R, E., LOPES, J. A. P. , "A comparative analysis and implementation of various PLL techniques applied to singlephase grids", IYCE 2011 - 3rd International Youth Conference on Energeticas 2011, July, 2011.

MELO, P., ARAÚJO, R, E., DE CASTRO, R., “Overview on Energy Management Strategies for Electric Vehicles - Modelling, Trends and Research Perspectives”, IYCE 2011 - 3rd International Youth Conference on Energeticas 2011, Leiria, Portugal, July, 2011.

SALLES, W., LEITE DA SILVA, A., ROSA, M., MANSO, L., "Avaliação dos Requisitos de Reserva Operativa em sistemas de Geração com Elevada Penetração de Energia Eólica", XXISNPTEE - Seminário Nacional de Produção e Transmissão de Energia Eletrica (Brazil), October 2011.

6.3.9 Government/Organization contract research (*2000 ca.)*

Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

Research projects funded by FAI (Innovation Support Fund) from the Ministry of Economy, Innovation and Development:

- REIVE - Smart electrical grids with electrical vehicles (with LNEG, CEEETA-ECO, EDP, REN, GALPENERGIA, EFACEC, CONTAR, LOGICA), 2010-2012
- Study “Recommendations for a sustainable strategy for Energy Efficiency and Renewable Energy in Portugal” (with AT Kearney), 2011-2012

Research project funded by the DSO that led to the reference profiles for market settlement

- Definition of load, losses and public lighting reference hourly profiles for market use in 2012

Research projects funded by FCT:

- GREEN ISLANDS - Power demand estimation and power system impacts resulting of fleet penetration of electric/plug-in vehicles, FCT (MIT-Portugal programme), 2009-2012 (coord. J. Peças Lopes)
- GEMS – Gross Errors and Missing Signals – New concepts in Power System State Estimation, 2010-2012 (coord. V Miranda)
- DYMONDS - Toward Dynamic Monitoring and Decision–Based Smart Distribution Systems (with IST/UTL and CMU), FCT, 2010-2013 (coord. J. A. Peças Lopes)
- LASCA - Large Scale Computing with Auto-encoders – Application to Power Systems, FCT, 2011-2012, (coord. V Miranda)
- SMAGIS - A Smart Energy Grid Integration System Configuration of an Energy Storage System in presence of RES Microgeneration, EDVs and Polygeneration (with IST/UTL), FCT, 2011-2013 (coord. Carlos Moreira)

- MG+EV – Identification of Control and Management Strategies for Microgrids with Plugged-in Electric Vehicles (with EFACEC) FCT, 2011-2013 (coord. J. A. Peças Lopes)

6.1 Group Description - UITT

Research Group Title	**INNOVATION AND TECHNOLOGY TRANSFER**
Principal Investigator	João Alberto Vieira de Campos Pereira Claro
Research Area	Economics and Management
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 31.736,00

European Commission: 0,00

QREN: 56.931,00

TOTAL: 88.667,00

6.2 Objectives & Achievements - UITT

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 were Prof. João Claro together with M.Sc. Alexandra Xavier.

MISSION

The Innovation and Technology Transfer Unit (UITT) mission is to perform R&D, advanced consulting, and executive education in the broad areas of Technology and Innovation Management, and Technology Entrepreneurship.

STRATEGIC OBJECTIVES

In the areas of Technology and Innovation Management, the unit's main objectives are: to improve INESC TEC's R&D management practices, in collaboration with the Board of Directors and other R&D units; and to support private companies in their Technology and Innovation Management processes.

In the area of Technology Entrepreneurship, the main objectives are: to support researchers and promoters in technology transfer and knowledge valorisation; to support the Board of Directors in the continuous effort to establish an innovative and entrepreneurial environment and culture at INESC TEC; to support public and private organizations that carry out initiatives to foster and support technology entrepreneurship.

Concerning R&D activities, the main objectives are: to create knowledge in Technology Management, Innovation Management, and Technology Entrepreneurship; to host and support MSc and PhD students carrying out research in the areas outlined above; to promote the valorisation of knowledge through the development of conceptual frameworks, methodologies, tools and executive education programmes, to be provided to private and public organizations.

MAIN RESEARCH AND DEVELOPMENT AREAS AND ACTIVITIES

- Technology entrepreneurship. Particular focus is placed on factors that influence researchers in early stages of entrepreneurial ventures, and the ways different organisational solutions address the equity gap problem. The design and impact of collaborative environments involving university, industry, and the public sector, to promote entrepreneurship and knowledge transfer and valorisation in Creative Industries, is also considered.

- Technology and Innovation Management. This area focuses on innovation management practices, tools and metrics, building on contributions to the Portuguese Standard for R&D&I Management and subsequent consulting. The research also focuses on multidisciplinary approaches to enabling the Front End of Innovation combining methods and tools that build on state-of-the-art concepts and trends in: enterprise information systems; enterprise integration; information and communication technology and business narrative modelling and analysis.

- Innovation networks. The research in this area involves analysing open innovation in multiple countries and studying the degrees of openness observed in different open innovation initiatives. The impact of framework conditions in the operations of Technology Transfer Offices is also

examined. Scientometric tools are used to analyse R&D collaborative networks, such as technology clusters or international collaborations.

- Technology strategy. UITT is examining how uncertainty and flexibility are considered in technology roadmapping. Researchers at UITT also study the interactions between technology strategy and operations strategy.

- Flexibility in engineering design. Methods to design complex products and systems with flexibility, to enhance their performance in relation to uncertain future conditions, are being developed. This includes extending flexible design from individual projects to networked systems, and improvements in design methods aiming at a better integration of engineering, management and social sciences aspects.

- Science and technology policy. This area includes studying the relationship between foreign trade, human capital development, local R&D efforts and economic growth. The role of networks as fundamental enablers of early technology development and commercialization is also examined.

6.2.2 Main Achievements (4000 ca)

TECHNOLOGY ENTREPRENEURSHIP, a project in partnership with ANJE (Associação Nacional de Jovens Empresários) to foster the development of technology-based entrepreneurial ventures for the software, multimedia, textiles and clothing industries. During 2011, the project developed idea generation and opportunity assessment support activities.

CEICI (Centre of Excellence for Creative Industries and Innovation) is a project promoted by INESC Porto, as part of the Centre for Creative Industries (P.INC I) led by Association for Technology Transfer of the University of Porto. CEICI is based on an integrated set of activities that will: promote CI businesses by creating and strengthening the necessary skills to turn ideas into innovative products and services, using tools and methodologies; support entrepreneurship projects on CI through coaching and mentoring; promote networks; use case studies to disseminate creative entrepreneurship projects that will be examples for emerging CI projects.

A weeklong Lecture & Hands-on Entrepreneurship Workshop, for post-graduate and postdoc science and engineering fellows at the University of Porto, was co-organized with I3S Associate Laboratory and the Engineering Innovation Institute of the University of Florida (USA).

A EU funded project with Technical University of Delft, Advancis, Leaders2Be, Lappeenranta University of Technology (Kouvola Unit), and University of Lodz, started in 2011, aiming at creating an entrepreneurship training and coaching programme that contributes to the development of key entrepreneurial skills, both technical and behavioral, essential to enable and leverage university spin-off growth.

TECHNOLOGY AND INNOVATION MANAGEMENT

UITT organized with UPIN a stream of workshops to raise the awareness of Portuguese companies for the value of implementing Innovation Management Systems. This partnership also includes a consulting component, related to Innovation Management support.

UITT are recognized for their experience and knowledge in the development, implementation and evaluation of contents, methodologies, procedures, processes and tools for Innovation Management in all kinds of organizations in different sectors.

In the area “ENABLING THE FUZZY FRONT END OF INNOVATION” (FFE), the research focuses on the multidisciplinary nature of the FFE and on supporting tools and concepts. Several articles were published in 2011, and the development of a modeling tool, [B]NML ([Business] Narrative Modelling

Language), was completed. The team, coordinated by Prof. J.J.Ferreira, was consolidated, and consists now of 5 researchers, and 4 PhD students.

FLEXIBILITY IN ENGINEERING DESIGN

A major project started in 2011, with MIT, Grupo Portucel Soporcel, Instituto Superior de Agronomia, and Universidade de Trás-os-Montes e Alto Douro. This project is applying an engineering systems perspective, integrating technology, management and policy components, to the design of the forest fire management system in Portugal. With a total budget above 600 thousand Euros, the project's academic leadership counts with Richard de Neufville, from MIT, and João Claro, from UITT. In October, early results were discussed and well received by the project's Stakeholder Committee, which includes all the major public and private stakeholders of the forest fire management system in Portugal.

João Claro helped launch and is collaborating in the leadership of the new PhD in Engineering and Public Policy (EPP) at FEUP, a dual degree program in collaboration with the EPP department from Carnegie Mellon University, arguably the world leading organization in this area. Kristen Schell, a research assistant at UITT, received one of the two PhD grants for the dual degree track of the program.

INNOVATION NETWORKS

UITT sought the beginning of collaboration with the University of Porto Business School (UPBS) in the area of Open Innovation, through the co-organization of a workshop led by Marko Torkkeli for the UPBS's alumni. A proposal for an executive education and coaching initiative was prepared for Sonae Indústria, and was in final stages of negotiation.

Aurora Teixeira led two studies for the UT Austin|Portugal Program UTEN initiative, on the professionalization of technology transfer and commercialization in Portugal, and on characteristics of, and recent trends on, academic spin-offs in Portugal.

OTHER

UITT started an internal weekly research seminar in 2011, with 39 sessions held on the knowledge areas where the unit develops its work.

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - UITT

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 21
The complete list can be consulted in: http://profile.inescporto.pt

Au-Yong Oliveira, M., Ferreira, J.J., "Business Model Generation: A handbook for visionaries, game changers and challengers", African Journal of Business Management , April 2011, Book Review, vol.5, no.7.

Au-Yong Oliveira, M., Ferreira, J.J., "Facilitating qualitative research in business studies: Using the business narrative to model value creation'", African Journal of Business Management , January 2011, ISSN 1993-8233, (ISI INDEXED JOURNAL), vol.5, no.1, p.68-75.

Au-Yong Oliveira, M., Ferreira, J.J., "Producing innovation: Comments on Lee and Yu (2010)", African Journal of Marketing Management, March 2011, Commentary, vol.3, no.3, p.65-67.

Castro e Silva, M., Teixeira, A., "A bibliometric account of the evolution of EE in the last two decades Is ecological economics (becoming) a post-normal science?", Ecological Economics , January 2011, Indexed in EconLit and ISI, vol.70, no.5, p.849-862.

Claro, J., Costa, C., "A made-to-measure indicator for cross-disciplinary bibliometric ranking of researchers performance", Scientometrics 2011, vol.86, no.1, p.113-123.

Fernandes, L., Mendes, A., Teixeira, A., "A review essay on child well-being measurement", Social Indicators Research, February 2011, DOI 10.1007/s11205-011-9814-9 [Indexed in ISI].

Gonçalves, R., Martins, J., Pereira, J., Au-Yong Oliveira, M., Ferreira, J.J., "Accessibility levels of Portuguese enterprise websites: equal opportunities for all?", Behaviour & Information Technology , May 2011, p.1-19.

Huizingh, E., Conn, S., Torkkeli, M., "Open Innovation", The International Journal of Technological Innovation, Entrepreneurship and Technology Management, January 2011, Huizingh Eelko, Conn Steffen and Torkkeli Marko (Eds.), , vol.31, no.1, p.1-68.

Kyrki, A., Torkkeli, M., "Software Superstore - Russian IT Resources in Offshore Software Development", International Journal of Business and Emerging Markets 2011, vol.3, no.2, p.177-197.

Meneses, O., Teixeira, A., "The innovative behaviour of tourism firms", Economics and Management Research Projects: An International Journal 2011, vol.1, no.1, p.25-35.

Pacheco Sequeira, J.A., Teixeira, A., "Assessing the influence and impact of R&D institutions by mapping international scientific networks: the case of INESC Porto", Economics and Management Research Projects: An International Journal 2011, vol.1, no.1, p.8-19.

Podmetina Daria, D., Väätänen, J., Torkkeli, M., Smirnova, M., "Open innovation in Russian Firms: an empirical investigation of technology commercialization and acquisition ", International Journal of Business Innovation and Research 2011, vol.5, no.3, p.298-317.

Savitskaya, I., Podmetina, D., Torkkeli, M., Väätänen, J., "Influence of external factors on application of model of open innovation by the industrial enterprises", Nauchno-Tekhnicheskiye Vedomosti 2011, vol.121, no.3, p.36-44.

Savitskaya, I., Torkkeli, M., "A Framework for Comparing Regional Open Innovation Systems in Russia ", International Journal of Business Innovation and Research 2011, vol.5, no.3, p.332-346.

Silva, E.G., Teixeira, A., "Does structure influence growth? A panel data econometric assessment of 'relatively less developed' countries, 1979-2003", Industrial and Corporate Change , April 2011, Indexed in EconLit and ISI, vol.20, no.2, p.433-455.

Silva, S., Teixeira, A., "Labour decisions and industrial dynamics in an evolutionary model: a neglected modelling approach", Evolutionary and Institutional Economics Review 2011, forthcoming (Indexed in EconLit), vol.7, p.295-331.

Smirnova, M., Podmetina, D., Väätänen, J., Torkkeli, M., "Collaborative Approaches to New Product Development: the Case of Russia", International Journal of Entrepreneurship and Innovation Management 2011.

Teixeira, A., "Mapping the (in)visible college(s) in the field of entrepreneurship ", Scientometrics, July 2011, vol.89, no.1, p.1-36.

Teixeira, A., Sequeira, J., "Determinants of the international influence of a R&D organisation: a bibliometric approach", European Journal of Scientific Research 2011, forthcoming (Indexed in Scopus), vol.53, no.3.

Väätänen, J., Podmetina, D., Savitskaya, I., Torkkeli, M., "New Trends in Russian Innovations: The Ownership Effect on the Adoption of Open Innovation Practices", Journal of East-West Business, December 2011, vol.17, no.2, p.132-143.

Vidal Grande, M., Teixeira, A., "Corruption and MNCs' entry mode. An empirical econometric study of Portuguese firms investing in PALOPs", Economics and Management Research Projects: An International Journal 2011, vol.1, no.1, p.36-52.

6.3.2 Other international publications (6000 ca.)

Total number of publications: 10
The complete list can be consulted in: http://profile.inescporto.pt

Assunção, S., Teixeira, A., Forte, R., "Do countries' endowments of Non-Renewable Energy Resources matter for FDI attraction? A cross-country econometric analysis", IIBC-2011 - 7th Iberian International Business Conference - Iberian Firms in a New World 2011, Lisboa, Portugal.

Collins, R., de Neufville, R., Claro, J., Oliveira, T., "Suppression or Prevention: Modeling forest fire management using System Dynamics", INFORMS Annual Meeting 20 - INFORMS Annual Meeting 2011 2011, Charlotte, EUA.

Grande, M., Teixeira, A., "Corruption and Multinational Companies' Entry Modes. Do Linguistic and Historical Ties Matter?", IIBC-2011 - 7th Iberian International Business Conference - Iberian Firms in a New World 2011, Lisboa, Portugal.

Jimenez, E.R., Pinho de Sousa, J., Claro, J., "Airport Competition and Aviation Network Evolution: an Exploratory Study on Continental Portugal", XXV ANPET - XXV ANPET: Congresso de Pesquisa e Ensino em Transportes, November 2011, Belo Horizonte, Brasil.

Machado, E.M., Au-Yong Oliveira, M., Baptista, J.d.S., "The occurence of musculoskeletal injuries in nursing professionals: An analysis of Portuguese hospitals", in Proceedings of SHO 2011 - International Symposium on Occupational Safety and Hygiene, February 2011, ISBN 978-972-99504-7-6, Guimarães, Portugal, p.353-357.

Passos, A., Xavier, A., Torkkeli, M., "Designing a Innovation Measurement Tool for the Portuguese Footwear Sector", in Proceedings of ISPIM 2011 - XXII ISPIM Conference – Sustainability in Innovation: Innovation Management Challenges, June 2011, Hamburgo, Alemanha.

Podmentina, D., Savitskaya, I., Torkkeli, M., Väätänen, J., "Review of methodology in open innovation research", in Proceedings of ISPIM 2011 - XXII ISPIM Conference – Sustainability in Innovation: Innovation Management Challenges 2011, Hamburgo, Alemanha.

Smirnova, M., Podmetina, D., Torkkeli, M., Väätänen, J., "COOPERATION AND OPEN INNOVATION IN EMERGING ECONOMIES. STUDY OF INNOVATION STRATEGIES IN RUSSIA", Proceedings of AOM 2011 - 2011 Academy of Management Annual Meeting - West Meets East: Enlightening, Balancing, and Transcending , August 2011, San Antonio - Texas, USA.

Väätänen, J., Podmetina, D., Smirnova, M., Torkkeli, M., "Open Innovation Strategy - Optimizing R&D Cooperation Quantity and Intensity", in Proceedings of IAMOT 2011 - The 20th International

Conference on Management of Technology: 'Technology and the Global Challenges: Security, Energy, Water, and the Environment' , April 2011, Miami - Florida, USA.

Veloso Ferreira, M.I., Teixeira, A., "Organizational Characteristics and Performance of Export Promotion Agencies: Portugal and Ireland compared", 37th EIBA Conference - 37th EIBA Annual Conference: Taking International Business to the Next Level - Emerging Issues, Strategies and Economies 2011, Bucareste, Roménia.

6.3.3 Ph. D. thesis completed (3000 ca.)

(void)

6.3.4 Patents/prototypes (2000 ca.)

(void)

6.3.5 Organization of Conferences (2000 ca.)

(void)

6.3.6 Industry contract research *(2000 ca.)*

The relationship of the unit with industry has been mainly focused on supporting technology transfer, spin-off company incubation, and on the implementation of Innovation Management Systems. During 2011 UITT providing coaching to 7 entrepreneurial projects: Grabmark, Digital Music, Apicula, Culture Print, Digital Active TV, OSTV, Palco da realidade.

Innovation Management Systems

Implementation – Cerealis, K2C, Flupol

Audit – M.A.R. Kayakes , Shortcut

Training

Executive Training on “Innovation Management Systems” organized by APCER

3In Company Workshops

Studies

Study for the Footwear sector, related to Innovation dynamics: “Innovation dynamics in the footwear sector”; the contractor is APPICAPS.

General activity

Helping entrepreneurs and R&D Units in the process of evaluation of opportunities and in the development of “Commercial Feasibility Studies” and “Business Plans”.

Implementing process and tools for an efficient management of R&D projects .

6.3.7 Internationalization (2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

COLLABORATIVE RESEARCH

UITT has a longstanding strategic collaboration with Prof. Marko Torkkeli, from the Lappeenranta University of Technology in Finland, who is a visiting researcher with the unit.

UITT also has on-going research collaborations with Prof. Richard de Neufville, from the Engineering Systems Division of MIT, Prof. Steve Markham, from North Carolina State University, and Prof. Angus Kingon, from Brown University.

João Claro co-supervises: Kristen Schell, a research assistant at UITT, with Paul Fishbeck and Pedro Ferreira from CMU; Vasco Teles, also a research assistant at UITT, with Randy Kirchain, from MIT.

INTERNATIONAL PROJECTS

SPIN-UP is an ERASMUS project with Technical University of Delft, Advancis, Leaders2Be, Lappeenranta University of Technology (Kouvola Unit), and University of Lodz.

FIRE-ENGINE is a project with MIT, funded by the MIT Portugal Program.

UITT collaborates with COTEC Portugal in CAL4INO, a Lifelong Learning project with Cambridge Judge Business School, Queen's University Belfast, Laurea University, RISEBA, Emerald, University of Wuppertal and University of Piraeus.

UITT initialise contacts and submit a proposal for provide training in Innovation Management Practices and Open Innovation issues for LINPRA, the Lithuanian Engineering Industry.

TRAINING NETWORKS

UITT collaborates with UTEN, an initiative within the UT Austin|Portugal Program, in particular in a research component of the initiative. UITT also collaborates with the MIT Portugal Program, hosting PhD students, lecturing in the program, and in 2011 with a contribution to the definition of the strategy for the program's second phase. A third collaboration with the CMU Portugal Program started in 2011, specifically with the PhD in EPP at FEUP: the unit hosts PhD students from the program, and contributes to lecturing and leadership.

UITT co-organizes with the Engineering Innovation Institute of the University of Florida, and I3S Associate Laboratory, a weeklong Lecture & Hands-on Entrepreneurship Workshop, for post-graduate and postdoc science and engineering fellows at the University of Porto.

No. of papers in journals cooperation with authors from foreign institutions: 7

No. of other publications cooperation with authors from foreign institutions: 5

6.3.8 Other national publications (6000 ca.)

Total number of publications: 17
The complete list can be consulted in: http://profile.inescporto.pt

Africano, A.P., Teixeira, A., Caiado, A., "The usefulness of State trade missions for the internationalization of firms: an econometric analysis ", March 2011, GEE Papers, no.34.

Assunção, S., Forte, R., Teixeira, A., "LOCATION DETERMINANTS OF FDI: A LITERATURE REVIEW" 2011, WP FEP 433.

Au-Yong Oliveira, M., Ferreira, J.J., "Innovativeness and its link to interoperability: An investigation using a novel Business Narrative Modelling Language (BNML)", in Book of Abstracts of IEMS '11 - 2nd Industrial Engineering and Management Symposium , January 2011, Porto, Portugal.

Carvalho, L., Teixeira, A., "Where are the poor in International Economics?" 2011, WP FEP 425.

Couto, M., Teixeira, A., "Festivais de Música de Verão em Portugal: determinantes da participação e a identificação dos seus patrocinadores" [Summer Music Festivals in Portugal: determinants of participation and identification of its sponsors] 2011, WP FEP 426.

Delgado, D.J., "Transmission Network Expansion Planning under Uncertainty", July 2011.

Dias, M., Teixeira, A., "A Importância da Geopolítica nas Decisões de Localização Internacional: O Caso Polaco" [The Importance of Geopolitics in International Decisions: The Polish Case] 2011, WP FEP 428.

Fernandes, L., Teixeira, A., Teixeira, A., "A weighted multidimensional index of child well-being which incorporates children's individual perceptions" 2011, Working Paper 415.

Governo, F., Teixeira, A., "Marketing and technology sophistication as hidden weapons for fostering the demand for 'art house' cinema films: a cross country analysis", January 2011, FEP Working Papers , no.397.

Grande, M., Teixeira, A., "Corruption and Multinational Companies' Entry Modes. Do Linguistic and Historical Ties Matter?" 2011, WP FEP 417.

Grande, M., Teixeira, A., "Linking entry mode choices of MNCs with countries' corruption. A review " 2011, WP OBEGEF.

Lima, F.A., "INOVAÇÃO PELO DESIGN: Contributos para a sua implementação." [Innovation trough Design: Contributes for its implementation.], October 2011, Tese de Mestrado.

Nogueira, J.P., Teixeira, A., "Determinantes do empreendedorismo académico na área das ciências da vida em Portugal" [Determinants of academic entrepreneurship in the field of life sciences in Portugal] 2011, WP FEP 440.

Oliveira, P., Teixeira, A., "The internationalization profiles of Portuguese SMEs" 2011, WP FEP 439.

Pereira Pacheco, A., "Simulation Analysis of a Wildland Fire Suppression System", June 2011.

Silva, C., Teixeira, A., "Empreendedorismo político local em Portugal. Uma análise exploratória" [Local political entrepreneurship in Portugal. An exploratory analysis.] 2011, WP FEP 427.

Teixeira, A., Catarino, M., "The importance of Intermediaries organizations in international R&D cooperation: an empirical multivariate study across Europe" 2011, GEE Papers from Gabinete de Estratégia e Estudos, Ministério da Economia e da Inovação, vol.38.

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

(void)

6.1 Group Description - LIAAD

Research Group Title	**LIAAD**
Principal Investigator	Alípio Mário Guedes Jorge
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 109.493,36

European Commission: 6.501,00

QREN: 16.947,00

TOTAL: 132.941,36

6.2 Objectives & Achievements - LIAAD

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. Pavel Brazdil.

This Unit is an autonomous Associate Unit of INESC TEC.

OBJECTIVES

The LIAAD Associate Unit is the core Research Group of the research line "Intelligent and Adaptive Systems and Mathematical Modelling in Decision Support". LIAAD continues the tradition of conducting both fundamental and applied high quality research. The main aim is to develop new methods and techniques in the areas of data mining and modelling and use these for decision support. Many of the activities are carried out by postgraduate students under the supervision of their peers and thus contributing to their training.

The scientific competences associated with this line require a combined effort from researchers, professionals and post-graduate students with competences in diverse areas including artificial intelligence, in particular, machine learning, data mining, multi-agent modelling, as well as information systems, information management and retrieval, spatio-temporal information, simulation, optimisation, statistical and mathematical modelling in economics and management science.

The work required to achieve these research goals is described in the following sections.

LEARNING AND EXTRACTING INFORMATION

Developing and improving data mining algorithms and methodologies for solving complex decision problems taking into account, for instance, the ability to deal with new data types, new ways of collecting data, new decision problems, new computational models, etc.

Developing and enhancing methods for learning, in real-time, from distributed data streams and evolving data, requiring the ability to adapt decision models in environments with unknown dynamics. Developing and enhancing methods for resource-aware data mining, including distributed online algorithms for change detection, summarisation, classification, regression, clustering, etc.

Developing and enhancing metalearning methods to aid the user in selecting appropriate machine learning / data mining method or sequence/combination of such methods. Exploiting past information to determine which algorithms are likely to produce better results on a new task.

Developing and enhancing ILP relational methods. The aim is to investigate how to speed-up these methods, taking advantage of parallel, distributed approaches and grid computing with application to bioinformatics, and NLP.

Developing methods for automation of web site reconfiguration and maintenance of contents and enhancing methods for document classifications, extracting information from text/web documents: automatic methods for sentiment analysis.

MATHEMATICAL AND STATISTICAL MODELLING AND DECISION SUPPORT

Studying and enhancing methods for statistical modelling, in particular parametric models for interval data that allow for inference and hypothesis testing; clustering methods for symbolic data and methods for variable selection and grouping.

Developing and enhancing methods useful in simulation, modelling and optimisation, focusing on decision problems in management science, among other application areas. Incorporating methods that include meta-heuristics and optimisation techniques based on genetic algorithms, and other bio-inspired systems.

Developing and enhancing methods in mathematical modelling focusing on dynamical systems, game theory and mathematical economy and finances, also applicable to mathematical physics, mathematical biology, time series analysis, and models of industrial organisation. Developing and enhancing methods using AI-based approaches, such as multi-agent framework, by simulating firms for specific industries and locations and studying their interactions and cooperation.

RESEARCH GROUP INTERACTION and TECHNOLOGY TRANSFER

The research activities of LIAAD have interacted with other specific competences, such as:

CRACS – on development ILP/relational methods in bioinformatics;

USE – on adaptive modelling processes in the context of renewable power systems;

UESP – on optimisation and decision support; data mining in industrial applications; modelling industrial networks.

Synergies being explored are:

USE - in self-energy production and management for autonomous systems;

USIG - on information systems and on particular aspects involving adaptation, text/web mining and applications in various areas such as e-health;

UTM - on adaptive methods on problems that involve multimedia content; event detection;

ROBIS - in applying adaptive methods and machine learning process control and robotics;

UGEI - in areas similar to the interaction with UESP.

6.2.2 Main Achievements (6000 ca)

IMPORTANT NOTE: The results reported here have been co-financed by Plurianual 2010 (2/3) and PEST 2011 (1/3) and will be also reported separately for the Plurianual report.

HIGHLIGHTS

In 2011 the group had a record number of publications (34) in international journals. Some publications in high profile conferences such as KDD, ICML and IJCAI should also be highlighted. Overall the group published more than 100 articles in journals, conferences and books.

Researchers from the group have (co-)chaired 2 international conferences (IDA – Intelligent Data Analysis, IEEE-ICDM) and several international conferences.

3 new books were published, one of which is the IDA proceedings. One book edited in 2010 was data mining best-seller in Amazon.com.

M. Paula Brito was elected president of International Association for Statistical Computing.

3 members of LIAAD concluded their PhD. One PhD work from 2010 won the CONET best PhD Award.

As before, some of our researchers participate as members of editorial boards of scientific journals and scientific committees of international conferences.

LIAAD cooperated in projects with USIG, CRACS, UTM, USE, UESP, UGEI and ROBIS. These collaborations resulted in some joint publications with elements from other units and one deployed software product.

LEARNING FROM DATA STREAMS

- CONET Award for Best PhD Work - Pedro Pereira Rodrigues, "Learning from Ubiquitous Data Streams: Clustering Data and Data Sources" - (http://www.cooperating-objects.eu/events/ewsn-2011-awards/).
- Organization of International Conference IDA 2011 in Porto
- Publications in Major Conferences (ICML, IJCAI) and Journals (DAMI, JMLR)
- Invited talk in International Conference (EGC, France)

MODELING DYNAMIC SYSTEMS

- Book “Data Mining with R, learning with case studies” was the #1 data mining book at amazon.com sales rank during all year of 2011.
- Paper published on the top Data Mining conference (KDD’2011) - “2D-Interval Predictions for Time Series”
- Paper published on the top Artificial Intelligence conference (IJCAI’2011) - “Utility-based Fraud Detection”

WEB AND TEXT MINING

- The European project ePolicy started.
- The QREN project Palco3.0, in cooperation with units CRACS, USIG and UTM, was concluded in November. One of the results of the project was the Automatic Recommendation Platform, developed mainly by LIAAD and CRACS, which has been deployed at the site www.palcoprincipal.pt, and is fully operational.

GAME THEORY AND MATHEMATICAL FINANCE

- Book in two volumes Mauricio M. Peixoto, Alberto A. Pinto and David A. Rand. “Games and Science”, Springer Proceedings in Mathematics series.
- Alberto A. Pinto was elected Presidente do Centro Internacional de Matemática (CIM), Portugal.
- Alberto A. Pinto was invited by Springer to initiate the new “Springer-Verlag Proceedings in Mathematics series as an editor with Mauricio Peixoto and David Rand.

COOPERATION WITH OTHER UNITS

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

This RL is tied to the research activities carried out by the Laboratory of Artificial Intelligence and Decision Support (LIAAD), an LA Associate Unit, but it broadens its scope, by integrating other specific competences of the Research Group (like operations research) as well as strengthening synergies and incorporating the skills available in other Research Groups, such as:

CRACS – on development/enhancements of ILP/relational methods in bioinformatics; on the development of a Recommender Service which has been deployed;

UTM – on the development of recommender systems based on audio analysis;

USE – on adaptive modelling business processes in the context of renewable power systems;

UESP – on optimisation and decision support; data mining in industrial applications; modelling industrial networks;

UGEI – on the application of data mining to urban transport management.

Other interesting synergies with the potential to be explored are:

with USE, in self-energy production and management for autonomous systems;

with USIG, on information systems and on particular aspects involving adaptation, text/web mining and applications in various areas such as e-health;

with UTM, on adaptive methods on problems that involve multimedia content;

with ROBIS, in applying adaptive methods and machine learning process control and robotics;

with UGEI, in areas similar to the interaction with UESP.

6.3 Productivity - LIAAD

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 40.
The complete list can be consulted in: http://profile.inescporto.pt. Also in: http://www.liaad.up.pt/

23 Articles in International Journals Listed on ISI

1. João Gama, M. May: Ubiquitous Knowledge Discovery, Intelligent Data Analysis, Vol. 15(1): 1, [ISI, DBLP] - IF 0,412

2. João Gama, Pedro P. Rodrigues, L. M. B. Lopes, Clustering distributed sensor data streams using local processing and reduced communication, Intelligent Data Analysis, Vol. 15, pp. 3-28 - [ISI, DBLP] - IF 0,412

3. E. Ikonomovska, João Gama, S. Dzeroski, Learning model trees from evolving data streams, Data Mining and Knowledge Discovery, Vol. 13, 1, pp. 128-168 - July [ISI, DBLP] IF 1,238

4. J. Pei, João Gama, Q. Yang, R. Huang, X. Li, Best papers from the Fifth Int. Conf. on Advanced Data Mining and Applications (ADMA 2009), Knowledge and Information Systems, Vol. 27, 2, pp. 163-164 - [ISI, DBLP]- IF 2,008

5. José F. Gonçalves, Paulo Sousa, A genetic algorithm for lot sizing and scheduling under capacity constraints and allowing backorders, International Journal of Production Research, Vol. 49, 9, pp. 2683-2703 - May [ISI] - IF 1,033

6. José F. Gonçalves, M. G. C. Resende, A parallel multi-population genetic algorithm for a constrained two-dimensional orthogonal packing problem, Journal of Combinatorial Optimization, vol. 22, 2, pp. 180-201, - [ISI, DBLP]- IF 0,483

7. José F. Gonçalves, M. G. C. Resende, J. J.M. Mendes, A biased random-key genetic algorithm with forward-backward improvement for the resource constrained project scheduling problem, Journal of Heuristics, Vol. 17, 5, pp. 467-486 - October - [ISI, DBLP]- IF 1,623

8. José F. Gonçalves, M. G. C. Resende, Biased random-key genetic algorithms for combinatorial optimization, Journal of Heuristics, Vol. 17, 5, pp. 487-525 - October - [ISI, DBLP]- IF 1.623

9. Rui Gonçalves, Helena Ferreira, Alberto A. Pinto, Universality in the stock exchange markets, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1049-1063 - [ISI]- IF 0,951

10. M. Gaspar, T. Amaral, B. M. P. M. Oliveira, N. Borges, Protective effect of physical activity on dissatisfaction with body image in children - A cross-sectional study, Psychology of Sport and Exercise, Vol.12, 5, pp.563-569, - [ISI]- IF 2,218

11. Alberto A. Pinto, D. A. Rand, Uniformly hyperbolic diffeomorphisms in every surfaces, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1031-1047 - [ISI]- IF 0,951

12. L. Almeida, J. Cruz, Helena Ferreira, Alberto A. Pinto, Bayesian-Nash equilibria in theory of planned behavior, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1085-1093 - [ISI]- IF 0,951

13. J. M. Alonso-Meijide, F. Ferreira, M. A. Mozos, Alberto A. Pinto, Two new power indices based on winning coalitions, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1095-1100 - [ISI]- IF 0,951

14. L. Boukas, D. Pinheiro, Alberto A. Pinto, S. Z. Xanthopoulos, A. N. Yannacopoulos, Behavioural and dynamical scenarios for contingent claims valuation in incomplete markets, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1065-1084 - [ISI]- IF 0,951

15. N. J. Burroughs, Bruno M. P. M. Oliveira, Alberto A. Pinto, Miguel Ferreira, Immune response dynamics, Mathematical and Computer Modeling, Vol. 53, 7-8, pp. 1410-1419 - [ISI]- IF 1,066

16. N. J. Burroughs, Miguel Ferreira, Bruno M. P. M. Oliveira, Alberto A. Pinto, Autoimmunity arising from bystander proliferation of T cells in an immune response model, Mathematical and Computer Modeling, Vol.53, 7-8, pp. 1389-1393 - [ISI]- IF 1,066

17. F. M. R. Leal, Bruno M. P. M. Oliveira, S. Rodrigues, Relationship between cooking habits and skills and Mediterranean diet in a sample of Portuguese adolescents, Perspectives in Public Health, Vol. 131, 6, pp. 283-287 - November - [ISI]- IF 0,833

18. C. Pedrosa, Bruno M. P. M. Oliveira, I. Albuquerque, C. Simões-Pereira , M. D. V. Almeida, F. Correia, Markers of metabolic syndrome in obese children before and after 1-year lifestyle intervention program, European Journal of Nutrition, Vol. 50, 6, pp. 391-400 - September - [ISI]- IF 1,644

19. C. Pedrosa, F. Correia, D. Seabra, Bruno M. P. M. Oliveira, C. Simões-Pereira , M. D. V. Almeida, Prevalence of overweight and obesity among 7-9-year-old children in Aveiro, Portugal: comparison

between IOTF and CDC references, Public Health Nutrition, Vol. 14, 1, pp. 14-19 - January - [ISI]- 2,075

20. N. J. Burroughs, Miguel Ferreira, Bruno M. P. M. Oliveira, Alberto A. Pinto, A transcritical bifurcation in an immune response model, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1101-1106 - [ISI]- 0,951

21. C. A. A. Carvalho, M. M. Peixoto, D. Pinheiro, and Alberto A. Pinto, Focal decomposition, renormalization and semiclassical physics, Special issue in honour of M. Peixoto and David Rand. Journal of Difference Equations and Applications, Vol. 17, 7, pp. 1019-1029 - [ISI] - 0,951

22. Jorge M. S. Valente, M. R. Moreira, A. Singh, R. A. F. S. Alves, Genetic algorithms for single machine scheduling with quadratic earliness and tardiness costs, The International Journal of Advanced Manufacturing Technology - [ISI]- 1,071

23. J. Martins, M. Aguiar, Alberto A. Pinto, and N. Stollenwerk, On the series expansion of the spatial SIS evolution operator, Special issue in honour of M. Peixoto and David Rand, Journal of Difference Equations and Applications, Vol. 17, 7, 1107-1118- [ISI] - 0,951

5 Articles in International Journals Listed on DBLP and not on ISI

1. M. Noirhomme-Fraiture, Paula Brito, Far beyond the classical data models: symbolic data analysis Statistical Analysis and Data Mining, Vol. 4, 2, pp. 157-170 - February - [DBLP]

2. J. M. Carmona-Cejudo, M. Baena-García, R. M. Bueno, João Gama, A. Bifet, Using GNUsmail to Compare Data Stream Mining Methods for On-line Email Classification, J. of Machine Learning Research - Proceedings Track, Vol. 17, pp. 12-18, - [DBLP]

3. J. Kanda, A. C. P. L. F. de Carvalho, E. R. Hruschka, Carlos Soares, Selection of algorithms to solve traveling salesman problems using meta-learning, Int. J. of Hybrid Intelligent Systems, Vol. 8(3), pp. 117-128 - [DBLP]

4. Rui Camacho, M. Pereira, V. S. Costa, N. A. Fonseca, Carlos Adriano Gonçalves, C. J. V. Simões, R. M. M. Brito, A Relational Learning Approach to Structure-Activity Relationships in Drug Design Toxicity Studies, J. Integrative Bioinformatics, Vol. 8, 3 - [DBLP]

5. S. Silva, J. N. Fidalgo, Dalila B. M. M. Fontes, A simulation based decision aid tool for setting regulation of energy grids with distributed generation, Operational Research, Vol. 11, 1, pp. 41-57 - [DBLP]

12 Other Articles in International Journals not included in the list above for lack of space.

6.3.2 Other international publications (6000 ca.)

3 Books by major international publisher

1. K. Faceli, A. Lorena, João Gama, A. Carvalho, Inteligência Artificial - Uma abordagem de Aprendizado de Máquina, LTC

2. M. Peixoto, Alberto A. Pinto, David. A. Rand (Eds.), Dynamics, Games and Science I, Springer Proceedings in Mathematics

3. M. Peixoto, Alberto A. Pinto, David. A. Rand (Eds.), Dynamics, Games and Science II, Springer Proceedings in Mathematics

4 Proc. of international conferences / workshops

1. Pedro P. Rodrigues, M. Pechenizkiy, M. M. Gaber, João Gama, Proc. of the Workshop on Learning from Medical Data Streams, Vol. 765 of CEUR-WS.org

2. João Gama, E. J. Hollmén, Advances in Intelligent Data Analysis X, IDA 2011, Vol. 7014 [DBLP]

3. M. M. Peixoto, Alberto A. Pinto, David A. Rand, Games and Science I, Springer, Proc. in Mathematics series: 1

4. M. M. Peixoto, Alberto A. Pinto, David A. Rand, Games and Science II, Springer, Proc. in Mathematics series: 2

4 Book Chapters by major international publisher

1. Luís Torgo, Model Trees, in Encyclopedia of Machine Learning, C.Sammut, G.I.Webb (Eds.), pp. 684-686, Springer

2. Luís Torgo, Regression Trees, in Encyclopedia of Machine Learning, C.Sammut, G.I.Webb (Eds.), pp. 842-845, Springer

3. João Gama, Clustering Data Streams, in Encyclopedia of Machine Learning, C. Sammut and G.Webb (Eds), Springer

4. D. Leite, Pedro Campos, I. Mota, Computational, Results of Membership in R&D Cooperation Networks: To Be or Not To Be in a Research Joint Venture, in Luis M. Camarinha-Matos, A. A. P. Klen, H. Afsarmanesh (Eds.): Adaptation and Value Creating Collaborative Networks, IFIP Publications, Vol. 362, Springer, 507-51 [ISI]

38 articles in books, international publisher, indexed in ISI or DBLP

1. R. Campos, G. Dias, Alípio M. Jorge, An Exploratory Study on the Impact of Temporal Features on the Classification and Clustering of Future-Related Web Documents, EPIA 2011, pp. 581-596 [DBLP]

2. D. O. Cardoso, P. M. V. Lima, M. Gregorio, João Gama, F. M. G. França, Clustering data streams with weightless neural networks, ESANN 2011 [DBLP]

3. M. A. Domingues, Alípio M. Jorge, Carlos Soares, Exploiting Additional Dimensions as Virtual Items on Top-N Recommender Systems, Web Intelligence, pp.92-95 [DBLP]

4. M. A. Domingues, Alípio M. Jorge, Carlos Soares, Using Contextual Information as Virtual Items on Top-N Recommender Systems, CoRR abs/1111.2948 [DBLP]

5. João Gama, Reasoning about the Learning Process, EGC 2011, Actes, pp. 7-8 [DBLP]

6. E. Ikonomovska, João Gama, S. Dzeroski, Incremental multi-target model trees for data streams, ACM SAC, pp. 988-993[DBLP]

7. J. M. Sá, Raquel Sebastião, João Gama, T. Fontes, New Results on Minimum Error Entropy Decision Trees,CIARP 2011, pp. 355-362 [DBLP]

8. S. Krishnaswamy, João Gama, M. M. Gaber, Advances in data stream mining for mobile and ubiquitous environments, CIKM 2011, pp. 2607-2608 [DBLP]

9. Carlos A. Ferreira, João Gama, V. S. Costa, Constrained Sequential Pattern Knowledge in Multi-relational Learning. EPIA 2011, pp. 282-296 [DBLP]

10. Márcia D. B. Oliveira, João Gama: Visualizing the Evolution of Social Networks, EPIA 2011, pp. 476-490 [DBLP]

11. E. Ikonomovska, João Gama, B. Zenko, S. Dzeroski, Speeding-Up Hoeffding-Based Regression Trees With Options, ICML 2011, pp. 537-544 [DBLP]

12. João Gama, Petr Kosina, Learning about the Learning Process, IDA 2011, pp. 162-172 [DBLP]

13. J. M. Carmona-Cejudo, M. Baena-García, J. del Campo-Ávila, A. Bifet, João Gama, R. M. Bueno: Online Evaluation of Email Streaming Classifiers Using GNUsmail, IDA 2011, pp. 90-100 [DBLP]

14. João Gama, Petr Kosina, Learning Decision Rules from Data Streams, IJCAI 2011, Vol. 7014, pp. 1255-1260 [DBLP]

15. Carlos A. Ferreira, João Gama, V. S. Costa, Sequential Pattern Knowledge in Multi-Relational Learning, Proc. of ISCIS 2011, pp. 539-545 [DBLP]

16. Pedro P. Rodrigues, João Gama, J. Araújo, L. M. B. Lopes, L2GClust: local-to-global clustering of stream sources, ACM SAC, pp. 1006-1011 [DBLP]

17. E. Ikonomovska, K. Driessens, S. Dzeroski, João Gama, Adaptive Windowing for Online Learning from Multiple Inter-related Data Streams, Data Mining Workshops, ICDMW,pp. 697-704 [DBLP]

18. Cláudio R. Sá, Carlos Soares, Alipio M. Jorge, P. J. Azevedo, J. P. Costa, Mining Association Rules for Label Ranking, PAKDD 2011, Vol. 6635, pp. 432-443 [DBLP]

19. A. L. Azevedo, J. Bastos, A. Almeida, Carlos Soares, et al., Customer-Oriented and Eco-friendly Networks for Health Fashionable Goods - The CoReNet Approach, PRO-VE 2011, pp. 69-76 [DBLP]

20. C. T. Gonçalves, Rui Camacho, E. Oliveira, From Sequences to Papers: An Information Retrieval Exercise, Data Mining Workshops (ICDMW), pp. 1010-1017 [DBLP]

21. Rui Camacho, M. Pereira, V. S. Costa, N. A. Fonseca, C. Simões, R. M. M. Brito, Assessing the Effect of 2D Fingerprint Filtering on ILP-Based Structure-Activity Relationships Toxicity Studies in Drug Design, PACBB 2011, Vol. 93, p. 355-363 [ISI, DBLP]

22. Luís Torgo, Elsa Lopes, Utility-Based Fraud Detection, IJCAI 2011, Vol. 7014, pp. 1517-1522 [DBLP]

23. D. M. Silva, R. M. A. Silva, G. R. Mateus, José F. Gonçalves, M. G. C. Resende, P. Festa, An Iterative Refinement Algorithm for the Minimum Branch Vertices Problem, SEA 2011, pp. 421-433 [DBLP]

24. Marta S. R. Monteiro, Dalila B. M. M. Fontes, F. A. C. C. Fontes, An ant colony optimization algorithm to solve the minimum cost network flow problem with concave cost functions, GECCO 2011, pp. 139-146 [DBLP]

25. L. A. C. Roque, Dalila B. M. M. Fontes, F. A. C. C. Fontes, A Biased Random Key Genetic Algorithm Approach for Unit Commitment Problem, SEA 2011, LNCS 6630, pp. 327-339 [DBLP]

26. R. Fonseca, Pedro P. Rodrigues, The Importance of System Integration in Intensive Care Units - A Review, HEALTHINF 2011, pp. 142-147 [ISI, DBLP]

27. Luís Torgo, Orlando Ohashi, 2D-interval predictions for time series, KDD 2011, pp. 787-794 [DBLP]

28. Brett Drury, G. Dias, Luís Torgo, Contextual Classification Strategy for Polarity Classification of Direct Quotations from Financial News, RANLP 2011, pp. 12-14 [DBLP]

29. R. Mendes, Pedro P. Rodrigues, Main Barriers for Quality Data Collection in EHR - A Review, HEALTHINF 2011, pp. 451-454 [ISI, DBLP]

30. M. J. Campos, Pedro P. Rodrigues, Key Issues and Future Perspectives on Identity Management in eHealth - A Review, HEALTHINF 2011, pp. 455-458 [ISI, DBLP]

31. J. F. Ribeiro, Pedro P. Rodrigues, Decision Support Systems and Technologies used in Periodontology, HEALTHINF 2011, pp. 459-462 [ISI, DBLP]

32. C. M. Oliveira, Pedro P. Rodrigues, Automatic Organ Delineation of Computed Tomography Images for Radiotherapy Planning in Prostate Cancer - An Overview, HEALTHINF 2011, pp. 482-485 [ISI, DBLP]

33. J. Matos, Pedro P. Rodrigues, Modeling Decisions for Hospital Bed Management - A Review, HEALTHINF 2011, pp. 504-507 [ISI, DBLP]

34. J. M. Coelho, Pedro P. Rodrigues, The Red Dot System - Emergency Diagnosis Impact and Digital Radiology Implementation: A Review, HEALTHINF 2011, pp. 508-511 [ISI, DBLP]

4 other non listed for lack of space.

34 other publications not included in the list above for lack of space

6.3.3 Ph. D. thesis completed (3000 ca.)

João Cordeiro, Rule Induction for Sentence Reduction, UBI, Supervisor: Pavel Brazdil, concluded in April, 29, 2011

Helena Ferreira, Natural and Complex Dynamical Systems, Supervisor: Alberto Pinto, Concluded in January, 7, 2011

Rita Ribeiro, Utility-based Regression, PhD on Computer Science, FCUP-UP, Supervisor: Luís Torgo, Concluded in September 2011

Hugo Ferreira, Automatic Plan Generation and Adaptation by Observation: Supporting Complex Human Planning, FEUP, Supervisor: Rui Camacho, Concluded in November 2011

6.3.4 Patents/prototypes (2000 ca.)

(void)

6.3.5 Organization of Conferences (2000 ca.)

- Co-organization of the Workshop “Symbolic Data Analysis, SDA11”, Namur, Belgium, June
- Conference chair - Intelligent Data Analysis
- Data Streams Track – 26th Annual ACM SAC, TaiChung, Taiwan, March.
- Vice-Chair Int. Conf. Data Mining (IEEE-ICDM), Vancouver, Canada
- 4th Medical Informatics Symposium, Porto, October
- Learning from Medical Data Streams, In conjunction with the 13th Conf. on Artificial Intelligence in Medicine, Ljubljana, Slovenia
- Steering committee of Discovery Science, Intelligent Data Analysis, and Society for Knowledge Discovery in Distributed and Ubiquitous
- Participation in program commitees of confs/ workshops

As Senior PC member, Steering Commitee member, Area Chair or stream/track organizer

- ECML/PKDD 2011, Athens, Greece, September – Area chair and PC

- IJCAI 2011, Barcelona, Spain, July - Senior PC and PC
- Discovery Science – Steering committee and PC
- "Dynamics and Games". The 3rd Annual UECE - Lisbon Meetings - Game Theory and Applications ISEG, Technical University of Lisbon
- Stream organizer of two mini-symposia - "Dynamical Modeling in
- Immunology and Ecology", "Industrial Organization" and "Game Theoretical
- Models in Psychology " - ICIAM 11, Vancouver, Canada, 18-22 July

AS PC member

- DIS 2011 – Int. Conf. on the Dynamics of Information Systems
- ECT 2011 – Int. Conf. on Evolutionary Computation Theory and Applications
- ECML/PKDD 2011
- IJCAI 2011
- ICML 2011
- Discovery Science 2011
- SIAM-SDM, Data Mining Conference of SIAM
- EPIA-2011
- PlanSoKD'2011 -
- Int. Workshop on Nonlinear Maps and their Applications
- "Dynamics and Games". The 3rd Annual UECE - Lisbon Meetings - Game Theory and Applications
- PAKDD, PC Member
- KDBI 2011, track of EPIA 2011
- KDIR 2011
- CSBC 2011 - ENIA
- PAAMS 2011
- ILP 2011
- AIS 2011
- DCAI 2011
- PACBB 2011
- ADMA 2011
- World Congress on Engineering – WCE 2011

6.3.6 Industry contract research *(2000 ca.)*

The Unit participated in 2 industry contracted reserach projetcs, together with other Units of INESC TEC:
• SIMULESP (João Gama)
• Palco3.0 (Alípio M. Jorge)

6.3.7 Internationalization (2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

Publications with authors from foreign countries:

• 20 Journal Papers

• 3 books

• 9 articles in books indexed on ISI Proceedings and/ or DBLP

Leading roles in scientific societies

- Vice-President of the Portuguese Statistical Society (SPE) (2009-2011); member of the Board (2003-2008). Speech delivered on the 1st World Statistics Day (in Portuguese).
- President-Elect of the International Association for Statistical Computing (IASC) (2011-2013) to assume Presidency in 2013; Vice-President and Council member (2009-2011).
- President of CIM (Centro Internacional de Matemática)

Participation in Editorial Boards of int. journals

- Machine Learning, Data Mining Knowledge Discovery, Intelligent Data Analysis, New Generation Computer – João Gama
- Associate Editor, Progress in Artificial Intelligence, Springer – João Gama
- Machine Learning – Pavel Brazdil
- Journal of the Brazilian Computer Science, Springer – Alípio M. Jorge
- Editorial Board of International Journal of Computational Intelligence in Bioinformatics and Systems Biology (IJCIBSB) – Rui Camacho

Graduate Training Networks (Erasmus agreements; teaching abroad)

- 4 weeks course, "Data Mining in R - Learning with Case Studies", www.statistics.com. 1st edition (Jun 2011)

Senior Research Visitors

- Zoran Bosnic, Univ. of Ljubljana, Slovenia, November
- André Carvalho (USP), September
- Jarek Olejniczak, Warsaw School of Economics, May

- Lubos Popelinsky, Univ. of Masarik, Czech Republic
- Albert Bifet, Yahoo Research, Barcelona
- Hiroshi Motoda, Osaka University, Japan

Visiting Post-Graduate Students

- Darko Pevec, Univ. of Ljubljana, Slovenia, November
- Petar Vracar, Univ. of Ljubljana, Slovenia, November
- Jorge Kanda, USP, Oct/Feb 2012
- Fernando Correa, USP, Jan/ Mar 2012
- Bruno Nogueira, USP- São Carlos, Jan/Jul
- Robson Motta, USP-São Carlos, Jan
- André Rossi, USP-São Carlos, May
- Menno Luiten, Universiteit Leiden, October

Research Visits

- Pedro P. Rodrigues, João Gama, Univ. of Ljubljana, Slovenia – July

Other

- Bilateral Agreement with Univ. of Ljubljana, Slovenia

6.3.8 Other national publications (6000 ca.)

5 articles in books

1. Brett Drury, J.J. Almeida, M.H.M Morais, Magellan: An Adaptive Ontology Driven "Breaking Financial News" Recommender, 6ª Conferência Ibérica de Sistemas e Tecnologias de Informação

2. Cláudia Moreiras, Cristina Matias and Pedro Campos, Modeling and Simulation of Firms' Growth in Business Markets using the Moran Process, Actas do EPIA 2011, Lisboa

3. Tarcísio Lucas, Ricardo B.C. Prudêncio, Teresa B. Ludermir, Carlos Soares, Meta-learning to optimize the number of hidden nodes of mlp networks trained by extreme learning machine algorithm, X Congresso Brasileiro de Inteligência Computacional (CBIC'2011)

4. Jorge Kanda, André Carlos Ponce Leon Ferreira de Carvalho, Eduardo R. Hruschka, Carlos Soares, Usando redes neurais artificiais para recomendar meta-heurísticas para o problema do caixeiro viajante, X Congresso Brasileiro de Inteligência Computacional

5. Cláudio Rebelo de Sá, Carlos Soares, Alípio Mário Jorge, Paulo J. Azevedo, Joaquim Pinto da Costa. Mining association rules for label ranking, Proceedings of XVII Jornadas de Classificação e Análise de Dados - JOCLAD 2011, pp. 121-124

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

(void)

6.1 Group Description - USIG

Research Group Title	**INFORMATION SYSTEMS AND COMPUTER GRAPHICS**
Principal Investigator	Fernando Silva
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 28.523,00

European Commission: 301.252,00

QREN: 281.090,00

TOTAL: 610.865,00

6.2 Objectives & Achievements - USIG

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 were Prof. Fernando Silva and M.Sc. António Gaspar.

OBJECTIVES

The Information Systems and Computer Graphics Unit (USIG) mission is to pursue high quality research, strongly linked to industrial partnerships, consultancy and technology transfer, in three main areas Information Management, Software Engineering and Computer Graphics. The unit is particularly well positioned to address complex and difficult engineering problems faced by industry as it has the expertise to analyse, design, mine and implement large information systems, using best software engineering practices for design, development and testing, and also provide the visual and user interaction components such a solution may require. Furthermore, the unit is also strongly committed to the training of young researchers and professionals.

USIG main research goals are organized as follows:

SOFTWARE DEVELOPMENT METHODOLOGIES - Improve and innovate on current software development methodologies with particular emphasis on model-driven development with formal methods, agile and collaborative development methodologies, and software quality assurance based on software testing, verification and certification.

INFORMATION MANAGEMENT, RETRIEVAL AND PROCESSING - Investigate frameworks for information management, retrieval and processing in contexts such as web mining, recommender systems, social web, semantic web, information retrieval and text mining. This leads to the development of innovative systems such as federated libraries of semantically socially assisted annotated documents, digital cultural heritage portfolios and e-learning environments and tools.

DIGITAL PRESERVATION - Devise models, methods and tools for digital preservation particularly in the area of database preservation and scientific data repository management. Preliminary work has already taken place on the transformation of databases into preservation-friendly representations under the framework established by the OAIS, and on the development of descriptions for scientific datasets.

LARGE SCALE INFORMATION SYSTEMS - Develop innovative models, methodologies and architectures for large-scale information systems. We focus on system integration and interoperability, authentication, access authorisation, security and auditability mechanisms.

INNOVATIVE METHODS IN COMPUTER GRAPHICS AND VIRTUAL ENVIRONMENTS - Investigate innovative methods in computer graphics and virtual environments, as well as in natural user interfaces, especially with applications in serious games, immersive and interactive urban planning based on virtual environments. Special focus has been given to mobile devices, modeling and visualization of large scenes for immersive environments, and image synthesis.

USIG activity is also driven by applications with particular emphasis in the areas of public administration (local, regional and central government), healthcare, telecommunications, transport and industry and the commerce and services sectors. e-Government and e-Health area expected to be major areas of application in the near future.

6.2.2 Main Achievements (4000 ca)

The group achieved similar research production as in 2010, year in which a substantial increase was observed in comparison with previous years. Although there was a decrease in journal papers, 7 journal papers were published, 49 conference papers were published and 38 of these were presented at international events with refereeing, with one third indexed by Springer, ACM, IEEE and/or ISI-Proceedings.

In 2011 two best paper awards were obtained (SBIM 2011 and ICSEA 2011).

Budget remained constant, slightly above 1M€, with a more even distribution among our three sources. European funding rose 29%, thanks to ongoing projects and one new project: CAALYX-MV - Complete Ambient Assisted Living Experiment - Market Validation. National funding had a slight budget increase of 3%, with some projects ending, but with a strong reinforcement of new projects: CNG - new generation educational contents (QREN), D4I - LINUX desktop software (QREN), TICE.Mobilidade - usage based car insurance (QREN), AAL4ALL - certification of AAL applications (QREN), ECOPLANNER - ecoefficiency decision support system (QREN) and ERAS - virtual reconstruction of archaeological sites (FCT). Services decreased 6%, although new projects started: CCDRN-EA, AVESAT, GIS2R, MIELE.

In 2011 new collaborations were established with FAMASET, FLUPOL, ONI, Palcos da Realidade and Wiremaze, leading to proposals that might impact 2012. Other collaborations were reinforced, such as those with CCDRN, APDL and MonteAdriano.

Final systems were produced in EI-Nautilus, RAIA, Palco Principal and Portal Douro. Prototypes were produced in eCAALYX, Mobiles, 3DWikiU and Robot Vigilante. Field trials were conducted in eCAALYX, Mobiles and Robot Vigilante. SI.VIDA was deployed in 10 additional hospitals.

The group continued its involvement in industrial fora, like CEDT – Excellence Center for Transaction Dematerialization (Membership of the Board of Directors), DANOTEC – New Technologies and Defense Association (Representation of INESC Porto), AIFF – Forest Industries Association (Representation of INESC Porto), ITS Portugal – Intelligent Transportation Systems (Membership of the Board of Directors), ELANET – European Local Authorities Association (Membership of the Board of Directors) and Hillside Group – Non-Profit Corporation for Software Patterns promotion (Vice-Presidency of the Board of Directors).

6.3 Productivity - USIG

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 7
The complete list can be consulted in: http://profile.inescporto.pt

Aguiar A. and David G. Patterns for Effectively Documenting Frameworks. in Transactions on Pattern Languages of Programming II, Springer, LNCS 6510, pp.79-124, 2011 (DOI:10.1007/978-3-642-19432-0_5)

Brandão Silva P. and Coelho A.. Procedural Modeling for Realistic Virtual Worlds Development, Journal of Virtual Worlds Research, https://journals.tdl.org/jvwr/article/view/2109/3041, vol.4, no.1 2011.

Jacob L. and Coelho A. Issues in the Development of Location-Based Games, International Journal of Computer Games Technology, Article ID 495437, 7 pages, 2011 on-line: http://www.hindawi.com/journals/ijcgt/2011/495437/

Lopes C.T. and Ribeiro C., Comparative evaluation of web search engines in health information retrieval, Online Information Review, volume 35, Issue 6, pp. 869-892, March, 2011. (DOI: 10.1108/14684521111193175) (ISI)

Nunes S., Ribeiro C. and David G., Term Weighting based on Document Revision History, Journal of the American Society for Information Science and Technology, Wiley, Volume 62, Issue 12, pages 2471–2478, December, 2011. (DOI: 10.1002/asi.21597) (ISI, IF= 2.137)

Rocha A., Martins A., et. al., Innovations in health care services: The CAALYX system, International Journal of Medical Informatics, Elsevier, Available online since April 2011. (DOI: 10.1016/j.ijmedinf.2011.03.003) (ISI, IF=2.244)

Wermelinger M., Sereno Ferreira H., Quality evolution track at QUATIC'10, ACM SIG-SOFT Software Engineering Notes, Volume 36, Num. 1, pp. 28-29, 2011. (DOI: 10.1145/1921532.1960273)

6.3.2 Other International publications (6000 ca.)

Number of publications: 38

PAPERS IN ISI-PROC, BOOK-CHAPTERS, SPRINGER, ACM AND IEEE PROCEEDINGS:

Lopes C.T. and Ribeiro C., Data Certification Impact on Health Information Retrieval, USAB- Workshop on Human-Computer Interaction and Knowledge Discovery in Databases (HCI-KDD), Springer, LNCS 7058, pp. 31-42,2011.

Alexandre, G., Oliveira Adão, T., Fradeira Gonçalves, M., Magalhães, L.G., Bessa, M., Peres, E., Varajão, J., Foundations for a mobile context-aware advertising system, CENTERIS'2011 - Conference on ENTERprise Information Systems, Springer, CCIS 220, pp. 51-61, October 2011.

Coelho, F.E., Ribeiro, C., Automatic Illustration with Cross-media Retrieval in Large-scale Collections, CBMI 2011 - 9th International Workshop on Content-Based Multimedia Indexing, IEEEXplore, pp. 25-30, 2011.

Coelho, F.E., Ribeiro, C., "Dpikt: Automatic Illustration System for Media Content ", CBMI 2011 - 9th International Workshop on Content-Based Multimedia Indexing, IEEEXplore, pp. 241-244, 2011.

Cruz, A., Coelho, A., Sousa, A., Game Design Evaluation Study for Student Integration, SGDA 2011 - 2nd International Conference on Serious Games Development and Applications, Springer, LNCS 6944, pp.61-71, 2011.

Coelho, A., Kato, E., Xavier, J., Gonçalves, R., Serious Game for Introductory Programming, SGDA 2011 - 2nd International Conference on Serious Games Development and Applications, Springer, LNCS 6944, pp.72-82, 2011.

Devezas, J.L., Nunes, S., Ribeiro, C., "Using the h-index to Estimate Blog Authority", ICWSM'11 - 5th International AAAI Conference on Weblogs and Social Media, AAAI Press, 2011.

Miranda, J.C., Alvarez, X., Orvalho, J., Gutierrez, D., Sousa, A., Orvalho, V., Sketch Express: facial expressions made easy, SBIM'11 - 8th Eurographics Symposium on Sketch-Based Interfaces and Modeling, ACM, pp. 87-94, 2011. (Best paper award).

Laginha Palma, J., Daydé, M., Marques, O., Correia Lopes, J. (Editors), High Performance Computing for Computational Science — Proceedings of VECPAR 2010, Selected Papers, Springer, LNCS 6449, 2011.

Reis, M., Bacelar, M., Reis, M.G., Meira, D., Bessa, M., Peres, E., Morais, R., Valente, A., Soares, S., Bulas-Cruz, J., Internet-based Collaborative E-Exercisebook System for Primary Math Teaching, CONATEL'2011, IEEEXplore, pp. 1-7, 2011.

OTHER PAPERS IN INTERNATIONAL CONFERENCES WITH REFEREEING:

Barbosa, F., Aguiar, A., Reusable Roles, a test with Patterns, PLOP'2011.

Coelho, A., Silva, L., Oliveira, L., Silva, A., Martins, F., Carvalhais, J., The concept of vineyard parcel for the Douro delimited region, OIV'2011.

Coelho, A., Dias, L.J., A mobile advertising platform for eTourism, ENTER'2011.

Coelho, P., Aguiar, A., Correia Lopes, J., OLBS: Offline Location Based Services, NGMAST'2011.

Correia Melo, M., Bessa, M., Peres, E., Varajão, J., Magalhães, L.G., Framework for Collaborative 3D Environments, CENTERIS' 2011.

Correia Melo, M., Brandão Silva, P., Magalhães, L.G., Bessa, M., Coelho, A., Moura, J., Rocha, A., Ferreira, F., Cruz, J., Sousa, A., 3DWikiU - 3D Wiki For Urban Environments, SIACG'2011.

Correia, F.F., Aguiar, A., Patterns of Information Classification, PLOP'2011.

Cruz, A., Coelho, A., Sousa, A., Technical Analisys and Approaches for Game Development in Second Life, CISTI'2011-SGaMePlay'2011, vol.2 2011.

de Andrade, F.R., Pascoal Faria, J., Paiva, A., Test Generation from Bounded Algebraic Specifications using Alloy , ICSOFT'2011.

Dores, A.R., Carvalho, I.P., Barbosa, F., Almeida, I., Guerreiro, S., Leitão, M., Sousa, L.d., Castro-Caldas, A., "Serious Games: Are They Part of the Solution in the Domain of Cognitive Rehabilitation", SGDA'2011.

Almeida, A., Costa, R., Lima, L., Novais P., Non-obstructive Authentication in AAL Environments, AITAmI' 2011.

Fradeira Gonçalves, M., Rocha, T., Magalhães, L.G., Peres, E., Bessa, M., Chalmers, A., Identifying Different Visual Patterns in Web users Behaviour, SCCG'2011.

Lira, T., Ribeiro, C., Correia Lopes, J., Biodiversity Information Systems Using Geo-referencing and Physical Identification, WEBIST'2011, pp. 255-262, 2011.

Matsumoto, P., Guerra, E., Sereno Ferreira, H., Aguiar, A., Correia, F., Yoder, J., AOM Metadata Extension Points, PLOP'2011.

Margarido, I.L., Pascoal Faria, J., Vieira, M., Vidal, R.M., CMMI Practices: Evaluating the Quality of the Implementation, SEPG Europe'2011.

Mendes, D., Coelho, A., Sousa, A., Expeditious Creation of Multiplayer Games for Second Life and OpenSimulator Virtual Worlds, SLACTIONS'2011.

Miranda, J.C., Fernandes, T., Sousa, A., Orvalho, V., Interactive Technology: Teaching People with Autism to Recognize Facial Emotions, Autism Spectrum Disorders - From Genes to Environment, Tim Williams (Ed.), InTech, 2011.

Morgado, I.C., Paiva, A., Pascoal Faria, J., Reverse Engineering of Graphical User Interfaces, ICSEA'2011.

Polzin, P., Borges, J., Coelho, A., A Methodology To Analyze Users' Access To Health Services And Competition Between Health Services Providers, IRSSM'2011.

Marques, T., Nunes, F., Silva, P., Rodrigues, R.P., Tangible interaction on tabletops for elderly people, ICEC'2011.

Oancea, D., Moreira, R., Correia Lopes, J., A Reflective Framework for Adapting Video-on-Demand over Distributed Environments, NIME'2011.

Riboira, A., Rodrigues, R.P., Abreu, R., Interactive visualizations of automatic debugging reports, SIACG'2011.

Riboira, A., Abreu, R., Rodrigues, R.P., An OpenGL-based Eclipse Plugin for Visual Debugging , TOPI'2011.

Rocha, L., Rodrigues, R.P., GraphJudge: a system for assisted assessment of Computer Graphics assignments, SIACG 2011.

Rodrigues, N., Magalhães, L.G., Moura, J.P., Chalmers, A., Santos, F., Morgado, L., Procedural Virtual Worlds, Virtual Worlds and Metaverse Platforms: New Communication and Identity Paradigms, IGI Global, pp.16-32, J011.

Sereno Ferreira, H., Correia, F.F., Aguiar, A., Yoder, J., The Lazy Semantics Pattern on the context of Meta-Architectures, AsianPLoP'2011.

Silva, J., Ribeiro, C., Correia Lopes, J., UPData - A Data Curation Experiment at U.Porto using DSpace, iPRES'2011.

6.3.3 Ph. D. thesis completed *(3000 ca.)*

Thesis advised by members of USIG:

Hugo Sereno Ferreira, Adaptive Object-Modeling: Patterns, Tools and Applications, PhD Thesis, Doctoral Program in Computer Science (MAPi), Universities of Minho, Aveiro and Porto, 2011.

António Miguel Rosado da Cruz, Automatic Generation of User Interfaces from Rigorous Domain and Use Case Models, PhD Thesis, Doctoral Program in Informatics Engineering (PRODEI), University of Porto, 2011.

6.3.4 Patents/prototypes (2000 ca.)

Several prototypes were developed in 2011:

EI-Nautilus - Final version of UNI_NET Classroom, a classroom control software, compatible with several OS (Windows, MAC OS and Linux), for the integrated control of student PCs and interactive boards in the classroom, integrating student's and classroom's information management. This project was developed for NAUTILUS, a producer of classroom material (with integrated PCs) and retailer of interactive classroom boards.

RAIA - A sensor observation service and catalog service for a web based oceanographic georeferenced sensor network.

Palco Principal - Final version of Palco Principal music social platform, including applications for mobile access (IOS and Android).

eCAALYX - Field trial in Berlin of a mobile application to monitor the elder's personal sensor network and a gateway service with data persistence acting as an intermediary between the mobile phones and the caretaker site.

Portal Douro - Web regional portal for the touristic promotion of the Douro Region, incorporating advanced location based content features.

Mobiles - Information system and mobile application supporting electrical mobility.

3DWikiU - Modelling prototype using a procedural solution that connects through WFS (Web Feature Services) to GIS data sources providing urban information.

Robot Vigilante - Control and supervision platform of a autonomous surveillance robot.

6.3.5 Organization of Conferences (2000 ca.)

Some of the events in which members of USIG participated are:

ACE 2011 - Portugal, Augusto Sousa – PC member

ADM 2011 - Brazil, Luís Magalhães - PC member

AI4Games - Portugal, Augusto Sousa, Rui Rodrigues – PC member

Agile Portugal 2011, Portugal, Ademar Aguiar, Hugo Ferreira - Co-chair.

CAPSI'2011 – Portugal, Gabriel David - PC member

Cloudviews 2011 – Portugal, Ricardo Costa – Organizing Committee, PC member

GRAPP 2011 – Portugal, Augusto Sousa – PC member

First Experiment@ Int. Conference (exp.at'11) – Portugal, Augusto Sousa – PC member

IDEAS'2011 - Portugal, Gabriel David - PC member

INFORUM 2011 - Portugal – A. Aguiar, J.P. Faria, G. David, H. - PC member

PLoP 2011 – USA, Ademar Aguiar, Hugo Ferreira - PC member

SEGAH'2011 – Portugal - Rui Rodrigues – PC member

SGaMePlay'2011 - Portugal - Rui Rodrigues – PC member, Organizing committee

SIACG 2011 - Portugal - Augusto Sousa - Scientific Committee

SPLASH 2011 - USA - Ademar Aguiar, Workshops Co-chair

XATA'2011 – Portugal - J. C. Lopes – PC member, Sterring Committee – G David - PC member

WSCAD-SSC 2011 - Brazil, Augusto Sousa - PC member

6.3.6 Industry contract research *(2000 ca.)*

EI-NAUTILUS - QREN funded project, developed for NAUTILUS, which created a set of applications, NET_SCHOOL, for the integrated management of computers in classrooms.

Palco Principal - This QREN project technologically updated a music content social platform created by UBBIN Labs, incorporating mobile access, content identification, automatic classification, selective research, organization, sharing, recommendation and intelligent treatment of all types of data involved.

GENERG - Consulting services for GENERG, a renewable energy power producer, addressing their Information Systems Architecture and IT Governance.

Mobiles - This QREN funded project addressed the IT needs of electrical mobility and prototyped several solutions in a partnership lead by NDRIVE.

RobVigil – Management and dispatch console for an autonomous surveillance robot. Project funded by QREN with a partnership lead by Clever House.

D4i - Development of a multiplatform desktop environment for free software applications in a QREN funded project lead by IPortalMais.

CNG - Development of new generation educational contents, in a QREN funded project. The consortium is lead by iZone Interactive Media.

TICE.Mobilidade - Development of on demand insurance solutions based on a mobility datawarehouse (PPS 2STAX). TICE.PT anchor project funded by QREN. The consortium is lead by I2S.

AAL4ALL - Development of an ecosystem of products and services for Ambient Assisted Living (AAL). Health Cluster Portugal anchor project funded by QREN.

ECOPLANNER - Development of an eco-efficiency management platform. QREN funded project promoted by ECOINSIDE.

SIGAP - Consulting services for the software house TRIEDE TI in the area of Business Process Management for Port Authorities.

MIELE - Design of an interoperable middleware platform able to interface ICT systems in Ports, based on the Model Driven Development paradigm. Project supported by Leixões Port Authority under MIELE TEN-T project.

6.3.7 Internationalization *(2000 ca.)*

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

In 2011, members of USIG have co-authored 8 joint publications resulting from international collaborations. Some of the active collaborations are:

- Image synthesis and virtual reality: U. Warwick (UK)
- Procedural Modeling: U. Jaén (Spain), ETH Zurich
- Serious games: U. Delft (Holland), U. Coventry (UK)
- Information retrieval and digital preservation: Tom Wilson (U. Sheffield), David Allen (U. Leeds), Savvas A. Chatzichristofis (Cyprus U. T.), Nuno Vasconcelos (U. California San Diego), Mark Sanderson (RMIT U.)
- Software Engineering Institute at CMU
- Ambient Assisted Living: Telefonica I+D (Spain), U. Limerick (Ireland)

Further evidence can be seen through participation in EU projects and international networks:

ADDME - Activating Drivers for Digital eMpowerment in Europe.Thematic ICT PSP project.

RAIA - Oceanic Observatory of the Iberian Coast.

eCAALYX - Enhanced Complete Ambient Assisting Living Experiment - An AAL Initiative project that builds on the strengths of the infrastructure and functionality already developed in the original CAALYX project, with the development of new features.

ICT4DEPRESSION - First e-Health project applied to mental health. Funded by FP7.

CEMSDI - Civil-servants Empowerment for Multi-media Service Delivery ICT-enabled. ICT Policy Support Programme (ICT PSP)..

CAALYX-MV - ICT PSP project for the mass validation of CAALYX and eCAALYX results.

ELANET - European Local Authorities'Telematic Network, an association promoted by CEMR, with the goal to develop the Information Society at local and regional level.

HILLSIDE Group - Is a private non-profit devoted to the advance of software patterns. One collaborator is Vice-President.

6.3.8 Other national publications (6000 ca.)

Number of papers: 11

PAPERS IN PORTUGUESE CONFERENCES/WORKSHOPS, ETC.:

Bilber Rodrigues, N., Oliveira, L., Silva, L., Coelho, A., Utilização de padrões de desenho de software no desenvolvimento de Sistemas de Informação Geográfica - O caso da Região Demarcada do Douro, Proceedings of CAPSI 2011 CAPSI 2011 - 11ª Conferência da Associação Portuguesa de Sistemas de Informação 2011.

Campos, C., Leitão, M., Rodrigues, C., Design and Modeling of Road Environments, DSIE'2011 - 6th Doctoral Symposium on Informatics Engineering 2011.

de Andrade, F.R., Pascoal Faria, J., Paiva, A., Lopes, A., Geração de Testes a partir de Especificações Algébricas de Tipos Genéricos usando Alloy, INForum 2011 - Simpósio de Informática 2011.

Gonçalves, F., David, G., Are we on the right track to paperless hospitals?, MEDINFOR II - MEDINFOR II 2011.

Loureiro, B., Rodrigues, R.P., Multi-Touch as a Natural User Interface for Elders: A Survey, Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação 2011, Chaves, Portugal.

Margarido, I.L., Pascoal Faria, J., Vidal, R.M., Vieira, M., Classification of Defect Types in Requirements Specifications: Literature Review, Proposal and Assessment, Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação 2011.

Oliveira, L., Correia Rodrigues, A., Nunes, H., Dias, L.J., Coelho, A., Oliveira, J.M., Carrapatoso, E., Leitão, M.J., Plataforma Web de Informação Geográfica para o Turismo, Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, vol.1, June 2011, pp.600-605.

Reis, M.G.A.D., Cabral, L., Meira, D., Peres, E., Bessa, M., Valente, A., Morais, R., Soares, S., Batista, J., Aires, A., Escola, J.J., Bulas-Cruz, J.A., Reis, M.J.C.S., Um Estudo de Caso do Ensino da Matemática em Crianças com Paralisia Cerebral e Deficiência Mental no 1º CEB, CIAEM'2011 - XIII Interamerican Conference on Mathematics Education 2011.

Rocha, J., Ribeiro, C., Correia Lopes, J., Comparing Application Profiles and Ontologies for Describing Scientific Data, XATA 2011 - 9ª conferência nacional XATA2011 - XML, Aplicações e Tecnologias Associadas 2011.

Aldeias C.F., David G., Ribeiro C., DWXML: A preservation format for data warehouses, XATA 2011 - 9ª conferência nacional XATA2011 - XML, Aplicações e Tecnologias Associadas, Vila do Conde, Portugal, 2011.

Santos, A., Nunes, S., Abordagens para a pesquisa por palavras-chave em base de dados estruturada, INForum 2011 - Simpósio de Informática 2011.

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

SIVIDA - Specification of an Information System for AIDS data collection and processing, for the Healthcare High Commissioner.

DB Preserve -Data Warehouses for the Long-term Preservation of Institutional Electronic Records and Databases, a FCT project.

URBIS - Efficient management and visualization of spatiotemporal urban data, a FCT project.

Portal Douro -Consulting and development of a regional Portal for the Douro region.

3DWikiU - Wiki 3D for urban environments, a FCT project.

e-mili@ is a partnership between Fundação Calouste Gulbenkian, Câmara Municipal de Santa Maria da Feira e INESC Porto to develop a colaborative plataform to support the activities developed in the context of the local social support network and the eInclusion strategy in the region, particularly of the most vulnerable groups, such as the elderly with low scholarity.

ERAS - Virtual Expedite Reconstruction of Cultural Heritage Sites, a FCT project.

CCRDN-EA - Support of Atlantic Area INTERREG Programme collaborative platform for CCDRN.

AVESAT - Development of applications for the management and optimization of municipal transports for Comunidade Intermunicipal do Vale do Ave, integrated in the INTERREG IV SUDOE project APSAT.

6.1 Group Description - CRACS

Research Group Title	**CENTER FOR RESEARCH IN ADVANCED COMPUTER SYSTEMS**
Principal Investigator	Fernando Silva
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 169.656,00

European Commission: 30.153,00

QREN: 0,00

TOTAL: 199.809,00

6.2 Objectives & Achievements - CRACS

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. Fernando Silva.

This Unit is an autonomous Associate Unit of INESC TEC.

OBJECTIVES

The mission of the Associate Unit CRACS, the Center for Research in Advanced Computing Systems, is to pursue scientific excellence in the areas of programming languages, parallel and distributed computing, information mining, and Web based systems with a focus on developing scalable software systems for challenging, multidisciplinary applications. Research activities are anchored in two main research areas: Computational Models and Languages for Scalable Computing and Information Mining and Web-based Systems. The research goals include work focusing on:

COMPUTATIONAL MODELS AND LANGUAGES FOR SCALABLE COMPUTING

Develop innovative research in new logic programming frameworks that can integrate probabilistic reasoning and negation, progressively relying on the use of parallelism and tabling to scale larger applications and open new application domains for logic programming (LP).

Continue to develop type safe programming languages for distributed environments, such as robust programming languages for wireless sensor networks and investigating using logic programming in this domain.

Strengthen the work on distributed systems, in particular on innovative peer-to-peer based middleware with support for fault tolerance and real-time for demanding information systems, and on “run-time programming”, that is, dynamic, incremental, reprogramming of applications through semantics-preserving patches.

INFORMATION MINING AND WEB-BASED SYSTEMS

Continue top, leading, research in multi-relational data mining supporting the development of large-scale mining systems using inductive logic programming and statistical multi-relational learning systems.

Develop adaptive classification algorithms for online learning from continuous data streams, specialized data-structures and algorithms for mining large complex and dynamic networks and scalable learning algorithms from structured and temporal multi-relational data. This work can be applied to areas such as author identification, sensor data streams, medical data, genomics and proteomics.

Investigate frameworks for information mining and retrieval in contexts such as web mining, recommender systems, social web, semantic web, and text mining.

Develop new advanced frameworks and service oriented architectures that lead to the development of innovative systems such as federated libraries of semantically socially-assisted annotated documents, digital cultural heritage portfolios, digital repositories of learning objects and e-learning environments and tools.

Conceptualize and implement new ideas for privacy enhanced identity management and authorization mechanisms based on mobile devices for federated systems.. By using nonstandard computing, particularly biologically inspired computing, develop unsupervised learning tools for anomaly detection that can be used for example for network intrusion detection.

INTERNATIONAL COLLABORATION

A transversal goal is to reinforce the most recent international collaboration, in particular with CMU in the areas of Logic Programming for large-scale distributed and middleware systems; UT-Austin in high performance computing and information mining and retrieval; U. Wisconsin on machine learning for medical data; K.U. Leuven on probabilistic logic learning; U.T. Dallas on co-induction; U. Salzburg on "run-time programming" for real-time systems; U. York on "Adaptive systems security and networking" and U. Vigo on Bioinformatics.

COOPERATION WITH INESC-TEC units:

USIG – on adding secure authentication and identification technologies to online services.

LIAAD – on multi-relational data mining to support the development of large-scale mining systems using inductive logic programming with applications to medical data, genomics and proteomics; online learning from continuous data streams, with applications to sensor networks;

6.2.2 Main Achievements (4000 ca)

CRACS was quite successful in consolidating the research team, attracting young talented researchers, sustaining the publication ratio of the team at an excellent level, increasing international cooperation and participation in program committees of reputable international conferences. The main achievements for the unit in 2011 are as follows:

Productivity:

- CRACS was successful with two new projects, one as leader (FCT) and one as participant (EU-FP7/STREP), totaling over 220,000 euros of competitive funding. This raised the number of active projects to 11.
- CRACS published over 63 publications, namely: 10 in journal, 48 conferences (25 of which are in proceedings by Springer, ACM, or IEEE), 2 book proceedings, and 3 book chapters.
- CRACS uses a publication policy that favors quality over quantity, focusing on quality journals and top-rated conferences; nevertheless its publication record has been kept at a rate over 5.5 publications on average per senior researcher.

International recognition:

- YAP and Logtalk systems are highly regarded and used by the research community worldwide.
- Mooshak contest management system is being widely used, e.g. IEEE Xtream 2011 contest involving over 3000 students and 19 servers on the cloud, Tata Consulting and Universities worldwide.
- Excellent number of participation in PCs of relevant conferences: AAAI, IJCAI, DS, IDA, ICLP, PADL, ILP, EPIA, ACM-SAC, PACBB, ECEL, S-CUBE.

Advanced Training:

- Ongoing theses: 14 Master and 14 PhD. 15% of PhD students are foreign.
- Completed theses: 7 MSc and 5 PhD.
- Over 10 junior researchers have been hired using project funding. These researchers are normally also doing their master dissertation with members of our unit.

6.3 Productivity - CRACS

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 10
List can be consulted in: http://profile.inescporto.pt

1. Areias M., and R. Rocha, On Combining Linear-Based Strategies for Tabled Evaluation of Logic Programs, in Journal of Theory and Practice of Logic Programming, Special Issue of ICLP 2011, vol. 11 (4-5), pp.681–696, July 2011. (ISI, IF= 1.250)

2. Camacho R., M. Pereira, V. S. Costa, N. Fonseca, et al., A Relational Learning approach to Structure-Activity Relationships in Drug Design Toxicity studies, in Journal of Integrative Bioinformatics, Special Issue of PACBB'2011, vol. 8, September 2011.

3. Cruz F., and R. Rocha, Efficient Instance Retrieval of Subgoals for Subsumptive Tabled Evaluation of Logic Programs, in Journal of Theory and Practice of Logic Programming, Special Issue of ICLP 2011, vol. 11 (4-5), pp.697-712, July 2011. (ISI, IF= 1.250)

4. de Sousa M. M., C. R. Munteanu, A. Pazos, N. Fonseca, et al., Segments in Proteins Amino Acid Pair- and Triplet-wise Groupings in the Interior of Alpha-Helical Segments in Proteins, in Journal Theoretical Biology, vol. 271, pp.136–144, February 2011. (ISI,IF= 2.371)

5. Earl D., K. Bradnam, J. St. John, A. Darling and D. Lin, N. Fonseca, et al., Assemblathon 1: A competitive assessment of de novo short read assembly methods, in Genome Research, September 2011. (ISI, IF=13.588)

6. Figueira A. and G. Santos, Intelligent Tutoring Systems with SCORM, in Cepis UPGRADE, The European Journal for the Informatics Professional, vol. vol.XII (2), pp.34-42, April 2011.

7. Gama J., P. P. Rodrigues and L. Lopes, Clustering distributed sensor data streams using local processing and reduced communication, Intelligent Data Analysis, IOS Press, vol. 15, pp.3–28, January 2011. (ISI, IF= 0.412)

8. Kimmig A., V. Santos Costa, R. Rocha, B. Demoen, and L. De Raedt, On the Implementation of the Probabilistic Logic Programming Language ProbLog, in Theory and Practice of Logic Programming Systems, Special Issue of ICLP 2008, 11 (2-3), pp.235-262, 2011. (ISI, IF= 1.250)

9. Leal J.P. and R. Queirós, "Integrating the LMS in Service Oriented eLearning Systems", in International Journal of Knowledge Society Research (IJKSR),IGI-Global, vol. 2, pp.1-12, 2011.

10. Queirós R. and J. P. Leal, Modeling an eLearning environment for learning programming languages, in Learning Technology Newsletter of IEEE Computer Society's Technical Committee on Learning Technology (TCLT). 13(2), 28-31, April, 2011.

Please note that 6 more journal papers were accepted in 2011 but will be published only in 2012.

6.3.2 Other International publications (6000 ca.)

1. Antunes M., and M. E. Correia, Tunable immune detectors for behaviour-based network intrusion detection, in ICARIS'11, Springer, LNCS 6825, 334-347, 2011.

2. Antunes M., C. Silva, B. Ribeiro and M. E. Correia. An hybrid AIS-SVM ensemble approach for text classification, in ICANNGA'11, Springer LNCS 6594, 342-352, 2011.

3. Camacho R., M. Pereira, V. S. Costa, N. Fonseca and C. J. V. Simões et al. Assessing the effect of 2D fingerprint filtering on ILP-based structure-activity relationships toxicity studies in drug design, in PACBB'11, Springer, AISC 93, 355–363, 2011.

4. Campos, M. J., M. E. Correia and L. Antunes. Leveraging identity management interoperability in eHealth, in ICCST'2011, IEEExplore.

5. Choobdar S., F. Silva and P. Ribeiro. Network node label acquisition and tracking, in EPIA'11, Springer, LNAI 7026, 418-430, 2011.

6. Costa J., C. Silva, M. Antunes and B. Ribeiro. On Using Crowdsourcing and Active Learning to Improve Classification Performance, in ISDA'11, IEEExplore, 469-474, 2011.

7. Costa J., C. Silva, M. Antunes and B. Ribeiro. Get Your Jokes Right: Ask The Crowd, in MEDI'11, Springer, LNCS 6918, 178-185, 2011.

8. Costa J., C. Silva, M. Antunes and B. Ribeiro. The Importance of Precision in humour Classification", in IDEAL'11, Springer, LNCS 6936, 271-278, 2011.

9. Dutra I., H. Nassif, D. Page, J. Shavlik and R. Strigel et al. Integrating Machine Learning and Physician Knowledge to Improve the Accuracy of Breast Biopsy, in AMIA'2011.

10. Ferreira C. A., J. Gama and V. S. Costa. Constrained Sequential Pattern Knowledge in Multi-relational Learning, in EPIA'2011, Springer, LNCS 7026, 282-296, 2011.

11. Ferreira P., N. Fonseca, I. Dutra, R. Woods and E. Burnside. Predicting Malignancy from Mammography Findings and Surgical Biopsies, in IEEE BIBM 2011, IEEExplore.

12. Fonseca N., M. Pereira, V. S. Costa and R. Camacho "Interactive Discriminative Mining of Chemical Fragments", in ILP 2010 Revised Papers, Springer, LNCS 6489, 59–66, 2011.

13. Ferreira C. A., J. Gama and V. S. Costa. Sequential Pattern Knowledge in Multi-Relational Learning, in CIS II, chap. 12, Springer, 539-545, 2011.

14. Kirsch C. M., L. Lopes, E. Marques and A. Sokolova, Runtime Programming through Model-Preserving, Scalable Runtime Patches, in ACSD 2011, IEEExplore, 77-86, 2011.

15. Leal J. P., and R. Queirós, Using the Learning Tools Interoperability Framework for LMS Integration in Service Oriented Architectures, in TECH-EDUCATION'11, Springer, 2011.

16. Moura P., Programming Patterns for Logtalk Parametric Objects, in Applications of Declarative Programming and Knowledge Management, Springer, LNCS 6547, 52-69, 2011.

17. Pereira D., F. Hedayioglu, R. Correia, T. Silva and I. Dutra et al. DigiScope - Unobtrusive Collection and Annotating of Auscultations in Real Hospital Environments, in EMBC'2011, IEEExplore.

18. Queirós R., J. P. Leal, L. Oliveira and F. Moreira, Integration of ePortfolios in Learning Management Systems, in ICCSA 2011, Springer, LNCS 6586, 500-510, 2011.

19. Queirós R., M. Pinto, L. Oliveira and C. Silva, Interoperability on e-Learning 2.0: the PEACE Case Study, in CENTERIS'11, Springer, CCIS 220, 276-285, 2011.

20. Queirós R., and J. P. Leal, A Survey on eLearning Content Standardization, in WSKS'11, 2011.

21. Raimundo J. and R. Rocha. A Subterm-Based Global Trie for Tabled Evaluation of Logic Programs, in EPIA'11, Springer, LNAI 7026,239–253, 2011.

22. Ribeiro P., F. Silva and L. Lopes, A Parallel Algorithm for Counting Subgraphs in Complex Networks, in BIOSTEC'2010, Springer, CCIS 127, 380-393, 2011.

23. Silva T., and I. Dutra. T-SPPA: Trended Statistical PreProcessing Algorithm, in ICDIPC'11, Springer, CCIS 188, 118-131, Jul 2011.

24. Vaz D., V. S. Costa and M. Ferreira. Fire! Firing Inductive Rules from Economic Geography for Fire Risk Detection, in ILP'2010 Revised Papers, Springer, LNCS 6489, 238-252, 2011.

25. Wielemaker J., and V. S. Costa. On the Portability of Prolog Applications, in PADL'2011, Springer, LNCS 6539, 69-83, 2011.

Other (with refereeing):

26. Alves H., and A. Figueira. A Educational Library based on Clusters of Semantic Proximity, in ECDM'2011.

27. Cruz F., and R. Rocha A Simple Table Space Design for Retroactive Call Subsumption, in EPIA'2011.

28. Cruz F., and R. Rocha. Single Time-Stamped Tries for Retroactive Call Subsumption, in CICLOPS'2011.

29. Davis J., V. S. Costa, E. Berg, D. Page and P. Peissig et al. Discovering Latent Structure in Clinical Databases, in NIPS Workshop From statistical genetics to predictive models in personalized medicine, 2011.

30. Davis J., V. S. Costa, D. Page, P. Peissig and M. Caldwell. Discovering Latent Structure in Clinical Databases, in Snowbird'2011.

31. Farias R., L. Valente, L. M. Ribeiro and M. E. Correia. User-centric smart card and identity management for the improvement of the electronic services provided by the University of Porto, in EUNIS'2011.

32. Ferreira P., I. Dutra and N. Fonseca and Ryan Woods and Elizabeth S. Burnside. Studying the Relevance of Breast Imaging Features, in HEALTHINF'2011.

33. Leal J. P., and R. Queirós, Modeling a network of heterogeneous eLearning Systems, I-WEST'2011.

34. Leal J. P., and R. Queirós. A programming exercise evaluation service for Mooshak, ACM-ICPC CLIS'2011.

35. Queirós R., and J. P. Leal. Using the Common Cartridge profile to enhance learning content interoperability, in ECEL'2011.

36. Queirós R., and J. P. Leal. Programming Exercises Interoperability Language, ACM-ICPC CLIS'2011.

37. Raimundo J., and R. Rocha. Global Trie for Subterms, in CICLOPS'2011.

38. Silva A., and A. Figueira. Visualizing Online Interactions using Moodle: a reports module, in International Conference on e-Learning, 2011.

Books edited:

39. Abreu S., and V. Santos Costa (eds) Proceedings of CICLOPS'11, Universidade de Évora, 2011.

40. Rocha R., and J. Launchbury (eds). Proceedings of PADL'11, Springer, LNCS 6539, 2011.

6.3.3 Ph. D. thesis completed *(3000 ca.)*

Theses advised or co-advised by members of CRACS:

PhD thesis completed: 5

Mário J. Antunes, An Artificial Immune System for Anomaly Detection based on Dynamic Tunable Activation Thresholds, PhD in Computer Science, FCUP, Univ. Porto, Nov. 2011, Advisor: M. E. Correia

Aline Paes, Effective Revision of (Bayesian) Logic Programs, PhD in Systems Engineering and Computer Science , UFRJ, Brazil , Oct. 2011 , Advisors: V. Santos Costa, G. Zaverucha (UFRJ)

Eduardo Marques, Runtime Programming, PhD in Computer Science, FCUP, Univ. Porto Oct. 2011, Advisors: L. Lopes and C. Kirsch (U. Salzburg)

Leandro Marzulo, Exploiting Parallel Execution Lines with Dataflow Oriented Programming, Ph.D. in Systems Engineering and Computer Science, UFRJ, Brazil, Oct. 2011, Advisors: V. Santos Costa and F. França (UFRJ)

Pedro Ribeiro, Efficient and Scalable Algorithms for Network Motifs Discovery, PhD in Computer Science, FCUP, Univ. Porto, Jun 2011 , Advisors: F. Silva and L. Lopes

M.Sc. dissertations completed: 9

Vânia Rodrigues, Recommendation web-sites using concepts proximity, MSc in Networks and Information Systems Engineering , FCUP, Dec. 2011, Advisor: J. P. Leal

Filipe André Cunha, Extracting attributes from medical reports of mammography analysis, MSc in Networks and Information Systems Engineering, FCUP, Dec. 2011 , Advisor: I. Dutra

Maria João Campos, Identity in ehealth – from the reality of physical identification to digital identification, FMUP/FCUP, Dec. 2011 , Advisors: M. E. Correia and L. F. Antunes

Rui Edgar Vieira, Or-Parallel Prolog Execution on Multicores Based on Stack Splitting, MSc in Networks and Information Systems Engineering, FCUP, Nov. 2011 , Advisors: R. Rocha and F. Silva

André Manuel Silva, Analysis and Representation of Online Interactions, MSc in Networks and Information Systems Engineering, FCUP, Nov 2011 , Advisor: A. Figueira

Tiago André Gomes, Belief Propagation, MSc in Networks and Information Systems Engineering, FCUP, Nov 2011, Advisor: V. Santos Costa

Jorge Filipe Torres, An Integrated Development Environment for the Callas Programming Language, MSc in Computer Science, FCUP, Nov 2011 , Advisor: Luís Lopes

João André Araújo, On the Evaluation of Learning Algorithms for Wireless Sensor Networks, MSc in Computer Science, FCUP, Jul 2011, Advisor: Luís Lopes

João Janeiro, Especificação para documento clínico electrónico – relatório de imagem, MSc in Medical Informatics, FMUP/FCUP, Jun 2011, Advisors: M. E. Correia and L. F. Antunes

6.3.4 Patents/prototypes (2000 ca.)

Software prototypes and systems (year indicates year of 1st version):

1. YAP Prolog System, a high performance Prolog compiler. It is part of several Linux distributions and used worldwide, especially by the machine learning practitioners (latest version 6.2.1). Yap also includes YapTab, a tabling LP system, YapOr and ThOr, or-parallel Prolog systems, and OPTYap, an or-parallel tabling system.

2. Adapa: Automatic DAta PArallelism tool, 2008.

3. wd: a fast tool for discovering statistically interesting words, 2006.

4. BIORED: high performance distributed tool for mining patterns in biological sequences, 2006.

5. Authenticus: an author identification tool for scientfic publications, 2010.

6. Mooshak: a system for managing programming contests on the Web, v1.5.2.

7. RTPm/Stheno: P2P Middleware Platform for QoS computing, 2008.

8. The Callas Prog. Language, Virtual Machine, Simulator and Eclipse Prog. Environment for Wireless Sensor Networks, 2009.

9. XESB: a schema based XML editor, v1.05, 2005

10. crimsonHex: an LMS repository for programming problems, 2009.

11. SPD: an integrated system for creation, evaluation and publication of projects in a digital portfolio, 2006.

12. iGraph: a visualization and analysis tool for social network analysis in an online community based on foruns, 2006.

13. EOID: OpendID 2.0 Server with extensions for secure attributes management and smart card interactions, 2008.

14. Logtalk: Open-Source Object-Oriented Logic Programming Language, 1998, v2.43.3 in 2011.

15. Lineage Sequence Discovery (LSD) - discovery of patterns within biological sequences, 2010.

16. TAT-NIDS: A network intrusion system based on TAT-AIS, 2010.

17. MammoClass: an online application to classify mammograms, 2011

18. PopAffiliator: an online calculator for predicting individual affiliation to a major population group, 2011

19. LogCHEM: a prototype for discriminative interactive mining of chemical fragments, 2011.

20. L-FLAT: Logtalk Toolkit for Formal Languages and Automata Theory, 2011.

6.3.5 Organization of Conferences (2000 ca.)

1. Aug, USA, V. S. Costa [PC Member]

2. 2011, Jul, USA, P. Moura [PC Member] V. S. Costa [Co-Chair]

3. CloudViews 2011, Portugal, I. Dutra [PC Chair]

4. COLA/EPIA 2011, Oct, Portugal, P. Moura [Co-organizer and PC Member]

5. DS'2011, Oct, Finland, V. S. Costa [PC Member]

6. ICLP'2011, Jul, USA, V. S. Costa [PC Member]

7. IDA 2011, Oct., Portugal, V. S. Costa [PC Member]

8. IJCAI'2011, Jul, Spain, V. S. Costa [PC Member]

9. ILP 2011, Jul, UK, V. S. Costa [PC Member]

10. PACBB'2011, Apr, Spain, N. Fonseca, V. S. Costa [PC Member]

11. PADL'2011, Jan, USA, R. Rocha [PC Co-Chair]

12. SOFT-PT/INFORUM 2011, Sep, Portugal, F. Silva [PC Member]

13. XATA'2011, Jun, Portugal, J. P. Leal [Steering Comm. & PC Member], R. Queirós [PC Member & Organizer Comm.]

14. WSCAD-SSC/CTD/WIC 2011, Oct, Brazil, F. Silva [PC Member]

6.3.6 Industry contract research *(2000 ca.)*

Security, Access Control and Auditability of Information Systems

- Cooperation with the Central Services of the University of Porto in: deployment of the University of Porto Public Key Infrastructure (PKI) supported by smart-cards, de-materialization of course grades reported by faculty (with electronic signatures), and advise the University on the acquisition of a large hardware secure module. [M.E. Correia]

Distributed Systems Middleware

- Consultants for EFACEC - RT in the development of computing infrastructures for demanding critical information systems, namely a P2P middleware with support for FT and soft RT for public tram systems [F. Silva, L. Lopes]

6.3.7 Internationalization *(*2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

Members of CRACS maintain active international collaborations that resulted in 10 joint papers in 2011. Some collaborations are:

Information Mining

- Health: David Page, Jude Shavlik and Elizabeth Burnside, Univ. Wisconsin, Madison (USA)
- Graph Analysis: Marcus Kaiser, Jennifer Simonotto, Univ. Newcastle (UK)
- Metabolic Pathways: Imperial College (UK)
- Artificial Immune Systems: Jon Timmis, Univ. York (UK)
- Information security: Chris Mitchell e Jason Crampton. Univ London, UK

Languages and High Performance Computing

- Run-Time Programming and Middleware: Christoph Kirsch, Univ. Salzburg (Austria); Priya Narasimhan, CMU (US)
- Logic Programming and Tabling: T. Swift, Johns Hopkins Univ (US); Taisuke Sato, Tokyo IT; Jan Wielemaker, Univ Amsterdam
- Probabilistic Prolog & ILP: Angelika Kimmig, Luc de Raedt, Bart Demoen, Hendrik Blockeel, Tom Schrijvers, Theofrastos Mantadelis, Jesse Davis and Gerda Janssens K. U. Leuven (Belgium)
- Coinductive LP, Program Analysis & Model Checking: Gopal Gupta, Univ. Texas @ Dallas (USA)
- Constraint-Based Declarative Business Process Modeling: Michael Igler and Stefan Jablonski,
- Univ. Bayreuth, (GER).
- Parallel Programming: Keshav Pingali, Univ. Texas @ Austin (USA)
- Grid Computing: Felipe França, Gerson Zaverucha, Bernard Marechal and Diego Carvalho, COPPE @ UFRJ (Brasil)

- Distributed Programming of Large Ensembles: F. Pfenning, Seth Goldstein, M. Ashley-Rollman, Carnegie Mellon (USA)
- Web-Based Systems
- Online News and Social Media: Luis Francisco Revilla, Univ. Texas @ Austin (USA)
- Automatic Evaluation of Programming Exercises: Miguel Revilla, Univ. Valladolid

6.3.8 Other national publications (6000 ca.)

1. Araújo J., P. P. Rodrigues and L. Lopes, "Large-Scale Simulation of a Distributed Algorithm for Clustering Streaming Sensors", in INFORUM'2011.

2. Augusto A. B., and M. E. Correia An XMPP messaging infrastructure for a mobile held security identity wallet of personal and private dynamic identity attributes, in XATA'2011.

3. Ferreira P., D. Pereira, I. Dutra, R. Correia and F. Hedayioglu et al. The DigiScope Auscultation Data: First Explorations, in RecPad'2011.

4. Leal J. P. ,and R. Queirós, An Engine for Generating XSLT from Examples, XATA'2011.

5. Mendes R., and L. Lopes, A Modular Virtual Machine for the Callas Programming Language for Wireless Sensor Networks, in INFORUM'2011.

6. Pereira D., F. Hedayioglu, R. Correia, I. Dutra and F. Almeida et al. DigiScope: Unobtrusive Collection and Annotation of Auscultations in Real Hospital Environments, in RecPad'2011.

7. Queirós R., and J. P. Leal, PExIL: Programming Exercises Interoperability Language, XATA'2011.

8. Queirós R., and M. Pinto, Using Mobile Device Detection Approaches to Augment the Accuracy of Web Delivery Content, in XATA'2011.

9. Silva A. and A. Figueira. Visualização de Interacções em Fóruns Online, in Challenges'2011.

10. Torres J., and L. Lopes, An Eclipse Plug-in for Developing and Deploying Callas Applications, in INFORUM'2011.

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

A member of CRACS has served as consultant for the Portuguese Ministry of Health involving Information security assessment of network infrastructures and eHealth Systems, and the secure identity management infrastructure for Portuguese health professionals (electronic prescription)

6.1 Group Description - ROBIS

Research Group Title	**ROBOTICS AND INTELLIGENT SYSTEMS**
Principal Investigator	António Paulo Gomes Mendes Moreira
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 60.417,00

European Commission: 0,00

QREN: 45.797,00

TOTAL: 106.214,00

6.2 Objectives & Achievements - ROBIS

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinators of this Unit during 2011 were Prof. António Moreira and Eduardo Silva.

OBJECTIVES

The main goal of the Unit ROBIS is the development of innovative robotic solutions and intelligent systems for different application areas where standard platforms are not optimal. Research activities address not only relevant problems in robotics but also application areas where technologies used in robotics play an important role, like control, automation, simulation, modeling, intelligent systems, etc.

The main activity areas include: Mobile Robotics, Marine Robotics, Industrial Manipulators, Control Algorithms, Automation Systems integration, and Consulting Services.

The Unit's activity is grounded in research in the following scientific domains:

Mobile Robotics: Robotic platform architectures; Control of mobile platforms; Smart and Low-Cost AGVs.

Marine Robotics: Design of surface and underwater autonomous vehicles; underwater positioning and navigation, multiple platform systems, supervision of autonomous platforms, robotic based environment monitoring.

Cooperative robotics: Warehouses and Logistics applications.

Industrial Manipulators: Rapid teaching and programming interfaces; Hyper-flexible cells.

Intelligent sensors: Smart sensors and image processing; Applications in robotics and automation; adaptive sampling strategies in environment monitoring.

Intelligent control and simulation: control algorithms for complex dynamics systems. Simulation applications for complex dynamic electro/mechanical systems

The ROBIS UNIT is engaged in discovering and developing fundamental scientific principles and practices, such as perception, control and planning, which are applicable to intelligent robot systems and other complex dynamic systems. In addition, it is the goal of this group to facilitate technology transfer of its research results to yield solutions to real world problems for a wide range of application domains, namely, robots that navigate through complex indoor and outdoor spaces and advanced flexible manufacturing support systems.

6.2.2 Main Achievements (4000 ca)

In the RobVigil project, robots activities are being extended to surveillance, based on several innovative principles:

Self- localization in indoor environments

Secure wireless communications

Monitoring and control of mobile robots

Fast wireless battery recharge systems

In the SIIARI project, an intelligent robotic systems is being developed, capable of acquiring, in a fast and intuitive way, the know-how accumulated by specialized. The innovative characteristics are:

Programming of robots/machines through demonstration;

Modular and flexible system for automatic recognition of object geometry;

Advanced interface for management and control;

In the Lajeado project, for dam and reservoir monitoring with an autonomous underwater vehicle, funded by the Brazilian Hydroelectric Power Plant Company CEB Lajeado, INESC Porto is developing a high precision underwater positioning system and algorithms for the processing of underwater video and sonar data.

PERCEPTION-DRIVEN COORDINATED ROBOT MOTION CONTROL – Two novel research subjects:

Decentralized low-communication estimation methods to provide estimates of the formation full state at all the vehicles.

Dynamic-goal-driven formation control, to track a moving target cooperatively, by fusing the data measured by all the formation vehicles, which actively re-arrange their relative geometry to reduce the target estimate uncertainty.

WWECO – Environmental Assessment and Modeling of Wastewater Discharges using Autonomous Underwater Vehicles Bio-optical Observations. Some of the developments of the project include an adaptive sampling approach for the MARES AUV and an automatic data processing system that will enable a quicker response in case of contamination risk to near-by beaches.

Fleximap3D – Flexible Dynamic Mapping System by Tridimensional Images.

Development of a kinematic terrestrial and aquatic system able to perform three-dimensional survey and mapping and images of the surface area on road, rail and water tracks, i.e. coastal funds with high-resolution either above or below the water surface in shallow waters (coastal areas , dams, rivers, etc.). Gathered data will compose a geo-referenced 3D map using information from high-precision navigation systems, integrating dual-frequency GPS system, inertial system and odometer.

Produtech – Systems and applications for mobile and flexible robotics, organized in three activities.

Rapid teaching and programming of industrial manipulators. The robotic system is able to acquire this programming by rapid learning. This learning system is based on Sincrovision System. Allows a non-expert operator can teach the handler by demonstration.

Robotic automation is usually related to rigid processes. Based on new sensors, actuators and its integration, the development of low cost industrial applications that provide automatic detection and adjustment of objects are the main topics for this activity.

Technologies for mobile robotics, aims the develop modules that can be incorporated into existing robotic systems on the market (eg AGVs), in order to significantly increase their potential for use into new areas in the industry.

COGNAT - Cooperative Glider Navigation and Acoustic Tomography - Autonomous underwater gliders are robotic vehicles capable of changing its buoyancy in order to achieve vertical motion and

profile the water column. Using a set of internal moving masses, together with external control surfaces such as wings and rudders, they can also change attitude and convert some vertical motion into the horizontal. This buoyancy-driven propulsion results in a tremendous reduction in power consumption, as compared to conventional Autonomous Underwater Vehicles (AUVs) that typically use electric motors for propulsion, and thus represent a significant increase in mission range and duration.

European COST Action: On the use of unmanned aerial systems (UAS) for atmospheric research

This action will coordinate ongoing and conceive future research on the development and application of UAS as a cost-efficient, trans-boundary method for the monitoring of the atmospheric boundary layer and the underlying surface of the Earth. These systems will help to close the recent observational gap between established ground based and satellite based measurements and provide relevant atmospheric data both with high temporal and spatial resolution and an unique data coverage in space and time.

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - ROBIS

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 6
List can be consulted in: http://profile.inescporto.pt

Ferreira, M.A., Moreira, A.P., Neto, P., "A low-cost laser scanning solution for flexible robotic cells: spray coating", The International Journal of Advanced Manufacturing Technology, DOI 10.1007/s00170-011-3452-x, June 2011.

Marques Braga, R.A., Petry, M., Paulo Reis, L., Moreira, A.P., "IntellWheels: A Modular Development Platform for Intelligent Wheelchairs", Journal of Rehabilitation Research & Development, 2011.

Neto, P., Mendes, N., Araújo, R., Pires, J.n., Moreira, A.P., ""INTUITIVE ROBOT PROGRAMMING BASED ON CAD: DEALING WITH UNSTRUCTURED ENVIRONMENTS"", Industrial Robot: An International Journal, #IR-10-465, 2011

Pinto, M.A., Moreira, A.P., Matos, A., "Localization of Mobile Robots Using an Extended Kalman Filter in a LEGO NXT ", IEEE Transactions on Education, May 2011.

Ramos, P., Abreu, N.M., "Using an AUV for assessing wastewater discharges impact: an approach based on geostatistics", Marine Technology Society Journal, vol.45, no.2, p.74-87, March 2011

Restivo, M.T., Alves, J.C., Cardoso, A., "Experiment@Portugal", International Journal of Engineering Pedagogy, vol.1, p.6-7, 2011

6.3.2 Other International publications (6000 ca.)

Total number of publications: 24
List can be consulted in: http://profile.inescporto.pt

Alves, J.C., Dias, P., "A Micro-architecture for Streaming and Vector Computing", XXVI Conference on Design of Circuits and Integrated Systems (DCIS'2011), Albufeira, Portugal, November 2011

Brito Santiago, C., Gomes, L., Sousa, A., Reis, L.P., "Tracking Players in Indoor Sports Using a Vision System Inspired in Fuzzy and Parallel Processing", "Cutting Edge Research in New Technologies" ISBN: 979-953-307-655-2, 2011

Costa, P.J., Moreira, A.P., Gonçalves, J.A., Lima, J., "Proposal of a new real-time cooperative challenge in mobile robotics ", 18th IFAC World Congress - 18th World Congress of the International Federation of Automatic Control (IFAC) 2011, Milão, Itália.

Cruz, N., "Autonomous Underwater Vehicles", Autonomous Underwater Vehicles, Nuno Cruz (ed,), ISBN 978-953-307-432-0, InTech, October 2011

Cruz, N., Matos, A., Almeida, R.M., Ferreira, B.M., Abreu, N.M., "TriMARES - a Hybrid AUV/ROV for Dam Inspection", OCEANS '11 MTS/IEEE - OCEANS '11 MTS/IEEE KONA, September 2011, Kona - Hawaii, EUA.

Ferreira, B.M., Matos, A., Cruz, N., "Automatic reconfiguration and control of the MARES AUV in the presence of a thruster fault", OCEANS''11 - OCEANS''11 IEEE Santander Conference, Santander, Espanha, May 2011.

Lima, J., Leitão, P., Gonçalves, J., Gayubo, F., González, J.L., Fraile, J.C., "A Robotic System Enhanced with Computer Vision for Manipulating Sliced Meat Objects", ETFA2011 - 16th IEEE International Conference on Emerging Technologies and Factory Automation, September 2011, Toulouse, França.

Nascimento, T.P., S. Conceição, A.G., Alves, H., A. Fontes, F., Moreira, A.P., "A Generic Framework for Multi-Robot Formation Control", RoboCup 2011 - RoboCup International Symposium 2011, Istambul, Turquia, July 2011.

Nascimento, T.P., Fontes, F., Moreira, A.P., "LEADER FOLLOWING FORMATION CONTROL FOR OMNIDIRECTIONAL MOBILE ROBOTS: THE TARGET CHASING PROBLEM", ICINCO 2011 - 8th International Conference on Informatics in Control, Automation and Robotics, Noordwijkerhout, Holanda, July 2011

Ramos, P., Abreu, N.M., "Mapping and Dilution Estimation of Foz do Arelho Outfall Plume using an Autonomous Underwater Vehicle", Proceedings of IROS'11 - IEEE/RSJ International Conference on Intelligent Robots and Systems, San Francisco, California, USA, September 2011

Alves, J.C., Diniz, P., "CUSTOM FPGA-BASED MICROARCHITECTURE FOR STREAMING COMPUTING", SPL2011 - Southern Programmable Logic Conference, Córdoba, Argentina, April 2011

Brito Santiago, C., Reis, L.P., Rossetti, R., Sousa, A., "Foundations for Creating a Handball Sport Simulator", Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, Chaves, Portugal, April 2011

Brito Santiago, C., Lobato Oliveira, J., Reis, L.P., Sousa, A., "Autonomous Robot Dancing Synchronized to Musical Rhythmic Stimuli", Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, Chaves, Portugal, July 2011

Ferreira, B.M., Matos, A., Cruz, N., "Fault Tolerant Depth Control of the MARES AUV, Challenges and Paradigms in Applied Robust Control, Andrzej Bartoszewicz (ed.), ISBN: 978-953-307-33", October 2011

Gomes, L., Sousa, A., "Control of Milling Machine Cutting Force Using Artificial Neural Networks", Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, Chaves, Portugal, 2011

Neto, P., Mendes, N., Araújo, R., Pires, J., Moreira, A.P., "INTUITIVE ROBOT PROGRAMMING BASED ON CAD: DEALING WITH UNSTRUCTURED ENVIRONMENTS", Robotica2011 - 11th International Conference on Mobile Robots and Competitions, Lisboa, Portugal, April 2011

Petry, M., Moreira, A.P., Reis, L.P., Rossetti, R., "Intelligent Wheelchair Simulation: Requirements and Architectural Issues", Robotica2011 - 11th International Conference on Mobile Robots and Competitions, Lisboa, Portugal, April 2011

Pinto, A.M., Freitas Rocha, L., Moreira, A.P., Costa, P.J., "Shop Floor Scheduling In a Mobile Robotic Environment", EPIA 2011 - 15th Portuguese Conference on Artificial Intelligence, Lisboa, Portugal, October 2011

Ramos, P., Abreu, N.M., "Environmental impact assessment of Foz do Arelho sewage plume using MARES AUV", OCEANS''11 - OCEANS''11 IEEE Santander Conference, Santander, Espanha, April 2011

Ramos, P., Abreu, N.M., "Mapping and dilution estimation of wastewater discharges based on geostatistics using an Autonomous Underwater Vehicle", Autonomous Underwater Vehicles, N. Cruz (ed.), ISBN: 978-953-307-432-0, In-Tech, Austria, October 2011

Ramos, P., Abreu, N.M., "Spatial Analysis and Dilution Estimation of Foz do Arelho Outfall Using Observations Gathered by an AUV", Symposium2011 - International Symposium on Outfall Systems, Mar del Plata, Argentina, May 2011

Restivo, M.T., Alves, J.C., Cardoso, A., "Experiment@Portugal - Expected Outcomes", REV'2011 - 9th International Conference on Remote Engineering and Virtual Instrumentation, Brasov, Roménia, June 2011

Restivo, M.T., Alves, J.C., Cardoso, A., ""Experiment@Portugal"", IEEE EDUCON 2011 - IEEE Engineering Education 2011, Amman, Jordania, April 2011

Sobreira, H.M., Neves Santos, F., Alves, H., Moreira, A.P., "Localizing an NXT Lego Robot using infra-red beacons", EPIA 2011 - 15th Portuguese Conference on Artificial Intelligence, Lisboa, Portugal, October 2011

6.3.3 Ph. D. thesis completed *(3000 ca.)*

Nadja Mench Bressan, Software Integrado para Anestesia: Aquisição de Dados, Estratégias de Controle de Infusão e Alarmes Inteligentes, Doutoramento em Engenharia Biomédica da FEUP. (Co-orientador A. Paulo Moreira com orientação da Professora Doutora Catarina Sofia Nunes Duarte - Department of Mechanical Engineering, King's College London). April 2011.

Pedro Luís Cerqueira Gomes da Costa, Planeamento cooperativo de tarefas e trajectórias de múltiplos robôs, Doutoramento em Engenharia Electrotécnica e de Computadores da FEUP. (Orientador: A. Paulo Moreira). November 2011.

6.3.4 Patents/prototypes (2000 ca.)

Prototypes

- RobVigil – Autonomous Surveillance Robot

6.3.5 Organization of Conferences (2000 ca.)

(void)

6.3.6 Industry contract research *(2000 ca.)*

The Unit ROBIS has a very strong link with industry, regularly collaborating with technology suppliers for industry, on the design and development of new products they put on the market. For industrial companies the group supplies consulting services on innovation and industrial management. For industrial companies, the group also offers RTD services to meet specific requirements that cannot be answered by available commercial solutions. This section refers only to national contracts.

Contract research with industry referred to in the sections Internationalization and Government/Organization contracts, where projects with industry funded by QREN are listed.

6.3.7 Internationalization *(*2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

TRIMARES - Development of medium size autonomous underwater vehicle for the Brazilian Hydro Power Plant Company CEB Lajeado. The vehicle will be used as a platform to transport underwater inspection and mapping and water quality sensors.

Joint Research

I3S, University of Nice, France: Information theory, adaptive sampling

University of Dundee, U.K.: Fluid mechanics

Georgia Institute of Technology, U.S.A.: Hydrodynamic dispersion models

Universidade Federal de Juiz de Fora: Mobile Robotics, Control

Research project (FCT) with Carnegie Mellon University, U.S.A.: cooperative robotics

Research project (FCT) with Royal Institute of Technology, Stockholm

Co-supervision of PhD and MSc students at Federal University of Bahia, Brasil: Mobile robotics

International papers in cooperation with foreign institutions:

Conceição, A.G., Ribeiro, T., Moreira, A.P., Costa, P.J., "ARQUITETURA HIERARQUICA DISTRIBUIDA PARA COORDENA_CÃO E COOPERAÇÃOO DE SISTEMAS MULTI-ROBÔS" [hierarchical architecture distributed for coordination and cooperation of multi-Robots], SBAI 2011 - Simpósio Brasileiro de Automação Inteligente, São João del-Rei, Brasil, September 2011.

Lima, J., Leitão, P., Gonçalves, J., Gayubo, F., González, J.L., Fraile, J.C., "A Robotic System Enhanced with Computer Vision for Manipulating Sliced Meat Objects", ETFA2011 - 16th IEEE International Conference on Emerging Technologies and Factory Automation, Toulouse, França, September 2011

Nascimento, T.P., S. Conceição, A.G., Alves, H., A. Fontes, F., Moreira, A.P., "A Generic Framework for Multi-Robot Formation Control", RoboCup 2011 - RoboCup International Symposium 2011, Istambul, Turquia, July 2011

Nascimento, T.P., Stefano, D., "SPEECH RECOGNITION USING ARTIFICIAL NEURAL NETWORKS", SBAI 2011 - Simpósio Brasileiro de Automação Inteligente, São João del-Rei, Brasil, September 2011

6.3.8 Other national publications (6000 ca.)

Brito Santiago, C., Sousa, A., Reis, L.P., "Pseudo Fuzzy Colour Calibration for Sport Video Segmentation", VipIMAGE2011 - III Eccomas thematic conference on computational vision and medical image processing, Olhão, Portugal, October 2011

Calejo Rodrigues, R., Sousa, A., Veiga Martins, L., "SISTEMA DE INFORMAÇÃO BASEADO EM RFID APLICAÇÃO EM MANUTENÇÃO DE EDIFÍCIOS" [Information Systems RFID based Building Maintenance application], GESCON 2011 - GESCON 2011 - Sistemas de Informação na Construção, Porto, Portugal, October 2011

Conceição, A.G., Ribeiro, T., Moreira, A.P., Costa, P.J., "ARQUITETURA HIERARQUICA DISTRIBUIDA PARA COORDENA_CÃO E COOPERAÇÃOO DE SISTEMAS MULTI-ROBÔS" [hierarchical architecture distributed for coordination and cooperation of multi-Robots], SBAI 2011 - Simpósio Brasileiro de Automação Inteligente, São João del-Rei, Brasil, September 2011

Graça, I., Ramos, P., Bandeira, A.M., "Efeitos do investimento em Capital Humano na criação de valor para as Unidades Hospitalares EPE Portuguesas" [Efects of investment in Human Capital for creation of value to the Hospital Portuguese units], Revista Portuguesa de Contabilidade, vol.1, no.2, July 2011

Nascimento, T.P., Stefano, D., "SPEECH RECOGNITION USING ARTIFICIAL NEURAL NETWORKS", SBAI 2011 - Simpósio Brasileiro de Automação Inteligente, São João del-Rei, Brasil, September 2011

Ramos, P., Cruz, N., Matos, A., Carvalho, S., "Monitorização ambiental do emissário submarino da Foz do Arelho usando um veículo submarino autónomo" [Environmental monitoring of Foz do Arelho sea outfall using an autonomous underwater vehicle], Águas & Resíduos, no.16, 2011

Salazar, A.J., Bahubalindruno, G., Lacharla, G., Mendonça, H., Alves, J.C., da Silva, J., "A Comparison of Look-up Table Based Sine Wave Generation Implementations", REC'2011 - 7th Portuguese Meeting on Reconfigurable Systems, Porto, Portugal, February 2011

Xavier, J., Abreu, P.H., Reis, L.P., Petry, M., "Location and Automatic Trajectory Calculation of Mobile Objects using Radio Frequency Identification", Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, Chaves, Portugal, June 2011

6.3.9 Government/Organization contract research (2000 ca.)

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

National programs – FCT: 3; QREN: 4

WWECO - Mapeamento de Plumas de Emissários Submarinos Baseada em Sensores Ópticos (with Águas do Oeste S.A.) - Development of methods to improve environmental impact assessment and modeling capabilities of wastewater discharges using optical observations. Adaptive sampling approach for the MARES AUV and an automatic data processing system that will enable a quicker response in case of contamination risk to near-by beaches.

PERCEPTION-DRIVEN COORDINATED ROBOT MOTION CONTROL – Motion coordination and cooperative perception of the surrounding environment with multiple and possibly heterogeneous, autonomous vehicles.

COGNAT - Cooperative Glider Navigation and Acoustic Tomography - Autonomous underwater gliders are robotic vehicles capable of changing its buoyancy in order to achieve vertical motion and profile the water column.

RobVigil – QREN project with CLEVER HOUSE – Sistemas Inteligentes, Lda (Project leader), STRONG – Segurança, S.A. and SINEPOWER – Sociedade de Consultadoria e Projectos, Lda.

SIIARI – Contract project with FLUPOL – Aplicações Técnicas de Polímeros Fluorados, Lda.

6.1 Group Description – HASLAB

Research Group Title	**HIGH ASSURANCE SOFTWARE LABORATORY**
Principal Investigator	Jorge Miguel de Matos Sousa Pinto
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 280.250,00

European Commission: 115.500,00

QREN: 15.000,00

TOTAL: 426.750,00

6.2 Objectives & Achievements – HASLAB

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. Jorge Sousa Pinto

This Unit is transiently sheltered within INESC Porto but will become an autonomous Associate Unit of INESC TEC, pending an evaluation by the FCT.

OBJECTIVES

The HASLab group conducts R&D in the following areas: formal methods; dependable distributed systems; and cryptography and information security. The group focuses in particular on proposing integrated trustworthy solutions to problems that can only be attacked using combined methods and techniques.

Formal Methods

The general goal of Formal Methods (FM) is to certify properties of software systems (chiefly correctness and safety) through the use of mathematical techniques. Formal methods constitute an alternative approach to software reliability assurance, to which industry is progressively devoting more attention. In fact, not only is the need for formal methods increasingly more pressing, but the maturity of their underlying mechanisms is now more adequate for industrial use than it has been in the past, when it was extremely hard for non-specialists to be able to use FM tools. The perceived utility of formal methods is thus more and more indisputable, and what is more they are being explicitly introduced in software norms, such as the recent DO-178-C, software considerations in aeronautical systems.

HASLab researchers have expertise at the following different levels: specification and formal modelling, software architectures, user-system interaction, and program analysis and verification. The mission of the formal methods team is to promote and develop techniques enabling the application of formal methods in the context of dependable software engineering.

Dependable Distributed Systems

The dependability requirements of most business and government applications have in the past been matched perfectly by transactional mechanisms embodied in relational database management systems and asynchronous transactional middleware. The emergence of e-Business and e-Government in the Web, with an emphasis on 24×7 availability and greater value being generated by online services, shifted the focus to improving availability while leveraging existing application technologies, with the current trend being that services in e-Business and e-Government become larger and more critical.

HASLab researchers have been contributing to the state of the art in large scale distributed data management for more than 10 years, both in national projects and by coordinating the GORDA european project on open replication of databases. This contribution has focused both on architecting DBMS interfaces for pluggable replication as well as in offering a spectrum of replication protocols for different circumstances. The topics currently being addressed include elastic high-performance transactional systems; resilience to a wider variety of faults; and scaling data storage to large scale in cloud computing environments.

The HASLab dependability team has also been contributing to the state of the art in dependable distributed systems by developing agreement protocols and information dissemination protocols offering strong consistency properties.

Cryptography & Information Security

The HASLab information security team is active in three dimensions of provable security, the area that focuses on constructing formal arguments of security for cryptographic schemes and protocols: (i) formalizing security models (goals and attack scenarios) suitable for practical applications, and studying the relations between such models; (ii) constructing security arguments to support new and, perhaps more importantly, existing protocols that are used in the real world without theoretical validation; (iii) developing formal verification tools that can be used to mechanically check theoretical security proofs at the highest levels of assurance.

On a more applied direction, the HASLab team is currently achieving the highest impact in the development of programming languages and compilation tools for the specific domain of cryptographic software. Also here there is an emphasis on high-assurance software development, by focusing on domain-specific methodologies and tools for the formal verification of cryptographic software implementations.

6.2.2 Main Achievements (4000 ca)

Main scientific results:

- Implementation and detailed analysis, in a real environment with a large number of nodes geographically dispersed, of mutable consensus, a protocol for solving the fault-tolerant consensus problem in distributed systems
- An algorithm to calculate time series motifs statistical significance
- Techniques for the distributed estimation of sums and network sizes
- Eventual consistency of data through the use of convergent replicated data types
- A new algorithm for the detection of overlapping communities in complex networks
- An approach to transformation of structure-shy programs, in particular for XML queries
- A technique based on the joint use of simulation and formal verification for the design of safe industrial systems controllers
- Advances in spreadsheet engineering, including ClassSheet-driven Environments, Embedding and Evolution of Spreadsheet Models, and Model-based Spreadsheets
- New techniques for the analysis of open-source software
- Advances in dependable cloud computing and cloud-based database servers
- A novel approach to linear algebra programming based on matrix polymorphic types
- A method to hybridise logics at an institution-independent level
- A specification method for reconfigurable software based on hybrid logic

Projects

- 2 ongoing EC-funded projects

- 1 international project kick-off, funded by the United Nations University
- Continued membership of the European Network of Excellence in Cryptology II
- 3 FCT-funded projects kicked-off in 2011
- 7 ongoing FCT-funded projects
- 2 FCT-funded projects completed in 2011

Publications

- 6 papers in international peer-reviewed journals
- 44 papers in international conferences with peer reviewing
- 1 textbook
- 1 PhD thesis

Awards

- HASLab postdoc researcher Alexandra Silva was honored with the 2011 IBM Scientific Award.
- Two best paper awards (DisCoTec'2011 Best Paper Award and Best Student Paper Award, SIAM SDM 2011)

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - HASLAB

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 6
The complete list can be consulted in: http://profile.inescporto.pt

Carlos Baquero, Paulo Sérgio Almeida, Raquel Menezes. “Extrema Propagation: Fast Distributed Estimation of Sums and Network Sizes”. IEEE Transactions on Parallel and Distributed Systems, July 2011. IEEE computer Society Digital Library.

Marc Shapiro, Nuno Preguiça, Carlos Baquero, Marek Zawirski. “Convergent and Commutative Replicated Data Types”. EATCS Bulletin, No. 104, June 2011. European Association for Theoretical Computer Science.

Di Jin, Bo Yang, Carlos Baquero, Dayou Liu, Dongxiao He, Jie Liu. “Markov random walk under constraint for discovering overlapping communities in complex networks”. Journal of Statistical Mechanics: Theory and Experiment (JSTAT), May 2011. IOP Science.

M. J. Frade, J. S. Pinto. “Verification Conditions for Source-level Imperative Programs”. Computer Science Review, Volume 5, Issue 3, pp. 252-277, 2011. Elsevier.

Alcino Cunha and Joost Visser: “Transformation of Structure-Shy Programs with Application to XPath Queries and Strategic Functions”, In Science of Computer Programming, 76(6):516-539, 2011. Elsevier.

J. Machado, E. Seabra, J.C. Campos, F. Soares, C. Leão. “Safe Controllers Design for Industrial Automation Systems”. Computers and Industrial Engineering. 60(4): 635-653, 2011. Elsevier.

6.3.2 Other International publications (6000 ca.)

Total number of publications: 38

The complete list can be consulted in: http://profile.inescporto.pt

Due to the limited space made available in this form, only selected papers are listed.

F. Cruz, P. Gomes, R. Oliveira, and J. Pereira. Assessing NoSQL databases for telecom applications. In International Workshop on Clouds for Enterprises (C4E), 2011.

Nelson Gonçalves, Rui José and Carlos Baquero. Privacy preserving gate counting with collaborative Bluetooth scanners. Sixth International Workshop on MObile and NEtworking Technologies for social applications (OTM MONET´11). LNCS

M. Matos, R. Vilaca, J. Pereira, and R. Oliveira. An epidemic approach to dependable key-value substrates. In International Workshop on on Dependability of Clouds, Data Centers and Virtual Computing Environments (with DSN), 2011.

J.P. Fernandes, J. Saraiva, D. Seidel and J. Voigtlander. Strictification of Circular Programs, In 2011 ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation (PEPM). ACM Press, pages 131-140.

Alcino Cunha and Hugo Pacheco. Calculating with Lenses: Optimising Bidirectional Transformations. In proceedings of the 20th ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation, pages 91-100. ACM Press, 2011.

Alcino Cunha and Hugo Pacheco, Algebraic Specialization of Generic Functions for Recursive Types. In proceedings of the 2nd Workshop on Mathematically Structured Functional Programming. ENTCS, 229(5):57-74. Elsevier, 2011.

A. Sanchez, L. S. Barbosa and D. Riesco. A language for behavioural modelling of architectural patterns. BA-FM'11, ACM, pp 17-24. 2011.

C. Rodrigues, M. A. Martins, A. Madeira, and L. S. Barbosa. Refinement by interpretation in Pi-institutions. Proc. REFINE'111, EPTCS, 55, pp 53-64. 2011.

M. A. Martins, A. Madeira, L. S. Barbosa. Reasoning about complex requirements in a uniform setting. Proc. TICTTL, Univ. Salamanca. 2011.

L. Freire, P.M. Arezes and J.C. Campos. A importância das avaliações qualitativas em sistemas E-learning. In P. Arezes, J.S. Baptista, M.P. Barroso, P. Carneiro, P. Cordeiro, N. Costa, R. Melo, A.S. Miguel, and G.P. Perestrelo, editors, Occupational Safety and Hygiene (SHO 2011), pages 274-278. 2011.

L. Beckwith, J. Cunha, J.P. Fernandes, and J. Saraiva, An Empirical Study on End-users Productivity Using Model-based Spreadsheets, In European Spreadsheet Risks Interest Group 12th Annual Conference (EuSpRIG), pages 87-100, July 2011, University of Greenwich, London.

J.C. Campos and M.D. Harrison. Modelling and analysing the interactive behaviour of an infusion pump. Electronic Communications of the EASST, volume 45: Formal Methods for Interactive Systems 2011. 2011.

J.C. Campos and J. Machado. Supporting requirements formulation in software formal verification. In Ambrosio, A.M. and Mattiello-Francisco, M.F. and Batista, J.C. and Barbosa, R. and Cancela, H.,

editors, Latin-American Symposium on Dependable Computing (LADC 2011). Suplemental proceedings. INPE. 2011.

J. Machado and J.C. Campos. Partial Plant Models in Formal Verification of Industrial Automation Discrete Systems. In Ambrosio, A.M. and Mattiello-Francisco, M.F. and Batista, J.C. and Barbosa, R. and Cancela, H., editors, Latin-American Symposium on Dependable Computing (LADC 2011) suplemental proceedings. INPE. 2011.

L. S. Barbosa, A. Sanchez and P. R. Henriques. Towards rigorous analysis of Open Source Software. TTSS'11, Univ. of Oslo. 2011.

A. Madeira, J. M. Faria, M. A. Martins, L. S. Barbosa. On requirements engineering for reactive systems: A formal methodology. CBSEC'11. 2011.

6.3.3 Ph. D. thesis completed (3000 ca.)

Daniela da Cruz, Verification, Slicing, and Visualization of Programs with Contracts. Universidade do Minho, 2011.

6.3.4 Patents/prototypes (2000 ca.)

(void)

6.3.5 Organization of Conferences (2000 ca.)

GTTSE 2011: 4th Summer School on Generative and Transformational Techniques in Software Engineering, July 3-9, Braga, Portugal, 2011.

INTERACT 2011: 13th IFIP TC13 Conference on Human-Computer Interaction, Lisbon, Portugal, 5-9 September, 2011.

Interacción 2011: XII Congreso de Interacción Persona-Ordenador, Lisbon, Portugal, 2-5 September, 2011.

SLE 2011: 4th International Conference on Software Language Engineering. Braga, Portugal, July 2011.

SAC 2011: Dependable and Adaptive Distributed Systems, 26th ACM Symposium on Applied Computing, Taichung, Taiwan, March 21-25, 2011.

HASLab members participated additionally in the program committees of the following events:

SIMPDA 2011, SEFM 2011, OpenCert 2011, FOCLASA 2011, SBLP 2011, SBMF 2011, IWSSC 2011, Refine 2011, FACS 2011, WGT 2011, LDTA 2011, CBSoft 2011, SLE 2011; EICS 2011 (Associate chair), INTERACT 2011 (Associate chair); FMIS 2011, Interacción 2011, SEW-34, FM 2011, ICTAC 2011, SRDS 2011, SBRC-WTF 2011, SBRC-WoSiDA 2011, LADIS 2011, SAC-DADS 2011, DAIS 2011, MW4SOC 2011, IWCE 2011.

And in the following steering committees:

- Intl. Conf. on Distributed Applications and Interoperable Systems (DAIS)
- International Conference on Mathematics of Program Construction (MPC)
- International Symposium on Formal Aspects of Component Software (FACS)

6.3.6 Industry contract research (2000 ca.)

Confiabilidade na Segurança da Informação, PT Inovação, 2011-12

Bases de dados de armazenamento por tuplos, PT Inovação, 2011-12

Armazenamento de Dados Escalável em Cloud Computing, PT Inovação, 2010-11

Self-managing service platform, PT Inovação, 2009-2012

Evolutionary Verification, Validation and Certification (EVOLVE), QREN project co-promoted, 2008-2011

Consultancy for Multicert in the context of the Secure idenTity acrOss boRders linKed (STORK) project, 2008-11

Consultancy for Cachapuz in the context of the Global Weighing Solution QREN project, 2010-11

ETASP, Eurotux Application Server Platform, Eurotux, 2009-2012, QREN SI I&DT, consultancy

Consultancy for Grupo Editorial Vida Económica, in the context of QREN SI I&DT Núcleos.

6.3.7 Internationalization *(*2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

European projects:

- SMART - Secure Memories and Applications Related Technologies [ENIAC JU, 2010-13, ongoing]
- CumuloNimbo - A Highly Scalable Transactional Multi-Tier Platform as a Service [STREP FP7, 2010-2013, ongoing]

Other projects:

- PPAel - Peer-production Approaches to e-Learning [United Nations University, 2011-2013]

European Networks:

- European Network of Excellence in Cryptology II ICT-2007-216676 (associated membership)

International contracts:

- Verificação e Validação de Sistemas Software para Projetos Espaciais [consulting for Instituto de Aeronáutica e Espaço / AEB, 2011-2014, ongoing]

Working Group memberships:

- IFIP working group 2.7 / 13.4 on User Interface Engineering
- IFIP Working Group 2.1 on Algorithmic Languages and Calculi
- ACM SIGCHI EICS Community

Publications in cooperation:

- 3 journal papers and 13 other papers were published in 2011 in cooperation with authors from foreign institutions.

6.3.8 Other national publications (6000 ca.)

M. Coelho, D. da Cruz, P. R. Henriques, and J. S. Pinto. A visual inspector for Boogie programs. In L. Caires and R. Barbosa, editors, Proceedings of INForum'11, Simpósio de Informática (CoRTA track). Universidade de Coimbra, 2011.

J. Martins, J. M. Faria, and J. S. Pinto. An approach to model checking Ada programs. In L. Caires and R. Barbosa, editors, Proceedings of INForum'12; Simpósio de Informática (SETR track). Universidade de Coimbra, 2011.

P. Gomes, J. Pereira, and R. Oliveira. An object mapping for the cassandra distributed database. In INFORUM - Simpósio de Informática, 2011.

A. Pedro, M. J. Frade, A. P. Martins and S. M. de Sousa. Aprendizagem de processos semi-Markovianos generalizados: dos sistemas de eventos discretos estocásticos aos testes e à verificação. INForum 2011 (SOFT-PT track). Universidade de Coimbra, 2011.

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

Research projects funded by FCT:

- PBGT: Pattern Based GUI Testing, 2011-14
- APEX - Agile Prototyping for user, 2011-13
- Stratus: Uma abordagem em camadas para a gestão de dados em Cloud Computing, 2011-13
- ReD: Resilient database clusters, 2010-12
- CASTOR - Causality Tracking for Optimistic Replication in Dynamic Distributed, 2010-12
- CROSS - An Infrastructure for Certification and Re-engineering of Open Source Software, 2010-12
- FAVAS - A Formal Verification Platform for Real-time Systems, 2010-12
- Mondrian: Foundations for architectural design, 2010-12
- SSaaPP: SpreadSheets as a Programming Paradigm, 2010-12
- MATHIS - Reinvigorating Mathematics for the Information Society, 2009-12
- ProtUnf - Searching for high level rules in protein folding and unfolding: from amyloid diseases to protein structure prediction, 2008-11
- Pastramy: Persistent and highly available software transactional memory, 2008-11

6.1 Group Description – UGEI

Research Group Title	**UNIDADE DE GESTÃO E ENGENHARIA INDUSTRIAL**
Principal Investigator	Bernardo Sobrinho Simões de Almada Lobo
Research Area	Mechanical Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 82.160,00

European Commission: 82.444,10

QREN: 191.222,00

TOTAL: 355.826,10

6.2 Objectives & Achievements – UGEI

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. José António Sarsfield Cabral.

This Unit is an autonomous Associate Unit of INESC TEC.

OBJECTIVES

UGEI aims to produce problem driven knowledge focusing on three main fields: Service Engineering and Design, Decision Support and Intelligent Systems, and Performance Management and Business Intelligence. UGEI focuses on the areas where engineering, management and social sciences meet, at the cutting edge between theory and practice, around multidisciplinary projects mainly in Health, Retail, Mobility and Manufacturing.

Unit members are encouraged to carry out research projects based upon real-world problems. This application / problem solving attitude - which obviously encompasses the development of innovative theoretical work - is specially valued by the Unit, which has a strong and long lasting connection with both Portuguese and foreign organizations.

Moreover, it aims to establish direct links with renowned foreign research groups and to promote the dissemination of research in leading international journals and conferences.

The UGEI research objectives encompass the following dimensions:

Service Engineering and Design

a) Design Complex Service Systems with multiple stakeholders (e.g. Health)
b) Service Design for sustainability: developing new service design methods that explicitly incorporate sustainability concerns into the design of new services
c) Design for the Customer Experience: Designing services and products service systems for the customers experience, involving a human-centered design approach that feeds the design process with customer experience input.
d) Human-machine interaction: Understanding the influence of pervasive mobile devices, social networks and increasingly dynamic information and payment models on behavior of people; Proposing new frameworks, models and systems for improving quality of interaction and service, both in business and in social responsibility areas; Identifying medium and long term trends and needs for multidisciplinary research involving ICT.

Decision support and Intelligent Systems

a) Solution Approaches: Mathematical modeling and programming (combine new stronger models and valid inequalities based on the polyhedral structure of these problems to tighten linear relaxations and speed up the solution process); Robust and efficient optimization algorithms to produce resilient solutions, adaptable to frequent changes in the operating conditions;

Matheuristics: Exploiting mathematical programming techniques in (meta)heuristic frameworks; Simulation-based Optimization: integrating optimization techniques into simulation analysis

b) Intelligent Systems and Agent-Based Modeling and Simulation: Design and development of systems that integrate massive (often real time) data, optimization tools and visualization techniques to support decisions in tactical and operational levels.

c) Agent-Based Modeling and Simulation (ABMS)

ABMS approach to model business elements in supply chains. Developing each agent as an independent microscopic simulator, and Designing a framework to integrate independent agents. The framework provides network communication and language support for exchanging business messages using XML.

Performance Management and Business Intelligence

a) Performance assessments: Performance assessments exploring Data Envelopment Analysis, econometric and statistical techniques; Developing new efficiency and productivity measurement models, that can identify the drivers of good performance in companies; Enhancing Organizational Performance in different sectors (e.g. Health, Construction industry) and Promoting Robust benchmarking; Exploring new methodologies to assess and improve quality of life, livability and attractiveness of urban areas, as they are essential to the development of countries given their role in the attractiveness of human capital.

b) Data Mining, Data Analysis and Statiscal methods: Data Mining applied to companies management. In order to address the needs of business to extract knowledge from data that could be leveraged to increase revenues, new analytical techniques are required. The challenges placed by large data sets lead to a redefinition of the process of data analysis to find patterns and relationships between data elements in large and noisy data sets.

c) Demand Planning: Predicting the future as accurately as possible given all the information available: time series (exponential smoothing, Box-Jenkins) and explanatory models (neural networks).

6.2.2 Main Achievements (4000 ca)

In 2011, twelve papers related with the main research topics of UGEI have been published in international peer-review leading journals (10 of have ISI) and four ISI Proceedings. The number (twelve) of published proceedings of important international conferences is of worth note. Moreover, three special issues in international peer-review journals have been edited by members of UGEI, namely in the International Journal of Production Research, the Journal of Service Design and the Managing Service Quality Journal.

The members of UGEI Unit also contributed with two book chapters and three proceedings in national conferences.. They were invited to review over a dozen of papers in seven different top journals.

They were members of the scientific and programme committee of over 10 international conferences and members of the organizing committee of 1 international conferences.

Members of UGEI unit were enrolled in seven industry contract research projects. Throughout 2011, researchers of UGEI have also coordinated and participated in sixteen (16) research projects funded by QREN, FCT, ADI and European Commission.

The Unit established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the Research Lines report sections.

6.3 Productivity - UGEI

6.3.1 Publications in peer review Journals (6000 ca.)

Total number of publications: 12
List can be consulted in: http://profile.inescporto.pt

Almeder, C., Almada-Lobo, B. Synchronization of Scarce Resources for a Parallel Machine Lotsizing Problem, International Journal of Production Research, vol.49, nº24, pp.7315-7335, 2011

Amorim, P., Antunes, C., Almada-Lobo, B. Multi-Objective Lot-Sizing and Scheduling Dealing with Perishability Issues, Industrial & Engineering Chemistry Research, , vol.50, nº6, pp.3371-3381, 2011

Clark, A., Almada-Lobo, B., Almeder, C. Editorial on Lot Sizing and Scheduling: Industrial extensions and research opportunities, International Journal of Production Research, vol.49, nº9, pp.2457-2461, 2011

Fisk, R.P., Patrício, L. A brief history of SERVSIG, Managing Service Quality Journal, vol.21 nº 4, pp.328-330, 2011

Fisk, R.P., Patrício, L. Sixth SERVSIG international research conference 2010, Porto, Portugal - special issue Journal of Service Management, vol.22, nº 4, pp.440-442, 2011

Guimarães, L., Santos, R., Almada-Lobo, B. Scheduling wafer slicing by multi-wire saw manufacturing in photovoltaic industry: a case study, International Journal of Advanced Manufacturing Technology, vol.53, nº9, pp.1129-1139, 2011

James, R.J.W., Almada-Lobo, B.. Single and Parallel Machine Capacitated Lotsizing and Scheduling: New Iterative MIP-based Neighborhood Search Heuristics, Computers and Operations Research, vol.38, nº12, pp.1816-1825, 2011

Menezes, A., Clark, A., Almada-Lobo, B. Capacitated Lotsizing and Scheduling with Sequence-dependent, Period Overlapping and Non Triangular Setups, Journal of Scheduling, vol.14, nº2, pp.2457-2461, 2011

Morais, P., Camanho, A.S. Evaluation of performance of european cities with the aim to promote quality of life improvements, OMEGA, The International Journal of Management Science, vol.39, nº4, pp.398-409, 2011

Patrício, L., Fisk, R.P., Cunha, J.F., Constantine, L. Multilevel Service Design: From Customer Value Constellation to Service Experience Blueprinting, Journal of Service Research, vol.14, nº 2, pp.180-200, 2011

Patrício, L. and Fisk, R.P. Synthesizing Service Design and Service Science for Service Innovation, Touchpoint: The Journal of Service Design, vol. 3, nº2, pp. 14-16, 2011

Portela, M.C., Camanho, A.S., Borges, D. BESP - Benchmarking of Portuguese Secondary Schools, Benchmarking: An International Journal, vol.18, nº 2, pp.240-260, 2011

6.3.2 Other International publications (6000 ca.)

Total number of publications: 38

The complete list can be consulted in: http://profile.inescporto.pt

Due to the limited space made available in this form, only selected papers are listed.

Miguéis, V.L., Camanho, A.S., Cunha, J.F. Mining customer loyalty card programs: The improvement of service levels enabled by innovative segmentation and promotions designing Lecture Notes in Business Information Processing, vol. 82, pp.83-97, 2011

Gomes, C., Sperandio, F., Borges, J.L., Almada-Lobo,B., Brito, A.C. A Decision Support System for Surgery Theatre Scheduling Problems in ENTERprise Information Systems - Communications in Computer and Information Science vol. 221, Springer, pp.213-222, 2011

Mourinho, J., Dias, T.G., Cunha, J.F. Spider Maps for Location-Based Services Improvement in Lecture Notes in Business Information Processing, vol. 82, pp.16-29, 2011

Santos, M., Almada-Lobo, B., Massago, S. New Evolutionary Algorithm for Highly Capacitated Lotsizing and Scheduling in Metaheuristics: Intelligent Decision Making, Operations Research/Computer Science Interfaces Series, Vol. 50, pp.309-324, 2011

Nunes, A., Dias, T.G., Cunha, J.F., Pitt, J. Using social networks for exchanging valuable real time public transport information among travellers, in Proceedings of the IEEE 13th Conference on Commerce and Enterprise Computing (CEC) , pp.365-370, 2011

Mourinho, J., Dias, T.G., Cunha, J.F, GRASP algorithm for the Automated Generation of Spider Maps in MIC2011, pp.-, 2011

João Mourinho, Dias, T.G., Cunha, J.F, A Software Framework for the Automated Production of Schematic Maps in Proceedings of the CAiSE Forum 2011, pp.57-64, 2011

Teixeira, J., Patrício, L., Nunes, N.J., Nóbrega, L.: Customer Experience Modeling: Designing Interactions for Service Systems. in Proceedings of INTERACT 2011, 13th Conference on Human-Computer Interaction 2011: 136-143

Almada-Lobo, B., Borges, J.L., Brito, A.C., Stocco, M., Sperandio, F., Gomes, C. Simulating a Portuguese Hospital Master Surgery Schedule in Proceedings of the 1st International Conference on Serious Games and Applications for Health - SeGAH 2011, pp.1-4, 2011

Pedro Amorim, Carlos Henggeler Antunes, B. Almada-Lobo, A dual mutation operator to solve the multi-objective production planning of perishable goods, in Proceedings of IX Metaheuristics International Conference, pp.21-30, 2011

Pedro Amorim, Hans-Otto Günther, B. Almada-Lobo, Tackling Freshness in Supply Chain Planning of Perishable Products in Proceedings of VII ALIO/EURO Workshop on Applied Combinatorial Optimization, pp.184-187, 2011

Luis Guimarães, Diego Klabjan, B. Almada-Lobo, Capacitated lotsizing and scheduling: Tackling sequence dependent setupsusing column generation in Proceedings of the 2nd International Workshop on Lot Sizing IWLS'11 , pp.35-40, 2011

Luis Guimarães, Diego Klabjan, Bernardo Almada Lobo, Combining column generation and MIP-based heuristics to solve the capacitated lotsizing and scheduling problem in Proceedings of IX Metaheuristics International Conference, pp.591-593, 2011

Anderson Meneses, Pedro Amorim, B. Almada-Lobo, Christian Almeder, Integrating lot sizing and scheduling with the vehicle routing problem: A special look into perishable products in Proceedings of the 2nd International Workshop on Lot Sizing IWLS'11 , pp.55-58, 2011

Deisemara Ferreira, Alistair Clark, B. Almada-Lobo, Reinaldo Morabito, Comparação entre duas estratégias de eliminação de subtours para um modelo de dimensionamento e sequenciamento de lotes baseado no modelo ATSP in Proceedings of XLII SBPO - Simpósio Brasileiro de Pesquisa Operacional , pp.1-10, 2011

Florian Seeanner, B. Almada-Lobo, Herbert Meyr, Combining the principles of Variable Neighborhood Decomposition Search and Fix & Optimize heuristic to solve multi-level lot-sizing and scheduling problems in Proceedings of the 2nd International Workshop on Lot Sizing IWLS'11 , pp.61-65, 2011

6.3.3 Ph. D. thesis completed (3000 ca.)

Paulo Teixeira de Morais, Evaluation of Performance of European Cities With the Aim of Increasing Quality of Life, Industrial Engineering and Management Doctoral Program, Supervisors: Ana Camanho e José A. Cabral., 2011

Maria Gabriela Beirão dos Santos, Exploring Attitudes in Travel Behaviour, Industrial Engineering and Management Doctoral Program, Supervisors: José A. Cabral., 2011

Bruno de Athayde Prata, Uma Nova Abordagem para a Programação Integrada de Veículos e Tripulações, Industrial Engineering and Management Doctoral Program, Supervisors: T.G.Dias, J.P.Sousa., 2011

6.3.4 Patents/prototypes (2000 ca.)

(void)

6.3.5 Organization of Conferences (2000 ca.)

Program Committee of 9th workshop on intelligent techniques for web personalization & recommender systems (ITWP 11) Barcelona, 2011

Euro Working Group on DSS–Workshop. London, 2011.06

15º APDIO Congress, Coimbra, 2011.04

Associate-chair INTERACT 2011-13th Conference on Human-Computer Interaction, Lisbon, 2011.09

Steering Committee IWLS'11–International Workshop on lotsizing, Istanbul, Turkey, 2011.08

Chair, IEMS'11-2nd Symposium on Industrial Engineering and Management, Porto, 2011.01

Reviewer Computer Human Interaction CHI Conference 2011, Vancouver,Canada, 2011

Reviewer Services Marketing Track, European Marketing Academy Conference (EMAC), Ljubljana, 2011

Scientific Committee of

14th EWGT Conference "Transportation/Logistics". Poznan, Poland, 2011.09

13th IEEE Conference on Commerce and Enterprise Computing Luxembourg, 2011.09

TEAR 2011-6th Trends in Enterprise Architecture Research Workshop; in conjunction with the EDOC'2011, 15th International Enterprise Computing Conference, Helsinki, Finland, 2011.08

SoEA4EE'2011–3rd Workshop on Service Oriented Enterprise Architecture for Enterprise Engineering; in conjunction with the EDOC'2011, 15th International Enterprise Computing Conference, Helsinki, 2011.08

JISBD 2011, XVI Jornadas de Ingeniería del Software y Bases de Datos, A Coruña,Espanha, 2011.09

IESS1.1,2nd International Conference on Exploring Services Sciences, Genebra,Switzerland, 2011.02

ICSOB'2011,2nd International Conference on Software Business, Brussels, Belgium, 2011.06

ICSEM'11,2nd International Conference on Services in Emerging Markets, Mumbai, India, 2011.09

FSTI-2011, 1st First International Workshop on Frontiers in Service Transformations and Innovations, Tirana, Albania, 2011.09

CLEI 2011, "XXXVII Conferência Latino Americana de Informática", Quito,Ecuador, 2010.10

CIbSE'11, XIV Conferencia Iberoamericana en Software Engineering, Rio de Janeiro,Brasil, 2011.04

CAISE'11, 23rd Conference on Advanced Information Systems Engineering, London, 2011.06

6.3.6 Industry contract research (2000 ca.)

Analysis of Retail Store Atmospherics for Customers behaviour.

Funded by InovRetail (2011.03.01-2011.12.31); Areas of Science: Performance Management and Business Intelligence; Areas of Technology Transfer: Retail.

Replenishment Algorithms for Wholesale WIPRO RETAIL Framework

Funded by Wipro Retail (2010.05.01-2011.02.28); Area of Science: Decision Support and Intelligent Systems; Area of Technology Transfer: Retail.

Replenishment Algorithms for Wholesale WIPRO RETAIL Framework

Funded by Transdev and CaetanoBus (2007.01.09-2012.03.01); Area of Science: Service Engineering and Design; Area of Technology Transfer: Mobility and Manufacturing.

Designing the Mobile Service Experience

Funded by Cardmobili (2008.03.01-2012.03.01); Area of Science: Service Engineering and Design; Area of Technology Transfer: Mobility.

Towards the development of communities oriented to services

Funded by Sonae (2008.06.01-2012.12.01); Area of Science: Service Engineering and Design; Area of Technology Transfer: Retail.

Designing a sustainable Electronic Health Record: from Service Ecosystem to Information Architecture

Funded by Ministry of Health (2010.09.01-2013.09.01); Area of Science: Service Engineering and Design; Area of Technology Transfer: Health.

Segmented Promotion Monitorization System

Funded by Sonae MC (2010.05.04-2013.07.31); Area of Science: Performance Management and Business Intelligence; Area of Technology Transfer: Retail.

6.3.7 Internationalization *(*2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

8 papers (75% of the total) in international peer-review journals and 8 proceedings in international conferences (50% of the total) with authors from foreign institutions, namely: Imperial College London Northwestern University, Unversity of West of England, University of Vienna, University of São Paulo, Europa-Universität, Texas State University , University of Canterbury, Technical University of Berlin, Technical University of Darmstadt and Universidade Federal do Triângulo Mineiro.

Visiting Researchers at UGEI

Christian Almeder, Europa-Universität, Frankfurt (Oder), Germany, June 2011

Maristela Oliveira Santos, University of São Paulo, Institute of Mathematics and Computer Sciences, Brazil. January-February 2011

Sophie Parragh, Department of Business Administration, University of Vienna, Austria

January - June 2011.

Franklina Toledo, Institute of Mathematics and Computer Sciences, University of São Paulo, Brazil, February – July 2011

Alysson Costa, Institute of Mathematics and Computer Sciences, University of S~ao Paulo, Brazil, June – July 2011

6.3.8 Other national publications (6000 ca.)

Isabel Horta, A. S. Camanho, Jorge Moreira Da Costa, Assessment of performance and innovation of Portuguese construction companies in Livro de Actas do 15º Congresso da APDIO - IO2011, pp.115-127, 2011

Andreia Zanella, A. S. Camanho, Teresa Galvão Dias, Countries environmental performance assessment, in Livro de Actas do 15º Congresso da APDIO - IO2011, pp.37-51, 2011

C. B. Vaz, A. S. Camanho, Evolução do desempenho de lojas de retalho ao longo do tempo utilizando o índice de Malmquist in Livro de Actas do 15º Congresso da APDIO - IO2011, pp.65-77, 2011

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

(void)

6.1 Group Description – CISTER

Research Group Title	**CENTRO DE INVESTIGAÇÃO EM SISTEMAS CONFIÁVEIS E DE TEMPO REAL**
Principal Investigator	Eduardo Manuel de Médicis Tovar
Research Area	Electrical and Computer Engineering
Home Institution	INESC Porto

6.1.1 Funding

Fundação para a Ciência e a Tecnologia: 305.150,00

European Commission: 77.934,00

QREN: 0,00

TOTAL: 383.084,00

6.2 Objectives & Achievements – CISTER

6.2.1 Objectives (4000 ca.)

FOREWORD

The on-line form does not maintain fixed the Unit Coordinator names, allowing permanent updating with the effect of changing past reports. The Coordinator of this Unit during 2011 was Prof. Eduardo Tovar.

This Unit is an autonomous Associate Unit of INESC TEC.

OBJECTIVES

The CISTER Research Unit focuses its activity in the analysis, design and implementation of real-time and embedded computing systems (RTES). In RTES, correctness depends not only on the logical result of computation, but also on the time at which the results are produced. RTES is one of the ICT areas witnessing higher growth; over 98% of the current processors are embedded. RTES are everywhere, built into vehicles, roads, buildings, medical instruments, game consoles and mobile phones, usually interconnected in networks of many devices.

The strategy adopted by CISTER is the pursuit of excellence in research which is benchmarked against the best international groups in our research areas, in Europe (e.g. York, UK; SSSUP, IT; MdH and SICS, SE; TUW, AT; TUB, DE), U.S.A. (e.g. UNC-CH, UIUC, UVa, WUStL, CMU) and Asia (e.g. KAIST, KR).

There are five key strategic options that have been driving the research agenda of the Unit: (i) research focus; ii) sustained growing; (iii) selective publication efforts; (iv) selective and consistent participation in scientific service; (v) strong participation in international reputed academic/industrial research partnerships on both fundamental and applied research.

The continued focus and excellence of CISTER's research is supported through the Unit's definition of a few but strategic research areas: Wireless Sensor Networks (WSN); Cyber-Physical Systems (CPS); Multicore Systems (MCS); Adaptive Real-Time Systems (ARTS); Real-Time Software (RTS).

In WSNs, we will keep addressing strategic research topics such as Quality-of-Service (QoS) – timeliness/real-time, reliability, mobility and energy-efficiency, considering both standard COTS technology and cutting-edge new solutions. Some research will continue to be application-driven, such as for energy-efficiency in buildings.

In CPS, we will continue tackling challenges such as distributed programming paradigms and systems theory, holistically combining "physical concerns" (e.g. control systems, signal processing) and "computational concerns" (e.g. complexity, schedulability). Some research has been application-oriented e.g. smart skins for drag reduction in aircrafts and energy-efficiency of data centres via high resolution sensing/actuation.

The MCS area addresses new scheduling algorithms and proof techniques to enable design- and run-time timeliness guarantees, considering both identical and heterogeneous multiprocessor architectures, and considering an environment where exact information about service arrivals does not exist. The group is well-established and aims to continue its work, with an anticipated enlargement both in PhD members and PhD students.

ARTS addresses issues associated with systems requiring temporal isolation of components with different criticality, as well as systems being robust and reliable in the context of additional restrictions like available energy, changing environment or a dynamic set of services and their implementation in operating systems. We aim at an increased volume of journal publications and a small increase of the number of researchers.

RTS addresses the incorporation of advanced mechanisms (e.g. multicore programming, software transactional memory, real-time virtual machines, and component frameworks) in the software infrastructure (languages, operating systems, middleware) of RTES, enabling designers/programmers to manage increasing complexity and flexibility requirements.

6.2.2 Main Achievements (4000 ca)

CISTER has been consistently involved in the top scientific events and publications in its area of expertise, with a track record of 1500 citations for papers published in the last 6 years. Its senior researchers are recognized internationally and consistently participate as chairs and PC members in top conferences such as IEEE RTSS, IEEE RTAS, IEEE RTCSA, ECRTS, Ada-Europe, ACM/IEEE ICCPS and EWSN, as well as in the editorial board of the IEEE TII, Springer RTSJ, Elsevier JSA and the Ada User Journal.

In CPS area, we have advanced the state-of-the-art in scalable data aggregation/processing and macro programming. The SmartSkin project (led by CISTER + Embraer + Critical Materials) started, for reducing fuel consumption in aircrafts by reducing drag. In the SENODS project (led by CISTER + PT + CMU), for energy-optimized data centres, we successfully demonstrated some base functionalities at ISEP and PT data centres. A CPS researcher gave a talk at a school on ICT for future Energy Systems in Trento (IT).

The WSN area leads R&D in QoS, namely in within the leadership of the COTS4QoS cluster (CONET NoE). In 2011, we published seminal results on improving reliability in mobile WSN and on link quality estimation and interference modelling/generation and consolidated the design, implementation and deployment of large-scale and dense WSNs for monitoring a building at SANJOTEC high tech park, under the EMMON project.

The RTS area has continued the work on middleware for cooperative and autonomic embedded systems, tackling in particular support to code mobility, and analyzed the support for developing multicore applications, both at the language level, and at the operating system level (software transactional memory and parallel tasks. A joint activity was also realized with the CPS/ WSN areas in programmability of sensor networks.

ARTS has further developed work in the area of energy management – an efficient algorithm for slack management to enable the use of sleep states was developed. The management of preemptions and the associated cost in terms of loss of working set in the caches was investigated. Also, we continued the work on the contention on implicitly shared resources, in particularly interconnect busses and built a simulation framework for the wider real-time system community to test scheduling and resource management approaches.

During 2011, the MCS area had three main achievements: (i) an approach to achieve guaranteeable utilisation without inducing many preemptions [J1]; (ii) protocols for multi-mode systems deployed on multicores; and iii) scheduling a tasks set on a specific type of heterogeneous multiprocessor. The work on resource sharing on multi-core systems received the best student paper award at RTAS, one of the three flag ship events in the area.

Besides the other projects ongoing in 2011, we would like to highlight the start of the ENCOURAGE Artemis project on ICT support to energy-efficient buildings, lead by Intel Labs Europe (IE), and involving e.g. ENEL (IT), EnergiNord (DK), ISA (PT), U. Alborg (DK), UCD (IE) and Atos (ES).

In 2011, CISTER hosted several national and international events, reported in another section.

A Master Thesis supervised by CISTER received the prestigious EWSN/CONET 2011 MSc award (http://www.cooperating-objects.eu/events/ewsn-2011-awards/): Maissa Ben Jamaa, “An

Experimental Study for the Performance Evaluation and Optimization of Link Quality Estimators in Wireless Sensor Networks, MSc Thesis in Information Systems and New Technologies, University of Sfax, Tunisia, July 2010. This thesis was supervised by a CISTER researcher, in the scope of the RadiaLE framework (http://www.open-lqe.net), involving the REDCAD Research Unit (Sfax, Tunisia), the CISTER Research Unit (Porto, Portugal) and the University of Santa Catarina (Florianopolis, Brazil). RadiaLE is an open source benchmarking toolset for link quality estimation in wireless sensor networks, whose experimental test-bed was set up in CISTER-ISEP.

CISTER established large cooperation with other Units through projects and proposal submission as well as participation in other cross-Unit activities. This is reported in the RL report sections.

6.3 Productivity - CISTER

6.3.1 Publications in peer review Journals (6000 ca.)

Bletsas, K., Andersson, B., "Preemption-light multiprocessor scheduling of sporadic tasks with high utilisation bound", Real-Time Systems Journal (Springer), Volume 47, Number 4, January 2011, pp. 319-355.

Andersson, B., Pereira, N., Tovar, E., Gomes, R., "Using a Prioritized Medium Access Control Protocol for Incrementally Obtaining an Interpolation of Sensor Readings", M. Conti et al. (eds.), “Solutions on Embedded Systems”, Lecture Notes in Electrical Engineering (LNEE), February, 2011, pp. 17-31.

Baccour, N., Koubaa, A., Jamâa, M., Rosário, D., Youssef, H., Alves, M., Becker, L., "RadiaLE: a Framework for Designing and Assessing Link Quality Estimators in Wireless Sensor Networks", Ad Hoc Networks Journal (Elsevier), Volume 9, Issue 7, September 2011, pp. 1165–1185.

PAPERS IN REVIEWS/LETTERS

Raravi, G., Andersson, B., Bletsas, K., "Provably good task assignment on heterogeneous multiprocessor platforms for a restricted case but with a stronger adversary", ACM SIGBED Review - Work-in-Progress (WiP) Session of the 23rd Euromicro Conference on Real-Time Systems (ECRTS 2011), Volume 8 Issue 3, September 2011 , ACM New York, NY, USA, pp. 19-22.

Noda, C., Prabh, S., Alves, M., Boano, C., Voigt, T., "Quantifying the Channel Quality for Interference-Aware Wireless Sensor Networks", ACM SIGBED Review - Special Issue on the 10th International Workshop on Real-time Networks (RTN 2011), Volume 8, Issue 4, December 2011, ACM New York, NY, USA, pp. 43-48.

Ferreira, L., Nogueira, L., "On the Use of Code Mobility Mechanisms in Real-Time Systems", ACM SIGBED Review - Special Issue on the 10th International Workshop on Real-time Networks (RTN 2011), Volume 8, Issue 4, December 2011, ACM New York, NY, USA, pp. 16-21.

IMPACT OF MAIN PUBLICATIONS (number of citations and citations/year 2006-2010)

The CISTER team has consistently published in the flagship scientific events and journals in the area over the years, producing high-impact scientific publications. We provide some relevant figures next, based on the Harzing’s Publish or Perish tool (which in turn uses Google Scholar).

In the period 2006-2010 (5 years), CISTER had:

- 41 papers with over 3 citations/year, of which
- 26 papers with over 5 citations/year, of which
- 13 papers with over 10 citations/year

and, for papers published in the same period (2006-2010):

- 17 papers with over 40 citations, of which

- 8 papers with over 70 citations.

Only these 41 papers (with > 3 citations/year) alone sum up a total of 1680 citations. This is even more relevant considering the number of CISTER integrated PhD members accounted for FCT in 2011 – 12.

6.3.2 Other International publications (6000 ca.)

Total number of publications: 34.

The complete list can be consulted in: http://profile.inescporto.pt

Tennina, S., Gomes, R., Alves, M., Ciriello, V., Carrozza, G., "The Dark Side Of DEMMON: What Is Behind The Scene In Engineering Large-Scale Wireless Sensor Networks", 14th ACM MSWiM 2011.

Tennina, S., Bouroche, M., Braga, P., Gomes, R., Alves, M., Mirza, F., Ciriello, V., Carrozza, G., Oliveira, P., Cahill, V., "EMMON: A WSN System Architecture for Large Scale and Dense Real-Time Embedded Monitoring", 9th IEEE/IFIP EUC 2011.

Tennina, S., Valletta, M., Santucci, F., Renzo, M., Graziosi, F., Minutolo, R., "Entity Localization and Tracking: A Sensor Fusion-based Mechanism in WSNs", 4th MELT 2011.

Prabh, S., Hauer, J., "Opportunistic Packet Scheduling in Body Area Networks", 8th EWSN 2011.

Prabh, S., "Bandwidth Allocation in Hexagonal Wireless Sensor Networks for Real-Time Communications", IEEE ICNSC 2011.

Noda, C., Prabh, S., Alves, M., Voigt, T., Boano, C., "Quantifying the Channel Quality for Interference-Aware Wireless Sensor Networks", 10th RTN 2011.

Boano, C.A.; Voigt, T.; Noda, C.; Romer, K.; Zuniga, M., “JamLab: Augmenting sensornet testbeds with realistic and controlled interference generation”, 10th ACM IPSN 2011. * Best Paper Nominee *

Ehyaei, A., Tovar, E., Pereira, N., Andersson, B., "Scalable Data Acquisition for Densely Instrumented Cyber-Physical Systems", 2nd ACM/IEEE ICCPS 2011.

Gupta, V., Kim, J., Pandya, A., Lakshmanan, K., Rajkumar, R., Tovar, E., "Nano-CF: A Coordination Framework for Macro-programming in Wireless Sensor Networks", 8th IEEE SECON 2011.

Gupta, V., Tovar, E., Pinho, L., Kim, J., Lakshmanan, K., Rajkumar, R., "sMapReduce: A Programming Pattern for Wireless Sensor Networks", 2nd SESENA 2011.

Gupta, V., Tovar, E., Lakshmanan, K., Rajkumar, R., "A Framework for Programming Sensor Networks with Scheduling and Resource-Sharing Optimizations", Invited paper 1st CPSNA 2011.

Tennina, S., Gomes, R., Alves, M., Bouroche, M., Mirza, F., Carrozza, G., Santos, M., Ciriello, V., Braga, P., Oliveira, P., Cahill, V., "Poster: EMMON - A WSN System Architecture and Toolset for Large-Scale and Dense Real-Time Embedded Monitoring", 9th ACM SenSys 2011.

Tennina, S., Bouroche, M., Braga, P., Gomes, R., Alves, M., Mirza, F., Ciriello, V., Carrozza, G., Santos, M., Garg, A., Cahill, V., "Poster: EMMON: A System Architecture for Large-Scale, Dense and Real-Time WSNs", 8th EWSN 2011.

Tennina, S., Renzo, M., Pomante, L., Alesii, R., Santucci, F., Graziosi, F., "Demo: Automatic Personal Identification System for Security in Critical Services - A Case Study", 9th ACM SenSys 2011.

Fotouhi, H., Alves, M., Koubaa, A., Zuniga, M., "Poster: Smart-HOP: A Reliable Handoff Procedure for Supporting Mobility in Wireless Sensor Networks", 8th EWSN 2011.

Raravi, G., Andersson, B., Bletsas, K., "A conjecture about provably good task assignment on heterogeneous multiprocessor platforms but with a stronger adversary", WiP 23rd ECRTS 2011.

Raravi, G., Andersson, B., Bletsas, K., "Two-type Heterogeneous Multiprocessor Scheduling: Is there a Phase Transition?" 2nd RTSOPS 2011.

Marinho, J., Raravi, G., Nelis, V., Petters, S., "Partitioned Scheduling of Multimode Systems on Multiprocessor Platforms: when to do the Mode Transition?", 2nd RTSOPS 2011.

Awan, M., Nikolic, B., Petters, S., "Comparing the Schedulers and Power Saving Strategies with SPARTS", RTSS@Work, Demo at 32nd IEEE RTSS 2011.

Nelis, V., Dasari, D., Nikolic, B., Petters, S., "A Tighter Analysis of the Worst-Case End-to-End Communication Delay in Massive Multicores", WiP 32nd IEEE RTSS 2011.

Awan, M., Petters, S., "The Roman Conquered by Delay: Reducing the Number of Preemptions using Sleep States", WiP 17th IEEE RTAS 2011.

Maia, C., Silva, G., Ferreira, L., Pinho, L., Nogueira, L., Gonçalves, J., "A Framework for Offloading Real-Time Applications in a Distributed Environment", Demo at 32nd IEEE RTSS 2011.

Dasari, D., Nelis, V., Andersson, B., "WCET Analysis Considering Contention on Memory Bus in COTS-Based Multicores", WiP 6th IEEE ETFA 2011.

11 more unreported for lack of space.

TRACK RECORD OF PUBLICATIONS IN THE MAIN CONFERENCES IN CISTER AREAS

We also analyzed the amount of CISTER publications in the main conferences in CISTER areas, from 2006-2010 and in 2011, together with their acceptance ratio (for regular papers) in 2011, as presented next (alphabetical order):

CONFERENCE | WWW | TOPIC | # papers 2006-2010 | # papers 2011 | acceptance ratio 2011

Euromicro ECRTS | http://www.ecrts.org | Real-Time & Embedded systems | 4 | 2 | 21,0%

IEEE EUC | http://anss.org.au/euc2011 | Embedded and Ubiquitous computing | 2 | 2 | 23,0%

EWSN | http://www.ewsn.org | Sensor networks | 1 | 1 | 16,1%

ACM/IEEE ICCPS | http://www.iccps.org | Cyber-Physical Systems | 1 | 26,9%

IPDPS | http://www.ipdps.org | Distributed Systems | 5 | 0 | 19,6%

ACM IPSN | http://ipsn.acm.org | Sensor networks | 0 | 1 | 22%

ACM/IEEE MASCOTS | http://www.mascots-conference.org | Model. & Simulation |2 | 0 | n/a

IEEE MASS | http://mass2011.upv.es/ | Sensor Networks | 1 | 0 | n/a

ACM MSWiM | http://mswimconf.com/2011/ | Modeling & Simulation | 0 | 1 | 23,7%

OPODIS | http://www.opodis.net | Distributed Systems | 2 | 1 | n/a

IEEE RTAS | http://www.rtas.org | Real-Time & Embedded systems | 2 | 1 | 20,9%

IEEE RTCSA | http://www.rtcsa.org | Real-Time & Embedded systems | 8 | 0 | n/a

IEEE RTSS | http://www.rtss.org | Real-Time & Embedded systems | 8 | 0 |

IEEE SECON | http://www.ieee-secon.org | Sensor Networks | 0 | 1 | 27,4%

This totals 46 papers in top conferences, in the period 2005-2011.

6.3.3 Ph. D. thesis completed *(3000 ca.)*

(void)

6.3.4 Patents/prototypes (2000 ca.)

The patent “Using a Prioritized Medium Access Control for Incrementally Obtaining an Interpolation of Sensor Readings”. was submitted to the US patent office in May 6, 2010. The inventors where CISTER researchers Björn Andersson, Nuno Pereira, Eduardo Tovar and Ricardo Gomes. The invention was related to communication and processing techniques for efficient data processing in wireless sensor networks.

CISTER is on the forefront of worldwide research on IEEE 802.15.4 and ZigBee technologies, the most widespread technologies for Wireless Sensor Networks (WSNs). Within this line, CISTER has been developing tools that have been widely used by the international community (http://www.open-zb.net) and have been involved in the TinyOS 15.4 and ZigBee Working Groups (http://www.tinyos.net) since their foundation (early 2009). In 2011, "official" implementations of the standard 15.4 and ZigBee cluster-tree protocols have been made available in the TinyOS repository. This work has been mainly performed within the COTS4QoS research cluster (http://www.cooperating-objects.eu/research-clusters/cots4qos/), under the CONET NoE.

In 2011, CISTER continued its collaboration within the RadiaLE framework – a benchmarking toolset for the performance evaluation and design of radio link quality estimators [J3, T1], available as an open-source (http://www.open-LQE.net), as well as within the Z-Monitor framework – monitoring and analysis tool for IEEE 802.15.4-based Wireless Sensor Networks, available at http://www.z-monitor.org.

During 2011, a project consortium including CISTER has been developing DEMMON2 (the second EMMON demonstrator, after DEMMON1 in 2010, a monitoring application encompassing all system components, ranging from hardware, communication architecture, middleware and command and control GUI), to validate EMMON WSN technologies in a real-world environment (http://www.sanjotec.com/), allowing a fine-grained real-time monitoring of a building with over 400 wireless sensor nodes. More info at http://www.artemis-emmon.eu.

6.3.5 Organization of Conferences (2000 ca.)

CISTER organized the 23rd Euromicro Conference on Real-Time Systems (ECRTS'11) and its satellite workshops in Porto. ECRTS is one of the three flagship events in real-time embedded systems research. We had five satellite workshops that ran in parallel in the day before the main conference. This adds to a Work in Progress (WiP) session. The excellent technical program, with a total of 25 presentations (out of 119 high quality submissions), was complemented by a substantial social program covering many touristic aspects of the city and has drawn a new record for ECRTS of over 170 participants to the conference and its associated workshops. More info at http://www.cister.isep.ipp.pt/ecrts11/.

CISTER hosted the Artemis RECOMP project meeting week in ISEP, 29/AUG-2/SEP. RECOMP aims to reduce the certification cost of the deployment of multicore systems in safety critical settings. The week saw the participation of 67 researchers from top European universities (e.g. Danish Technical University in Kopenhagen, TU Braunschweig), SMEs (e.g. Symtavision GmBH, Saferiver) and larger corporations (e.g. Thales, EADS, Infineon, Honeywell, Danfoss, Kone, TÜV Süd). More info at http://www.recomp-project.eu/.

CISTER hosted the WP4 (research clusters) meetings of the FP7 European NoE in Cooperating Objects (CONET), 15-16/DEC/2011. The overall objective of this meeting was to make a status update on the research clusters activities and intra/inter-cluster collaborations, fostering technical discussions and leveraging future work within and between the 6 research clusters. CONET includes 16 core members, 11 from academia (e.g. TU Delft, TU Berlin, ETHZ, UCL, SICS and U. Pisa) and 5 from industry (SAP, Schneider, SELEX, Boeing R&T Europe and Telecom Italia. More info at http://www.cooperating-objects.eu.

6.3.6 Industry contract research (2000 ca.)

The unit has a track record of consistent participation in international industry-driven R&D projects, of which we outline the ones ongoing/started in 2011: EMMON, SENODS, RECOMP and ENCOURAGE.

EMMON (Embedded Monitoring), funded by FP7/ARTEMIS, aims at large-scale and dense embedded monitoring using wireless sensor networks. The EMMON architecture will enable to monitor different physical properties (e.g. temperature, humidity, pressure) of specific geographical areas at unprecedented scale and density, through the use of tiny low-cost low-power sensor nodes. CISTER leads WP4 on Protocols & Communication Systems.

The SENODs (Sustainable ENergy-Optimized Datacenters) project, funded by the Portugal-CMU Program, is lead by CISTER and involves Portugal Telecom as main industry driver. CISTER is using know-how and technologies developed in the Unit that offer integrated solutions to address both the cyber and physical challenges posed by the large-scale energy consumption, cooling, and operational needs of data centres.

RECOMP (Reduced Certification Costs for Trusted Multi-core Platforms) is a FP7/ARTEMIS Embedded Computing Systems Initiative, that will establish methods, tools and platforms for enabling cost-efficient certification and re-certification of safety-critical as well as mixed-criticality software systems such as those present in automobiles and aircrafts. CISTER is focusing on aspects related to the certification and re-certification of timing guarantees in the system.

The ENCOURAGE (Embedded iNtelligent COntrols for bUildings with Renewable generAtion and storaGE) project, funded by FP7/ARTEMIS, aims at developing embedded intelligence and integration technologies for optimizing energy use in buildings with renewable energy and enabling active participation in the future smart grid environment. CISTER essentially addresses sensing technologies and the event-based middleware.

6.3.7 Internationalization *(*2000 ca.)

(Collaborative publication, Research, Graduate Training Networks or other forms of participation of the Research Group at the International level)

CISTER has been actively involved in international networks of excellence and R&D projects which naturally foster further collaborations, e.g., preparing projects, visiting scholars, joint papers, organization of joint events. CISTER is member of the FP7/ARTEMIS JTI Artemisia Association, the European Networks of Excellence on Embedded Systems Design (ArtistDesign) and Cooperating Objects (CONET), the IEEE Technical Committee on Real-Time Systems, the Euromicro Technical Committee on Real-Time Systems, the IFIP Working Group 10.2 on Embedded Systems, the Ada-Europe Board and the TinyOS 15.4 and Zigbee working groups.

During 2011 CISTER continued its participation in several international projects, namely EMMON (Artemis), RECOMP (Artemis) and SENODS (PT-CMU), and started yet another one - ENCOURAGE (Artemis), dealing with ICT support to energy-efficient buildings.

PhD studies with CISTER are made within a specialized stream in Embedded and Real-Time Systems in Doctoral Programs of the Faculty of Engineering of the University of Porto (where most of the students are foreigners) or within the Dual-degree Ph.D. Programs of the Portugal-CMU initiative, where CISTER is involved from the beginning.

CISTER has also been collaborating with other international institutions for interchanging (hosting theirs and sending ours) students at both undergraduate and graduate levels, such as with SICS (Sweden), UDE (Germany), UFSC (Brazil), SupCom (Tunisia), UCLM (Spain), CTU (Czech Republic), IITs (India), KAIST (South Korea).

CISTER has been consistently publishing papers in co-authorship with other international groups. In 2011, we published around 10 full papers and 4 short papers and developed code, prototypes and toolsets with other foreign groups.

6.3.8 Other national publications (6000 ca.)

(void)

6.3.9 Government/Organization contract research *(2000 ca.)*

(Include here work carried out by the group that resulted in a publication or report. Of particular importance are those involved in public policy advice)

The following projects were funded by FCT:

PT-CMU - CMU Portugal Program , FCT Funded, 01/2007 to 12/2011.

REHEAT - Real-time scheduling on heterogeneous multicore architectures, ref. PTDC/EIA-CCO/105716/2008, 2/2010 to 1/2012.

REWIN - Real-Time Guarantees in Wireless Sensor Networks, ref. PTDC/EIA-CCO/109027/2008, 2/2010 to 1/2012.

REJOIN - REal-time scheduling on multicore processors: addressing two open problems JOINtly, Proj. FLAD / NSF 91-02/10, FLAD and NSF Funded, 6/2010 – 5/2011.

SENODS - Sustainable ENergy-Optimized Datacenters, ref. CMU-PT/SIA/0045/2009, 10/2010 to 9/2013.

MASQOTS - Mobility mAnagement in wireless Sensor networks under Quality-of-service constraints using standard and Off-The-Shelf Technologies, ref. PTDC/EEA-TEL/112220/2009, 2/2011 to 1/2014.

VIPCORE - Virtual Processor-based Multicore Scheduling, ref. PTDC/EIA-CCO/111799/2009, 2/2011 to 1/2014.

REPOMUC - Real-Time Power Management on Partitioned Multicores, ref. PTDC/EIA-EIA/112599/2009, 2/2011 to 1/2014.

EMMON - EMbedded MONitoring, Proj. FP7 ARTEMIS-JU 100036, EU and FCT Funded, 3/2009 – 2/2012.

RECOMP - Reduced Certification Costs for Trusted Multi-core Platforms, Proj. FP7 ARTEMIS-JU 100202, EU and FCT Funded, 4/2010 – 3/2013.

ENCOURAGE - Embedded iNtelligent COntrols for bUildings with Renewable generAtion and storaGE, Proj. FP7 ARTEMIS/0002/2010, EU and FCT Funded, 5/2011 – 4/2014.

7 Research Lines

In this section you can see the individual Research Lines reported in the last form as well as the Research Groups involved in each RL. They can be accessed by clicking the Research line's name or its unique identifier.

Reference	Research Line Title
RL-FIS-LA14-182	Networked Multimedia Systems and Services in Scenarios of Convergence
RL-EEI-LA14-183	Photonics for Life Sciences: Optical Biochemical Sensing and Imaging
RL-EEI-LA14-184	Sustainable Energy Systems and the Smart Grid
RL-EEI-LA14-185	Enterprise Collaborative Networks, Operations Management and Decision Support Systems
RL-EEI-LA14-186	Digital Society – Software, Information and Interaction Technology, Services and Policies
RL-FIS-LA14-187	Robotics, Intelligent and Autonomous Systems for Complex Environments
RL-EEI-LA14-188	Intelligent and Adaptive Systems and Mathematical Modeling in Decision Support
RL-EEI-LA14-189	Architectures, Languages and Systems for Advanced Computing
RL-EEI-LA14-190	Real-Time Embedded Systems for Smart Environments
RL-EEI-LA14-191	Critical Information Systems – Dependable Software, Development Methods and Tools
RL-EGE-LA14-192	Technology and Innovation Management
RL-EME-LA14-193	Industrial Engineering and Service Management

7.1 General Description (RL-FIS-LA14-182)

Research Line Title	**NETWORKED MULTIMEDIA SYSTEMS AND SERVICES IN SCENARIOS OF CONVERGENCE**
Principal Investigator	Manuel Alberto Pereira Ricardo
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-FIS-LA14-182)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. José Ruela.
This RL addresses scientific and technical challenges in emerging scenarios fostered by the ubiquity of the Internet and the Web and characterised by the convergence of traditional telecom and broadcast services and new interactive multimedia services.
The research plan is organised along three complementary axels:

- development of intelligent automatic or semi-automatic audio-visual applications that can enhance people's lives across different dimensions;
- development of systems that facilitate access to distributed multimedia resources in heterogeneous environments for any user in a seamless, adaptable and personalised way;
- design and evaluation of new architectural solutions suitable for next generation networks, focused on wireless networks and mobile communications.

An objective of the RL is to achieve a high degree of multidisciplinary and RG interaction and includes organising demonstrations and trials, technology transfer, strategic consulting and advanced training.

7.2.2 Main Achievements (2000 ca.)

RESEARCH GROUP INTERACTION AND CROSS-RG COOPERATION

This RL is tied to the research activities carried out by the Telecommunications and Multimedia Unit (UTM). Large interaction with other Units was achieved in the following projects that required cooperation among several RG:

Pro Limb – Electronic sensing for the prophylaxis of lower limb pathologies, with UOSE

REIVE – Smart Vehicle to Grid, with USE

PALCO 3.0 – Intelligent Web system for management of music social networks, with USIG, CRACS, LIAAD

MOBILES – Sustainable electric mobility, with USIG

RobVigil – Surveillance Robot, with USIG and ROBIS

CNG – Content for Next Generation Networks, with USIG

Escolinhas Criativas – Creative Spaces for Creative Kids, with USIG

MAIN RESULTS – a few examples, selected from projects mentioned above:

PALCO 3.0 – fine-tuning models of music similarity based on integration of music audio content, textual content, and usage content, improvements in musical rhythm description models, and integration and deployment of software modules in the project's commercial partner web platform.

REIVE – specification of REIVE communications architecture and functional model based on information flows for metering, monitoring and control applications in smart grids (with plug-in electric vehicles) and design and evaluation of a wireless mesh network solution for last mile communications.

MOBILES – development of Android application for transparent support of multi-technology communications between the vehicle CAN system, the NDRIVE navigation system, a remote server and the charging stations access points.

RobVigil – communications module with real-time management of multiple technologies, people detection and tracking with thermal cameras, auto-location system, management and remote control platform based on serious games interfaces and identification of vehicle registration plates.

7.3 Research Line Output (RL-FIS-LA14-182)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

Include only if more than one Research Groups of the LA is involved. Give title and full citation in original language

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

ABRANTES, F., ARAÚJO, J., RICARDO, M., "Explicit Congestion Control Algorithms for Time Varying Capacity Media", IEEE Transactions on Mobile Computing, Jan. 2011, vol.10, no.1, p.81-93.

ANDRADE, M.T., DOGAN, S., CARRERAS, A., BARBOSA, V., et al., "Advanced delivery of sensitive multimedia content for better serving user expectations in Virtual Collaboration applications", Multimedia Tools and Applications, Feb. 2011.

CAMPOS, R., DUARTE, R., SOUSA, F., RICARDO, M., RUELA, J., "Network infrastructure extension using 802.1D-based wireless mesh networks", Wireless Communications and Mobile Computing, Jan. 2011, vol.11, no.1, p.67-89.

CARDOSO, J., SOUSA, R.J., "Measuring the performance of ordinal classification", International Journal of Pattern Recognition and Artificial Intelligence, Dec. 2011, vol.25, no.8, p.1173-1195.

CARNEIRO, G.J., FONTES, H.M., RICARDO, M., "Fast prototyping of network protocols through ns-3 simulation model reuse", Simulation Modelling Practice and Theory, Oct. 2011, vol.19, p.2063-2075.

CIOBANU, L., CORTE REAL, L., "Iterative filtering of SIFT keypoint matches for multi-view registration in Distributed Video Coding", Multimedia Tools and Applications, Dec. 2011, vol.55, no.3, p.557-578.

GONÇALVES, H., GONÇALVES, J.A., CORTE REAL, L., "HAIRIS: A method for automatic image registration through histogram-based image segmentation", IEEE Transactions on Image Processing, March 2011, vol.20, no.3, p.776-789.

LOPES, C.T., RIBEIRO, C., "Comparative evaluation of web search engines in health information retrieval", Online Information Review, 2011, vol.35, no.6, p.869-892.

MARQUES, G., LANGLOIS, T., GOUYON, F., LOPES, M., DOMINGUES, M.A., "Short-term feature space and Music Genre Classification", Journal of New Music Research, June 2011, vol.40, no.2, p.127-137.

7.3.2 Collaborative Other Publications (2000 ca.)

Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

CAMPOS, R.L., OLIVEIRA, C., RUELA, J., "WiFIX+: A Multicast Solution for 802.11-based Wireless Mesh Networks", WONS 2011 - 8th Int. Conf. on Wireless On-demand Network Systems and Services, Jan. 2011, Bardonecchia, Italy.

CARDOSO, J., DOMINGUES, I.C., "Max-Coupled Learning: Application To Breast Cancer", ICMLA2011 - Tenth Int. Conf. on Machine Learning and Applications, Dec. 2011, Honolulu, USA.

CARDOSO, T., NEVES, P., RICARDO, M., SARGENTO, S., "Media Independent Handover Management in Heterogeneous Access Networks - An Empirical Evaluation", VTC2011-Spring - 2011 IEEE 73rd Vehicular Technology Conference, May 2011, Budapest, Hungary.

COELHO, F.E., RIBEIRO, C., "Automatic Illustration with Cross-media Retrieval in Large-scale Collections ", CBMI 2011 - 9th Int. Workshop on Content-Based Multimedia Indexing, June 2011, Madrid, Spain.

MARQUES, G., DOMINGUES, M.A., LANGLOIS, T., GOUYON, F., "Three current issues in music autotagging", ISMIR2011 - 12th International Society for Music Information Retrieval Conference, Oct. 2011, Miami, USA.

OTEBOLAKU, A., ANDRADE, M.T., "Context Representation for Context-Aware Mobile Multimedia Content Recommendation", IMSA 2011 - 15th IASTED Int. Conf. on Internet and Multimedia Systems and Applications, May 2011, Washington, USA.

REBELO, A.M., TKACZUK, J., SOUSA, R.J., CARDOSO, J., "Metric Learning for Music Symbol Recognition", ICMLA2011 - Tenth Int. Conf. on Machine Learning and Applications, Dec. 2011, Honolulu, USA.

TEIXEIRA, F.B., CALÇADA, T., RICARDO, M., "Protocol for Centralized Channel Assignment in WiFIX Single-radio Mesh Networks", MONAMI 2011 - 3rd International ICST Conference on Mobile Networks & Management, Sept. 2011, Aveiro, Portugal.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative theses within the framework of the RL.

CAMPOS, R.L., "Joint Path and Address Auto-configuration: an Approach to Multi-technology Personal Area Networks and 802.11-based Stub Wireless Mesh Networks", July 2011.

CIOBANU, L., "Video coding with low encoder complexity for systems with multiple cameras", July 2011.

MONEGO, H.D., "Radio Resource Management in 4G Networks: A Strategy Based on Mobility Tendency and Packet Length Sensibility", July 2011.

MOTA, P., “In-Circuit Test and Linearisation of RF Power Amplifiers”, December 2011.

PESSOA, L.M., "Compensation of Fibre Impairments in Coherent Optical Systems", July 2011.

SOUSA, R.J., “Methodologies for perceptual and acoustic evaluation of the voice signal in singing lessons and speech diagnosis and rehabilitation” (in Portuguese), October 2011.

7.1 General Description (RL-EEI-LA14-183)

Research Line Title	**PHOTONICS FOR LIFE SCIENCES: OPTICAL BIOCHEMICAL SENSING AND IMAGING**
Principal Investigator	Paulo Vicente Silva Maqrues
Research Area	Physics

7.2 Objectives and Achievements (RL-EEI-LA14-183)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 Objectives (1000 ca.)

Coordinator in 2011: Prof. Paulo Marques.

Optical sensing and imaging technologies have been the main activity of UOSE throughout the last decade resulting in the creation of an advanced dedicated infrastructure and trained human resources with great expertise in material science, optical fibre, integrated optics technology and imaging systems. The strategic goal of this RL is to optimise these multidisciplinary assets, directing them towards research and technology valorisation, in the following areas.

SENSORS DEVELOPMENT

- Novel sensing mechanisms
- Extreme environments applications
- Biochemical sensing

OPTICAL IMAGING

- Development of Differential Optical Coherence Tomography
- Compressive imaging and Hyper-spectral analysis

MICROFABRICATION & INTEGRATED OPTICS

- Direct writing with femtosecond laser pulses.

TECHNOLOGY TRANSFER

While the main focus of the activity of the RL is upstream in the knowledge production chain, nevertheless strategic partnerships with national and international companies will be pursued.

7.2.2 Main Achievements (2000 ca.)

2011 was essentially a year where consolidation of previously started areas of research was achieved and that resulted in the highest publication level ever. Improvements, as well as novel configurations were obtained in the following areas:

- Demonstration of utility of suspended core fibers in the implementation of high sensitivity optical sensors

- Ultralong (world record breaking) Raman laser
- Temperature independent sensor based on non-linear effects
- Sensors based on plasmonic resonances
- Fabrication of polymeric structures on the tip of optical fibers through self-polymerization
- Sensors based on hyperspectral processing
- Broadband optical sources for optical coherence tomography
- optical fibre based dosimeter for in-vivo real-time dosimetry in Radiotherapy applications
- Laser direct writing of integrated polarizers with femtosecond pulses
- Cyanobacteria detection in water for consumption
- Fibre Bragg Gratings as Interrogation Elements for Surface Plasmon Resonance Sensors
- Novel optical fiber geometry designs for sensing purposes (H-shaped, suspended twin core fiber, as examples)
- Development of quantum dot based analytical imaging techniques
- Optical fiber sensor for hydrogen and metals
- Development of glasses for biomedical applications (prosthesis)

7.3 Research Line Output (RL-EEI-LA14-183)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Erdmanis, M., Viegas, D., Hautakorpi, M., Novotny, S., Santos, J.L., Ludvigsen, H., "Comprehensive numerical analysis of a surface-plasmon-resonance sensor based on an H-shaped optical fiber", OPTICS LETTERS, July 2011, vol.19, no.15, p.13980-13988.

Statkiewicz-Barabach, G., Carvalho, J.P., Frazão, O., Olszewski, J., Mergo, P., Santos, J.L., Urbanczyk, W., "Intermodal interferometer for sensing applications fabricated in birefringent boron doped microstructured fiber", APPLIED OPTICS , July 2011, vol.50, no.21, p.3742-3749.

Fernandes, L.A., R. Grenier, J., R. Herman, P., S. Aitchison, J., Marques, P.V., "Femtosecond laser fabrication of birefringent directional couplers as polarization beam splitters in fused silica", Optics Express - The International Electronic Journal of Optics, June 2011, vol.19, no.13, p.11992-11999.

Queirós, R.B., Oliveira Silva, S., P. Noronha, J., Frazão, O., Ribeiro, P., Aguilar, G., Marques, P.V., G. F. Sales, M., "Microcystin-LR detection in water by the Fabry-Perot interferometer using an optical fibre coated with a sol-gel imprinted sensing membrane", Biosensors and Bioelectronics, May 2011, vol.26, no.9, p.3932-3937.

Abe, I., Oliveira, J., Simões, E., Frazão, O. et al., "Characterization of Optical Fiber Long Period Grating Refractometer coated with a Nanolayer", SENSORS AND ACTUATORS B-CHEMICAL, April 2011, vol.153, no.2, p.335-339.

Jorge, P., Maule, C.D., Soppera, O., Marques, P.V., "Rapid fabrication of dual analyte luminescent optrodes by self-guiding photo-polymerization", IEEE PTL, April 2011, vol.23, no.8, p.492-494.

P. Carvalho, A., Oliveira Silva, S., Baptista, J.M. et al., "Light requirements in microalgal photobioreactors: an overview of biophotonic aspects", Applied Microbiology and Biotechnology, March 2011, vol.89, no.5, p.1275-1288.

Magalhães, F.T., Araújo, F., V. Correia, M., Abolbashari, M., Farahi, F., "Active Illumination Single-Pixel Camera Based on Compressive Sensing", APPLIED OPTICS , February 2011, vol.50, no.4.

7.3.2 Collaborative Other Publications (2000 ca.)

Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language

Queirós, R.B., Marques, P.V., et al. , "Analytical Performance of a DNA Aptamer-based for E. coli Detection in Water", BITE - 2nd International Conference on Bio-Sensing Technology/BIOSENSORS 2011, October 2011, Amsterdam, The Netherlands.

Ferreira, M.S., Baptista, J.M., Roy, P., Jamier, R., Février, S., "Highly-Birefringent Photonic Bandgap Bragg Fiber Loop Mirror for Sensing Applications", OFS-21 - 21st International Conference on Optical Fiber Sensors, May 2011, Ottawa, Canada.

K. Szczurowski, M., Frazão, O., Baptista, J.M., Nielsen, K., Bang, O., Urbańczyk, W., "Sensing characteristics of birefringent microstructured polymer optical fiber", OFS-21 - 21st International Conference on Optical Fiber Sensors, May 2011, Ottawa, Canada.

Jesus Gouveia, C., Markovics, A., Baptista, J.M., Kovács, B., Jorge, P., "Colorimetric and refractometric measurements of carbon dioxide", AOP 2011 - International Conference on Applications of Optics and Photonics 2011, Braga, Portugal.

Frazão, O., Baptista, J.M., Santos, J.L., Bravo, M., López-Amo, M., "New Interrogation Technique for Multiplexing LPG-fiber Loop mirrors based displacement sensors using an OTDR", IEEE Sensors 2011 - IEEE Sensors 2011 2011, Limerick, Irlanda.

R. Grenier, J., Fernandes, L.A., Marques, P.V., S. Aitchison, J., R. Herman, P., "Optical Circuits in Fiber Cladding: Femtosecond laser-written Bragg Grating Waveguides", in CLEO: 2011 2011, paper CMZ1, Baltimore, USA.

Coelho, L.C., Oliveira Silva, S., Frazão, O., Xavier Malcata, F., Santos, J.L., "Optical fibre Hydrogen sensors coated with Palladium", AOP 2011 - International Conference on Applications of Optics and Photonics 2011, Braga, Portugal.

Carvalho, J.P., Jesus Gouveia, C., Chamorro, D., Jorge, P., Martinez, M., Giraldi, M., Barbero, A., Baptista, J.M., "Remote sensing of refractive index with an optical time-domain reflectometer", AOP 2011 - International Conference on Applications of Optics and Photonics 2011, Braga, Portugal.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

P. Caldas , "Fiber Optic Sensing by Evanescent Field Interaction", December 2011.

D. Alexandre , "Fabricação de dispositivos em fibra óptica para aplicação em redes de comunicação óptica e sensores ", PhD Thesis, February 2011.

7.1 General Description (RL-EEI-LA14-184)

Research Line Title	**SUSTAINABLE ENERGY SYSTEMS AND THE SMART GRID**
Principal Investigator	Manuel António Cerqueira Costa Matos
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EEI-LA14-184)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 Objectives (1000 ca.)

Coordinator in 2011: Prof. Manuel Matos.

The aim of the research line is to address the issue of sustainability, namely through the Smart Grid paradigm. EU goals require the development of knowledge and tools to support the massive integration of renewable energy into the electric power system, new control strategies for large scale integration of DER and off-shore wind farms and forecasting and decision support tools.

Through the Smart Grid paradigm, new organisation schemes for power system emerge, including smart metering, load response, microgrids, integration of Electric Vehicles and dispersed storage. This requires new models, control mechanisms and communication architectures. Knowledge extraction from newly available information and testing of prototypes in laboratorial environments and pilot sites is also an objective.

RESEARCH GROUP INTERACTION

The Power Systems Unit is the core research group for this research line.

An objective of the RL is to achieve a high degree of multidisciplinary and RG interaction.

7.2.2 Main Achievements (2000 ca.)

- Development of models to simulate the operation of electricity markets using Nash Equilibria concepts (collaboration with UESP) – in the framework of OIL (Optimisation Inter-Unit Line)
- A complete approach to Electric Vehicles integration in electric networks, including a smart charging procedure that allows EV to participate in the provision of primary and secondary frequency control, the development of the concept of aggregator
- Contribution on general requirements for EV charging stations, namely through the impacts of having EV participating in primary frequency control on standard IEC61851-1.
- Advances in Cross-entropy Method applied to generation capacity reliability evaluation
- New methodology for reconfiguration and voltage Var Control of distribution networks using the EPSO and graph theory
- New solution to the problem of recomposing missing information at the SCADA of energy/distribution management systems (EMS/DMS), through the use of offline trained autoencoders.

RESEARCH GROUP INTERACTION AND CROSS-RG COOPERATION

This RL is tied to the research activities carried out by the Power Systems Unit (USE). Large interaction with other Units was achieved.

Projects carried out in cooperation among several RG:

- SIMULESP - System to support the operation of electric power sub-transmission grids in contingency situations of ELECTROPAULO, Brazil), UNISANTA, Brazil [collaboration LIAAD]
- NER 300 - Specification of the Control Centers of Non-Interconnected Greek Islands, Greek Operator of the Non Interconnected Islands,2010-2011 [collaboration USIG]
- REIVE - Smart electrical grids with electrical vehicles, FAI [collaboration UTM]
- MARTIFER CV - Studies regarding large scale renewable energy sources integration in Cape Verde Islands up to 2020 and specification of advanced SCADA systems. GeSto Energy, 2010-11 [collaboration USIG]
- INOVGRID - Development of an advanced smart metering project for EDP Distribuição [collaboration UTM]

7.3 Research Line Output (RL-EEI-LA14-184)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.
LOPES, J.A.P., SOARES, F. J., ALMEIDA, P. M. R., "Integration of Electric Vehicles in the Electric Power System", THE PROCEEDINGS OF THE IEEE, vol.99, no.1, pp.168-183, January, 2011.

MADUREIRA, A., PEREIRA, J., GIL, N., LOPES, J.A.P., KORRES, G., HATZIARGYRIOU, N., "Advanced Control and Management Functionalities for Multi-MicroGrids", European Transactions on Electrical Power, vol.21, no.2, pp.1159-1177, March, 2011.

MIRANDA, V., KRSTULOVIC, J., KEKO, H., MOREIRA, C., PEREIRA, J., “Reconstructing missing data in State Estimation with autoencoders”, IEEE Transactions on Power Systems, 2011.

SARAIVA, J.T., PEREIRA, M. L., MENDES, V. T., SOUSA, J.C., "A Simulated Annealing Based Approach to Solve the Generator Maintenance Scheduling Problem", Electric Power Systems Research, vol.81, no.7, pp.1283-1291, July, 2011.

RESENDE, F., GIL, N., LOPES, J.A.P., "Service restoration on distribution systems using Multi-MicroGrids", European Transactions on Electrical Power, vol.21, no.2, pp.1327-1342, March, 2011.

SCHWEICKARDT, G., MIRANDA, V., WIMAN, G., “A comparison of metaheuristics algorithms for combinatorial optimization problems. Application to phase balancing in electric distribution systems”, Latin American Applied Research, vol.41, no.2, pp.113-120, 2011.

SILVA, S.M.S., FIDALGO, J., FONTES, D., "A Simulation Based Decision Aid Tool for Setting Regulation of Energy Grids with Distributed Generation", Operational Research International Journal, Volume 11, Issue 1, Pages 41-57, 2011.

WANG, J. , BOTTERUD, A. , BESSA, R. J. , KEKO, H., CARVALHO, L. , ISSICABA, D., SUMAILI, J., MIRANDA, V., "Wind Power Forecasting Uncertainty and Unit Commitment", Applied Energy, vol.88, no.11, pp.4014-4023, November, 2011.

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

BARIN, A., CANHA, L. N., MAGNAGO, K. M.,MATOS, M. A., WOTTRICH, B., "A Novel Fuzzy-Based Methodology for Biogas Fuelled Hybrid Energy Systems Decision Making" in K. Gopalakrishnan et al. (Eds.): Soft Comput. in Green & Renew. Ener. Sys. STUDFUZZ 269 pp.183–198, Springer-Verlag Berlin, Heidelberg, 2011

BESSA, R.J., BREMERMANN, L., MATOS, M., PESTANA, R., MACHADO, N., WALDL, H., WICHMANN, C., "Reserve and Congestion Management Using Wind Power Probabilistic Forecasting: A Real Case-Study ", European Wind Energy Association Annual Event (EWEA 2011), 2011.

CARVALHO, M.M., PEDROSO, J. P. , SARAIVA, J. T. , “Nash Equilibria in Electricity Markets”, in Proceedings of the VII ALIO/EURO, Workshop on Applied Combinatorial Optimization, Porto, Portugal, 4 – 6 May 2011.

FERREIRA, R., MIRANDA, L.M., ARAÚJO, R.E., PEÇAS LOPES, J., "A new Bi-Directional Charger for Vehicle-to-Grid Integration" ,ISGT 2011 - IEEE PES ISGT 2011, Europe, December,2011.

RUA, D.E., PEREIRA, L.F., GIL, N.J., PEÇAS LOPES, J., "Impact of Multi-Microgrid Communication Systems in Islanded Operation", ISGT 2011 - IEEE PES ISGT 2011 Europe, December 2011.

DE CASTRO, R., MELO,P., PACHECO, P., ARAÚJO, R. E., FREITAS, D.; , "A control allocation approach to manage multiple energy sources in EVs," Vehicle Power and Propulsion Conference (VPPC), 2011 IEEE , vol., no., pp.1-6, 6-9 Sept. 2011

PHULPIN, Y., LUCANI, D., BARROS, J., "Network coding in smart grids",SmartGridComm 2011, Second IEEE International Conference on Smart Grid Communications, pp.37-42, October 2011.

SUMAILI, J., KEKO, H., MIRANDA, V., CHICCO, G., "On the Use of Information Theoretic Mean Shift for Electricity Load Patterns Clustering", IEEE PowerTech 2011, June 2011.

7.3.3 PhD thesis completed (3000 ca.)

(Co-supervision or clearly multidisciplinary projects are allowed here)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative thesis projects within the framework of the RL.

Theses supervised by members of the research line:

Approved

António José Ferreira da Silva, “Application of Artificial Intelligent techniques and Adaptive Control to Wind Parks Management”, supervisor J. Nuno Fidalgo, co-supervisor Fernando Castro (ISEP/IPP), approved January 2011

Submitted

Pedro Miguel Pousada da Rocha Almeida, Impact of Vehicle to Grid in the Power System Dynamic Behaviour, supervisor J. Peças Lopes, submitted November 2011

Roque Filipe Mesquita Brandão, Assinatura Digital de Geradores Eólicos, supervisor F. Maciel Barbosa, submitted November 2011

Manuel José Costeira da Rocha, Transmission Expansion Planning – A Multiyear Approach Considering Uncertainties, supervisor J. Tomé Saraiva, submitted December 2011

Julija Vasiljevska, Evaluation of Technical, Economic and Environmental Impacts Resulting From Large Scale Integration of Microgrids, Including Responsive Demand, in Electrical Grids, supervisor J. Peças Lopes, co-supervisor Manuel Matos, submitted December 2011

Filipe Joel Nunes Soares, Impact of the deployment of electric vehicles in grid operation and expansion, supervisor J. Peças Lopes, submitted December 2011.

7.1 General Description (RL-EGE-LA14-185)

Research Line Title	**ENTERPRISE COLLABORATIVE NETWORKS, OPERATIONS MANAGEMENT AND DECISION SUPPORT SYSTEM**
Principal Investigator	Jorge Manuel Pinho de Sousa
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-185)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. J. Pinho de Sousa.
This RL aims at contributing for the performance improvement of industrial companies, through R&D projects, consultancy, technology transfer and training; and at promoting high quality research initiatives in specific areas.
Research is structured around 3 main vectors: Collaborative Networks; Optimization and Decision Support; Operations Management and Logistics.

The first vector covers topics such as information and knowledge management, and decision support in networks. In the second of these vectors, the research focus is on: Combinatorial Optimization and Metaheuristics; Cutting and Packing; Planning and Scheduling; Vehicle Routing and Distribution; and Optimization in Healthcare. Finally in the third vector, topics such as performance management, layouts design or Supply Chain Management are covered.

As a strategic objective, the RL promotes multi-disciplinary research and fosters the interaction with other research groups, particularly within the INESC TEC universe.

7.2.2 Main Achievements (2000 ca.)

An important critical mass has been achieved in the fields of Enterprise Collaboration Networks and Operations Management. Moreover the very active participation in the Manufuture and Footwear European Technology Platforms allowed the establishment of important partnerships at a European level.

During 2011 the following important achievements can be highlighted:

- Net-Challenge (Innovative networks of SMEs for complex products manufacturing) - project launched and coordinated by INESC Porto;
- H-Know (Advanced Infrastructure for Knowledge Based Services for Buildings Restoring);
- VFF (Holistic, extensible, scalable and standard Virtual Factory Framework);
- FIT4U (Framework of Integrated Technologies for User Centred Products);
- CORENET (Customer-ORiented and Eco-friendly NETworks for healthy fashionable goods);
- PROsumer.NET (Networking European Technology Platforms addressing Design-based Consumer Goods Industries and Related Research and Technology Fields);

- the multi-objective optimisation “scheduler”, developed by INESC Porto, has been marketed by SOFTI9 and I68 (Spain) with a considerable commercial success;
- a very large national RTD project was launched in the scope of the PRODUTECH competitiveness pole.

In 2011, 2 PhD theses were successfully finished, 7 papers were published in peer review journals, and 31 in international conference proceedings.

Several initiatives have been launched to promote the interaction with other research groups within the INESC TEC universe. The following should be highlighted:

1. USIG: on mobility and Intelligent Transportation Systems (ITS);
2. UITT: setting up projects on “operations management and technology transfer;
3. UGEI: participation of elements of UGEI in projects with companies in the field of forecasting; co-writing of papers;
4. Close cooperation in an inter-unit action line (LAI) on Optimization;
5. LIAAD: collaboration in projects and proposals;
6. CISTER: preparation of a joint proposal for a IP European project on ITS.

7.3 Research Line Output (RL-EGE-LA14-185)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Ferreira, R, Silva, J, Strauhs, F, Soares, A L, “Performance Management in Collaborative Networks: a Methodological Proposal”. International Journal of Universal Computer Science 17 (6), 2011.

Madeira, A C, Carravilla, M A, Oliveira, J F, Costa, C A, “Methodology for Sustainability Evaluation and Reporting in Higher Education Institutions”, Higher Education Policy, vol. 24, pp.459-479, 2011.

Rais, A, Viana, A, “Operations Research in Healthcare: A survey”, International Transactions in Operational Research, vol. 18, no. 1, pp. 1-31, 2011.

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Almeida, A H, Francisco, R P, Bastos, J, Azevedo, A, Ávila, P, “Performance and risk assessment framework for sustainable networks”, BS2011 – 2nd Int. Conf. on Business Sustainability, Póvoa de Varzim, Portugal, June 2011.

Azevedo, A, Bastos, J, Almeida, A H, Soares, C, “Customer-Oriented and Eco-friendly Networks for Health Fashionable Goods - CoReNet Approach”, PRO-VE' 11, São Paulo, Oct 2011.

Carvalho, M, Pedroso. J P, Saraiva, J, “Nash equilibria in electricity markets”, VII ALIO/EURO Workshop, Porto, May 2011.

Cunha, P F, Ferreira, P S, Rintala, S, Shamsuzzoha, A, Carneiro, L, “A Framework for Event Management within Networks of SMEs for Complex Products Manufacturing”, ICE 2011, Aachen, Germany, June 2011

Gomes, A M, Oliveira, M J, Ferreira, E P, “A multiobjective methaheuristic to the area and distance minimization rectangle packing problem”, IFORS 2011 – Int. Federation of OR Societies, Melbourne, 2011.

Junqueira, L, Oliveira, J F, Carravilla, M A, Morabito, R, “An Optimization Model for the Traveling Salesman Problem with Three-dimensional Loading Constraints”, VII ALIO/EURO Workshop, Porto, May, 2011.

Neto, T, Constantino, M, Pedroso. J P, Martins, I, “A tree search procedure for forest harvest scheduling problems addressing aspects of habitat availability”, VII ALIO/EURO Workshop, Porto, May 2011.

Parragh, S, Almada Lobo, B, Sousa, J P, “The dial-a-ride problem with split requests and profits”, OR 2011 – Int. Conference on Operations Research, Zurich, 2011.

Shamsuzzoha, A, Kankaanpää, T, Carneiro, L, “Collaborative customization strategy based on platform-based product families and white spots”, ICE 2011, Aachen, June 2011.

Shamsuzzoha, A, Rintala, S, Kankaanpää, T, Luís Carneiro, L, Ferreira, P S, Cunha, P F, “Methodology for Monitoring and Managing The Abnormal Situation (Event) in Non-Hierarchical Business Network”, DET2011 - 7th Int. Conf. of Digital Enterprise Technology, Athens, Sep 2011.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Bruno Prata, Multiobjective metaheuristics for the integrated planning of vehicles and drivers, PhD thesis, April 2011 (supervisors: Teresa Galvão, Jorge Pinho de Sousa).

Hugo Miguel Ferreira, Automatic Plan Generation and Adaptation by Observation: Supporting Complex Human Planning, PhD thesis, Nov 2011 (supervisors: Rui Camacho, João J Pinto Ferreira).

7.1 General Description (RL-EGE-LA14-186)

Research Line Title	**DIGITAL SOCIETY – SOFTWARE, INFORMATION AND INTERACTION TECHNOLOGY, SERVICES AND POLICIES**
Principal Investigator	Fernando Manuel Augusto Silva
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-186)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. Fernando Silva.

This research line is the focus of the USIG/INESC TEC unit.

The ability to organize, manage, and retrieve useful information plays a crucial role in today's digital society. This line of research addresses complex and difficult multidisciplinary problems faced by industry requiring expertise in the analysis, design and implementation of large software systems, using best software engineering practices for design, development and testing, as well as visual and user interaction components to enable their widespread use. Our focus is on major application areas with high social impact, namely e-Government, e-Health, transport systems and telecommunications, that, with the contribution of other research groups, enabled INESC-TEC to successfully achieve strong industrial partnerships and technology transfer.

7.2.2 Main Achievements (2000 ca.)

MAIN RESULTS – a few examples:

Palco 3.0 - Final version of Palco Principal music social platform, including applications for mobile access (IOS and Android).

Portal Douro - Final version of a Web regional portal for the touristic promotion of the Douro Region, incorporating advanced location based content features.

Mobiles - Prototype of an information system and mobile application supporting electrical mobility.

Robot Vigilante - Prototype of a control and supervision platform of a autonomous surveillance robot.

RESEARCH GROUP INTERACTION

This RL is closely tied to the research activities developed by the Information Systems and Computer Graphics Unit (USIG), taking advantage of this unity expertise in handling large software systems from end to end. Our competencies include: information systems, information management and retrieval, geographical information systems, spatio-temporal information representation and visualisation, computer graphics, interactive and immersive environments, virtual reality, serious gaming, image synthesis, simulation, software engineering, software testing, software quality and

collaborative environments. These are demonstrated by the extended interaction with other Units in several projects:

UTM - supporting networking services and new digital educational content (Palco 3.0, Portal Douro, CNG, Escolinhas Criativas, Robot Vigilante, Mobiles)

CRACS - on social software (Palco 3.0)

LIAAD - on data mining for eHealth (ICT4DEPRESSION)

ROBIS - graphical interfaces, software integration (Robot Vigilante)

Actually a collaboration pattern is emerging in several proposals (ICARUS, TEC4SEA, OMAN) among USIG, ROBIS, UTM and UOSE, where each has a clear role:

USIG - graphical interfaces, information processing and visualization, software integration;

ROBIS - robotics;

UTM - communications;

UOSE - sensors.

7.3 Research Line Output (RL-EGE-LA14-186)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

(void)

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Lino Oliveira, André Correia Rodrigues, Helder Nunes, Leonel João Dias, António Coelho, José Manuel Oliveira, Eurico Carrapatoso, Mário Jorge Leitão, Plataforma Web de Informação Geográfica para o Turismo, Actas de CISTI'2011 - CISTI'2011-6ª Conferência Ibérica de Sistemas e Tecnologias de Informação, vol.1, pp.600-605, Chaves, Portugal, Junho, 2011.

Nelson Bilber Rodrigues, Lino Oliveira, Lígia Silva, António Coelho, "Utilização de padrões de desenho de software no desenvolvimento de Sistemas de Informação Geográfica" - O caso da Região Demarcada do Douro , Proceedings of CAPSI 2011 - 11ª Conferência da Associação Portuguesa de Sistemas de Informação, Lisboa, Portugal, 2011.

António Coelho, Leonel João Dias, A mobile advertising platform for eTourism, ENTER 2011 - 18th ENTER eTourism Conference, Innsbruck, Austria, 2011.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

(void)

7.1 General Description (RL-EGE-LA14-187)

Research Line Title	**ROBOTICS, INTELLIGENT AND AUTONOMOUS SYSTEMS FOR COMPLEX ENVIRONMENTS**
Principal Investigator	António Paulo Gomes Mendes Moreira
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-187)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. António Paulo Moreira.
This research line is the focus of the ROBIS/INESC TEC unit.

The activity of ROBIS addresses research on fundamental and applied scientific principles and practices with the aim of developing innovative intelligent and robotic solutions. Research activities focus on aerial, land and marine robotics, industrial robotics and intelligent systems and sensors.

NAVIGATION AND OPERATION

Innovative approaches for navigation and positioning of autonomous vehicles.

Tools to assist the operation of autonomous robots (automatic configuration of navigation and mission).

Human/Robots interaction, including rapid teaching of manipulators; Hyper-flexible cells.

CONTROL AND COORDINATION

Multi-robot systems with approaches for coordination, control and perception for complex and cluttered environments applications.

Intelligent control and smart sensors, adaptive sampling strategies.

TECHNOLOGY TRANSFER

As Robotics is an area of intensive knowledge integration and with direct impact in its application, RG will develop an intensive effort in technology transfer and completing projects.

7.2.2 Main Achievements (2000 ca.)

This RL is tied to the research activities carried out by the Robotics and Intelligent Systems Unit (ROBIS).

Large interaction with other Units was achieved.

Projects carried out in cooperation among several RG:

In the RobVigil project, robots activities are being extended into a new area - surveillance, based on a strategy supported by several innovative principles:

Self- localization in indoor environments

Identification and tracking of people in a multi-camera system, both static and mobile cameras (UTM)

Secure wireless communications (UTM)

Control and monitopring of mobile units (USIG)

Fast wireless battery recharge systems

In the SIIARI project, an intelligent robotic system is being developed, capable of acquiring, in a fast and intuitive way, the know-how accumulated by specialized technicians and optimized during several years of experience. The innovative characteristics are:

Programming of robots/machines through demonstration;

Modular and flexible system for automatic recognition of object geometry;

Intelligent system capable of auto-adapting to new objects;

Advanced interface for management and control, supporting both local and remote interaction; (UESP)

Architecture and interaction between the modules and components of the system. (UESP)

Another interesting synergy with the potential to be explored is: in collaboration with USE, in self-energy production and management for autonomous systems.

7.3 Research Line Output (RL-EGE-LA14-187)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

Ferreira, M.A., Moreira, A.P., Neto, P., "A low-cost laser scanning solution for flexible robotic cells: spray coating", The International Journal of Advanced Manufacturing Technology, DOI 10.1007/s00170-011-3452-x, June 2011.

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

Alves, J.C., Dias, P., "A Micro-architecture for Streaming and Vector Computing", XXVI Conference on Design of Circuits and Integrated Systems (DCIS'2011), Albufeira, Portugal, November 2011

Alves, J.C., Diniz, P., "CUSTOM FPGA-BASED MICROARCHITECTURE FOR STREAMING COMPUTING", SPL2011 - Southern Programmable Logic Conference, Córdoba, Argentina, April 2011

Brito Santiago, C., Gomes, L., Sousa, A., Reis, L.P., "Tracking Players in Indoor Sports Using a Vision System Inspired in Fuzzy and Parallel Processing", "Cutting Edge Research in New Technologies" ISBN: 979-953-307-655-2, 2011

Lima, J., Leitão, P., Gonçalves, J., Gayubo, F., González, J.L., Fraile, J.C., "A Robotic System Enhanced with Computer Vision for Manipulating Sliced Meat Objects", ETFA2011 - 16th IEEE International Conference on Emerging Technologies and Factory Automation, September 2011, Toulouse, França.

Pinto, A.M., Freitas Rocha, L., Moreira, A.P., Costa, P.J., "Shop Floor Scheduling In a Mobile Robotic Environment", EPIA 2011 - 15th Portuguese Conference on Artificial Intelligence, Lisboa, Portugal, October 2011

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative thesis projects within the framework of the RL.

Nadja Mench Bressan, Software Integrado para Anestesia: Aquisição de Dados, Estratégias de Controle de Infusão e Alarmes Inteligentes, Doutoramento em Engenharia Biomédica da FEUP. (Co-orientador A. Paulo Moreira com orientação da Professora Doutora Catarina Sofia Nunes Duarte - Department of Mechanical Engineering, King's College London). April 2011.

7.1 General Description (RL-EGE-LA14-188)

Research Line Title	**INTELLIGENT AND ADAPTIVE SYSTEMS AND MATHEMATICAL MODELING IN DECISION SUPPORT**
Principal Investigator	Alípio Mário Guedes Jorge
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-188)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. Pavel Brazdil.
This research line is the focus of the LIAAD/INESC TEC unit.

It is our aim to produce both fundamental and applied research, developing new methods and techniques in the areas of data mining, artificial intelligence, statistical data analysis, operations research, optimization and mathematical modelling and use these for decision support. Many of the activities are carried out by postgraduate students thus contributing to their training.

A considerable part of our work is to develop and enhance algorithms and methodologies, contributing to the state of the art in our research areas.

We aim to apply some of our research results in projects with companies that can benefit from them. We are interested in the areas of power systems, web industry, urban transports, and water supply, among others.

It is also our aim to pursue cooperation with researchers from other national and foreign institutions, namely the University of São Paulo from Brazil.

RESEARCH GROUP INTERACTION

An objective of the RL is to achieve a high degree of multidisciplinary and interaction among several RG.

7.2.2 Main Achievements (2000 ca.)

IMPORTANT NOTE: The results reported here have been co-financed by Plurianual 2010 and PEST 2011 and will be also reported separately for a separate LIAAD Plurianual report 2011.

In 2011 the group had a record number of publications (34) in international journals. Some publications in high profile conferences such as KDD, ICML and IJCAI should also be highlighted. Overall the group published more than 100 articles in journals, conferences and books.

Researchers from the group have (co-)chaired 2 international conferences (IDA – Intelligent Data Analysis, IEEE-ICDM) and several international conferences.

3 new books were published, one of which is the IDA proceedings. One book edited in 2010 was data mining best-seller in Amazon.com.

M. Paula Brito was elected president of International Association for Statistical Computing.

3 members of LIAAD concluded their PhD. One PhD work from 2010 won the CONET best PhD Award.

As before, some of our researchers participate as members of editorial boards of scientific journals and scientific committees of international conferences.

COOPERATION WITH OTHER UNITS

CRACS – on development/enhancements of ILP/relational methods in bioinformatics; on the development of a Recommender Service which has been deployed;

UTM – on the development of recommender systems based on audio analysis;

USE – on adaptive modelling business processes in the context of renewable power systems;

UESP – on optimisation and decision support; data mining in industrial applications; modelling industrial networks;

UGEI – on the application of data mining to urban transport management.

7.3 Research Line Output (RL-EGE-LA14-188)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Rui Camacho, M. Pereira, Vítor Santos Costa, Nuno A. Fonseca, Carlos Adriano Gonçalves, C. J. V. Simões, R. M. M. Brito, A Relational Learning Approach to Structure-Activity Relationships in Drug Design Toxicity Studies, Journal Integrative Bioinformatics, Vol. 8, 3 - [DBLP]

Susana Silva, J. N. Fidalgo, Dalila B. M. M. Fontes, A simulation based decision aid tool for setting regulation of energy grids with distributed generation, Operational Research, Vol. 11, 1, pp. 41-57 - [DBLP]

M. M de Sousa, C. R Munteanu, A. Pazos, Nuno A. Fonseca, Rui Camacho, A. L. Magalhães, Amino Acid Pair- and Triplet-wise Groupings in the Interior of Alpha-Helical Segments in Proteins, Journal of Theoretical Biology, Vol. 271, 1, pp. 136-144, February

L. Pereira, F. Alshamali, R. Andreassen, R. Ballard, W. Chantratita, N. S. Cho, C. Coudray, J. Dugoujon, M. Espinoza, F. Gonzalez-Andrade, S. Hadi, U. Immel, N. Jeran, D. Havas, C. Marian, A. Gonzalez-Martin, G. Mertens, W. Parson, C. Perone, L. Prieto, H. Takeshita, H. R. Villalobos, Z. Zeng, L. Zhivotovsky, Rui Camacho, Nuno A. Fonseca, PopAfiliator: online calculator for individual afiliation to a major population group based on 17 autosomal STR genotype prole, International Journal of Legal Medicine, Vol. 125, pp. 629-636

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

Marcos Aurélio Domingues, Alipio M. Jorge, Carlos Soares, Using Contextual Information as Virtual Items on Top-N Recommender Systems, The Computing Research Repository - CoRR - November 2011 [DBLP]

Marcos Aurélio Domingues, Alipio M. Jorge, Carlos Soares, Exploiting Additional Dimensions as Virtual Items on Top-N Recommender Systems, Proceedings of the 2011 IEEE/WIC/ACM International Conference on Web Intelligence, WI 2011, page 92--95 - Olivier Boissier, Boualem Bena 2011 [DBLP]

Pedro Pereira Rodrigues, João Gama, João Araújo, Luís M. B. Lopes, L2GClust: local-to-global clustering of stream sources, Proceedings of the 2011 ACM Symposium on Applied Computing (SAC), page 1006--1011 - March 2011 [DBLP]

Carlos Abreu Ferreira, João Gama, Vitor Santos Costa, Sequential Pattern Knowledge in Multi-Relational Learning, Computer and Information Sciences II, Proceedings of the 26th International Symposium on Computer and Information Sciences, ISCIS 2011, page 539--545 - September 2011 [DBLP]

Carlos Abreu Ferreira, João Gama, Vitor Santos Costa, Constrained Sequential Pattern Knowledge in Multi-relational Learning, Progress in Artificial Intelligence, Proceedings of the 15th Portuguese Conference on Artificial Intelligence, EPIA 2011, Volume 7026, page 282--296 - October 2011 [DBLP]

Rui Camacho, M. Pereira, Vitor Santos Costa, Nuno A. Fonseca, C. Simões, Rui M. M. Brito, Assessing the Effect of 2D Fingerprint Filtering on ILP-Based Structure-Activity Relationships Toxicity Studies in Drug Design, Proceedings of the 5th international conference on practical applications of computational biology & bioinformatics (PACBB 2011), Vol. 93, pp. 355-363 - April 2011 [DBLP, ISI]

Nuno A. Fonseca, Vitor Santos Costa, Rui Camacho, Conceptual clustering of multi-relational data, 2 ACTIVIDADE CIENTIFICA 12, Inductive Logic Programming, 21th International Conference, ILP, 2011, Short papers, London, UK, 31 July-3 August, 2011.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

(Blank)

7.1 General Description (RL-EGE-LA14-189)

Research Line Title	**ARCHITECTURES, LANGUAGES AND SYSTEMS FOR ADVANCED COMPUTING**
Principal Investigator	Fernando Manuel Augusto Silva
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-189)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. Fernando Silva.
This research line is the focus of the CRACS/INESC TEC associate unit.

High-level languages design and implementation as well as parallel and distributed systems and frameworks are at the core of expertise of CRACS team. Working in these foundational areas allowed us to make significant contributions in the areas of Logic Programming, Concurrent and Distributed Systems, Information Mining and Web-based Systems. The major research objective of this line is therefore to strengthen this expertise and leverage our competence in order to apply it to the exciting and challenging multidisciplinary applications arising from the life sciences, engineering, the Web, and the broad area of social networking.

In our core areas, we have built excellent international collaborations with major Universities worldwide that should continue. The internal collaboration within INESC-TEC has been strengthened. The social impact of research is a motive of concern.

7.2.2 Main Achievements (2000 ca.)

MAIN RESULTS –a few examples:

New competitive funding raised within this RL totaled over 220,000€ with two new projects funded:

- LEAP – Logic Environments of Advanced Parallelism, FCT (2012/15)
- EPOLICY: Engineering the Policy-making Life Cycle, EU FP7/ICT-STREP (2011/14)

Publication record has increased to 63 publications, with10 journal papers and 48 conference papers, of which about 25 are published in proceedings with commercial diffusion (Springer, ACM, or IEEE), and mostly indexed by ISI. This accounts for about 5.5. publications on average per senior researcher.

International collaboration is a strong commitment form this RL. Over 10 joint publications with international collaborators were achieved. Some of the most important collaborations are with CMU, UT-Austin, Wisconsin-Madison, UT-Dallas in the US, Amsterdam, Leuven, Imperial, York, Newcastle, UPM, Salzburgh in Europe, Tokyo IT in Japan, and COPPE in Brasil.

A considerable number of software systems developed within this RL are made available online for download and at least three of the systems, Yap Prolog, Logtalk and Mooshak, are quite mature systems and are used worldwide by a large community of users both academic and industrial.

7.3 Research Line Output (RL-EGE-LA14-189)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

With LIAAD:

Camacho R., M. Pereira, V. S. Costa, N. Fonseca, et al., A Relational Learning approach to Structure-Activity Relationships in Drug Design Toxicity studies, in Journal of Integrative Bioinformatics, Special Issue of PACBB'2011, vol. 8, September 2011.

Gama J., P. P. Rodrigues and L. Lopes, Clustering distributed sensor data streams using local processing and reduced communication, Intelligent Data Analysis, IOS Press, vol. 15, pp.3–28, January 2011. (ISI, IF= 0.412)

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

With LIAAD:

Camacho R., M. Pereira, V. S. Costa, N. Fonseca and C. J. V. Simões et al. Assessing the effect of 2D fingerprint filtering on ILP-based structure-activity relationships toxicity studies in drug design, in PACBB'11, Springer, AISC 93, 355–363, 2011.

Ferreira C. A., J. Gama and V. S. Costa. Constrained Sequential Pattern Knowledge in Multi-relational Learning, in EPIA'2011, Springer, LNCS 7026, 282-296, 2011.

Fonseca N., M. Pereira, V. S. Costa and R. Camacho "Interactive Discriminative Mining of Chemical Fragments", in ILP 2010 Revised Papers, Springer, LNCS 6489, 59–66, 2011.

Ferreira C. A., J. Gama and V. S. Costa. Sequential Pattern Knowledge in Multi-Relational Learning, in CIS II, chap. 12, Springer, 539-545, 2011.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

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7.1 General Description (RL-EGE-LA14-190)

Research Line Title	**REAL-TIME EMBEDDED SYSTEMS FOR SMART ENVIRONMENTS**
Principal Investigator	Eduardo Manuel de Médicis Tovar
Research Area	Electrical and Computer Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-190)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. Eduardo Tovar.
This research line is the focus of the CISTER/INESC TEC associate unit.

Embedded computing systems (ECS) is a strategic research area in Europe, incorporating > 98% of the processors. ECS are also becoming inherently distributed and interconnected, paving the way for smart-* applications.

The main objective of this RL is to address the challenges related to guaranteeing the logical and temporal correctness of ECS for smart environments and cyber-physical systems, addressing topics such as real-time networks/protocols (e.g. sensor/actuator networks, real-time software (e.g. languages and operating systems), adaptive real-time systems (e.g. power management), multicore systems (e.g. scheduling).

This RL is tied to the research activities carried out by CISTER, but it broadens its scope by integrating other specific competences from other INESC-TEC groups, such as ROBIS (on real-time issues and platforms for robotic applications), CRACS (on the fundamental theory of real-time languages and operating systems) and HASLab (on the verification of embedded software).

7.2.2 Main Achievements (2000 ca.)

EMMON system being applied to monitoring of SANJOTEC building

Kick-off of the ENCOURAGE project on energy-efficient buildings

SENODS demonstrator at PT data centre

Project proposals prepared in cooperation with other INESC TEC groups:

PRAGMATICS – “PRoActive Green traffic MAnagement and control strategies using Cooperative Systems”, Integrated Project (IP), submitted to Objective ICT-2011.6.7 (Cooperative Systems for energy efficient and sustainable Mobility), involving the CISTER, UOSE and USIG units of INESC TEC.

CISTER organized and hosted 14th RTCM workshop, in collaboration with INESC Porto – UTM

The most representative Portuguese research teams in the areas of mobile and wireless communications got together at ISEP for the 14th edition of the RTCM workshop, 1st of July 2011. CISTER researcher Mário Alves organized this edition, with Prof. Manuel Ricardo (INESC Porto - UTM) and Jorge Sá Silva (University of Coimbra) in the scientific committee. Several other CISTER members helped on the local organization.

RTCM is a national network of excellence composed of both academic and industrial members that aims at fostering R&D around the areas of mobile and wireless communications. The RTCM workshops are held twice per year and represent great opportunities for the research community to present and share ideas and their latest R&D achievements. Participation in these workshops is open to motivate not only graduate but also undergraduate students to attend.

The workshop was a success both in terms of attendance (46 effective participants) and technical quality. This was evidenced by the testimony of many participants and by workshop co-chairs Manuel Ricardo and Jorge Sá Silva. The next edition is planned for Guimarães, European Capital of Culture in 2012. More info at http://rtcm.inescn.pt/index.php?id=424.

7.3 Research Line Output (RL-EGE-LA14-190)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Being the 1st year of integration of CISTER in INESCT TEC, which actually started only in mid-2011, it is not yet possible to report collaborative publications with other Research Groups within the LA.

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Being the 1st year of integration of CISTER in INESCT TEC, which actually started only in mid-2011, it is not yet possible to report collaborative publications with other Research Groups within the LA.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Being the 1st year of integration of CISTER in INESCT TEC, which actually started only in mid-2011, it is not yet possible to report collaborative PhD work completed and co-supervised with other Research Groups within the LA.

Research Line Title	**CRITICAL INFORMATIONS SYSTEMS – DEPENDABLE SOFTWARE, DEVELOPMENT METHODS AND TOOLS**
Principal Investigator	Jorge Miguel de Matos Sousa Pinto
Research Area	Electrical and Computer Engineering

7.4 Objectives and Achievements (RL-EGE-LA14-191)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.4.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. Jorge Sousa Pinto.
This research line is the focus of the HASLab/INESC TEC unit.

Some of the pillars of our society are currently based on information systems that are expected to be trustworthy. Paradoxically, it is widely accepted that these information systems, many of which support critical infrastructures, will fail from time to time. The focus of this line of research is the production of high-assurance software for trustworthy systems: software whose adequacy, responsiveness, predictability, robustness and security have been carefully considered during development.

This is clearly a hard problem that, with the increasingly asymmetric and unstable nature of environments, requires looking at previously disjoint scientific fields as a whole. This RL exploits synergies between competencies in three main aspects of trustworthy systems: rigorous software development, data and systems dependability, and information security. The RL focuses on safety-critical systems, cloud computing, and smartgrids, as application areas in which trustworthiness is particularly relevant.

7.4.2 Main Achievements (2000 ca.)

Main scientific results:

- Implementation and detailed analysis, in a real environment with a large number of geographically dispersed nodes, of mutable consensus, a protocol for solving the fault-tolerant consensus problem in distributed systems
- A technique based on the joint use of simulation and formal verification for the design of safe industrial systems controllers
- New techniques for the analysis and certification of open-source software

This RL is tied to the research activities carried out by the High-assurance Software Laboratory (HASLab) group. Significant interaction with other Units was achieved in 2011, in particular:

A new project involving the research groups HASLab and CISTER, on analysis and verification of critical concurrent programs, was approved for funding by FCT.

The following project proposals were submitted:

- The REACTS REGPOT proposal, involving HASLab and UITT (the Innovation and Technology Transfer unit).
- The Languages and tools for critical real-time systems ON2 proposal, involving the groups HASLab, CRACS (Center for Research in Advanced Computing Systems), and ROBIS (Robotics and Intelligent Systems).
- The Scalable networked sensing for critical systems monitoring (SENSYS) ON2 proposal, involving the groups HASLAB, UOSE (Optoelectronics and Electronic Systems Unit), UTM (Telecommunications and Multimedia Unit), and CRACS (Center for Research in Advanced Computing Systems).

Finally, one joint paper between LIADD and HASLab was published (and a second is pending).

7.5 Research Line Output (RL-EGE-LA14-191)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.5.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

J. Machado, E. Seabra, J.C. Campos, F. Soares, C. Leão. “Safe Controllers Design for Industrial Automation Systems”. Computers and Industrial Engineering. 60(4): 635-653, 2011. Elsevier.

7.5.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Several Units at INESC TEC are already multi-disciplinary. The following lists multi-disciplinary collaborative publication effort within the framework of the RL, both inter- and intra-Unit.

F. Cruz, P. Gomes, R. Oliveira, and J. Pereira. Assessing NoSQL databases for telecom applications. In International Workshop on Clouds for Enterprises (C4E), 2011.

Nelson Gonçalves, Rui José and Carlos Baquero. Privacy preserving gate counting with collaborative Bluetooth scanners. Sixth International Workshop on MObile and NEtworking Technologies for social applications (OTM MONET´11). LNCS

Cláudio Sá, Carlos Soares, Alípio M. Jorge, Paulo J. Azevedo and Joaquim Pinto da Costa. Mining Association Rules for Label Ranking. In Proceedings of the 15th Pacific-Asia Conference on Knowledge Discovery and Data Mining, PAKDD 2011, 24-27 May, Shenzhen, China.

M. Barbosa, A. Moss, D. Page, N. Rodrigues and P. Silva. Type Checking Cryptography Implementations. Accepted and presented at FSEN 2011 (pending LNCS proceedings).

J.C. Campos and J. Machado. Supporting requirements formulation in software formal verification. In Ambrosio, A.M. and Mattiello-Francisco, M.F. and Batista, J.C. and Barbosa, R. and Cancela, H., editors, Latin-American Symposium on Dependable Computing (LADC 2011). Suplemental proceedings. INPE. 2011.

J. Machado and J.C. Campos. Partial Plant Models in Formal Verification of Industrial Automation Discrete Systems. In Ambrosio, A.M. and Mattiello-Francisco, M.F. and Batista, J.C. and Barbosa, R.

and Cancela, H., editors, Latin-American Symposium on Dependable Computing (LADC 2011) suplemental proceedings. INPE. 2011.

J.C. Campos and M.D. Harrison. Modelling and analysing the interactive behaviour of an infusion pump. Electronic Communications of the EASST, volume 45: Formal Methods for Interactive Systems 2011. 2011.

7.5.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Being the 1st year of integration of HASLab in INESCT TEC, which actually started only in mid-2011, it is not yet possible to report collaborative PhD work completed and co-supervised with other Research Groups within the LA.

7.1 General Description (RL-EGE-LA14-192)

Research Line Title	**TECHNOLOGY AND INNOVATION MANAGEMENT**
Principal Investigator	Joao Alberto Vieira de Campos Pereira Claro
Research Area	Economics and Management

7.2 Objectives and Achievements (RL-EGE-LA14-192)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. João Claro.
This research line is the focus of the UITT/INESC TEC unit.

The Innovation and Technology Transfer Unit is the core RG for this RL. The RL explores research opportunities in Technology and Innovation Management, mainly associated with INESC TEC role at the university-industry interface, and collaborations with COTEC and UT Austin|Portugal in technology commercialization:

- Technology Entrepreneurship, focusing on early stages of academic new ventures;
- Innovation Management, studying practices, tools, and metrics, and multidisciplinary approaches to the Front End of Innovation;
- Innovation Networks, specifically Open Innovation and technology transfer;
- Technology Strategy, concentrating on roadmapping and the interface of technology and operations;
- Engineering Systems Design, focusing on flexibility and the integration of management and social concerns;
- Science and Technology policy, examining the economics of knowledge.

7.2.2 Main Achievements (2000 ca.)

FADIS is the acronym chosen for the 'Ferramenta de Apoio à Decisão na Internacionalização de Serviços Técnicos' (Tool to Support Decisions on the Internationalisation of Technical Services). This tool was developed in INESC Porto and its aim is to support SMEs in the process of internationalisation of technical services. Co-financed by the SI I&DT - Sistema de Incentivos à Investigação e Desenvolvimento Tecnológico (System to Promote Research and Technological Development), FADIS is promoted by a consortium which includes INESC Porto, UITT and the Manufacturing Systems Engineering Unit (UESP), SISTRADE, a software company, and CATIM – Centro de Apoio Tecnológico à Indústria Metalomecânica (Technology Centre for the Metal Industry).

7.3 Research Line Output (RL-EGE-LA14-192)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Au-Yong Oliveira, M., Ferreira, J.J., "Facilitating qualitative research in business studies: Using the business narrative to model value creation'", African Journal of Business Management , January 2011, ISSN 1993-8233, (ISI INDEXED JOURNAL), vol.5, no.1, p.68-75.

Claro, J., Costa, C., "A made-to-measure indicator for cross-disciplinary bibliometric ranking of researchers performance", Scientometrics 2011, vol.86, no.1, p.113-123.

Fernandes, L., Mendes, A., Teixeira, A., "A review essay on child well-being measurement", Social Indicators Research, February 2011, DOI 10.1007/s11205-011-9814-9 [Indexed in ISI].

Gonçalves, R., Martins, J., Pereira, J., Au-Yong Oliveira, M., Ferreira, J.J., "Accessibility levels of Portuguese enterprise websites: equal opportunities for all?", Behaviour & Information Technology , May 2011, p.1-19.

Kyrki, A., Torkkeli, M., "Software Superstore - Russian IT Resources in Offshore Software Development", International Journal of Business and Emerging Markets 2011, vol.3, no.2, p.177-197.

Rocha, A., Martins, Â., Freire Junior, J.C., Boulos, M., Vicente, M.E., Feld, R., van de Ven, P., Nelson, J., Bourke, A., ÓLaighin, G., Sdogati, C.S., Jobes, A., Narvaiza, L., Rodríguez-Molinero, A., "Innovations in health care services: The CAALYX system", Internation Journal of Medical Informatics 2011, 10.1016/j.ijmedinf.2011.03.003.

Smirnova, M., Podmetina, D., Väätänen, J., Torkkeli, M., "Collaborative Approaches to New Product Development: the Case of Russia", International Journal of Entrepreneurship and Innovation Management 2011.

Teixeira, A., Sequeira, J., "Determinants of the international influence of a R&D organisation: a bibliometric approach", European Journal of Scientific Research, May 2011, vol.53, no.3, p.400-430.

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Collins, R., de Neufville, R., Claro, J., Oliveira, T., "Suppression or Prevention: Modeling forest fire management using System Dynamics", INFORMS Annual Meeting 20 - INFORMS Annual Meeting 2011 2011, Charlotte, EUA.

Gonçalves, F., David, G., "Are we on the right track to paperless hospitals?", MEDINFOR II - MEDINFOR II 2011, Porto, Portugal.

Jimenez, E.R., Pinho de Sousa, J., Claro, J., "Airport Competition and Aviation Network Evolution: an Exploratory Study on Continental Portugal", XXV ANPET - XXV ANPET: Congresso de Pesquisa e Ensino em Transportes, November 2011, Belo Horizonte, Brasil.

Passos, A., Xavier, A., Torkkeli, M., "Designing a Innovation Measurement Tool for the Portuguese Footwear Sector", in Proceedings of ISPIM 2011 - XXII ISPIM Conference – Sustainability in Innovation: Innovation Management Challenges, June 2011, Hamburgo, Alemanha.

Väätänen, J., Podmetina, D., Smirnova, M., Torkkeli, M., "Open Innovation Strategy - Optimizing R&D Cooperation Quantity and Intensity", in Proceedings of IAMOT 2011 - The 20th International Conference on Management of Technology: 'Technology and the Global Challenges: Security, Energy, Water, and the Environment' , April 2011, Miami - Florida, USA.

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

(Blank)

7.1 General Description (RL-EGE-LA14-193)

Research Line Title	**INDUSTRIAL ENGINEERING AND SERVICE MANAGEMENT**
Principal Investigator	Bernardo Sobrinho Simões de Almada Lobo
Research Area	Mechanical Engineering

7.2 Objectives and Achievements (RL-EGE-LA14-193)

This section allows you to provide the Objectives and Achievements of the Research Line during the reporting period.

7.2.1 General Objectives (1000 ca.)

Coordinator in 2011: Prof. José António Sarsfield Cabral.
This research line is the focus of the UGEI/INESC TEC associate unit.

This Associate Unit, the Unit of Management and Industrial Engineering (UGEI) is the core research group for this line of research.

UGEI aims to produce problem-driven knowledge focusing on three main fields, as reported in the RG section:

1.Service Engineering and Design

2.Decision Support and Intelligent Systems

3.Performance Management and Business Intelligence

The objective of this RL is to promote a high degree of multidisciplinary and RG interaction. This RL broadens the scope of UGEI activity by integrating other specific competences of the Research Group as well as strengthening synergies and incorporating the skills available in other Research Groups.

Its research projects are based upon real-world problems: Application / problem solving oriented stance - which obviously encompasses the development of innovative theoretical work leading to multidisciplinary projects mainly in Health, Retail, Mobility and Manufacturing, not only within UGEI research team, but also across different INESC TEC units.

7.2.2 Main Achievements (2000 ca.)

MAIN COLLABORATIVE RESULTS

Within the Decision Support and Intelligent Systems research dimension applied to mobility, members from UGEI and UESP have worked on the dial-a-ride problem with split requests and profits. Demand responsive transportation systems are a means to complement standard transportation networks. For the first time in literature, routing problems have been optimized with pickups and deliveries, time windows, request splitting and selection.

A PhD work on “Integrated Vehicle and crew scheduling based on Multiobjective metaheuristics” supervised my members of UGEI and UESP was completed.

Members of UGEI and UESP have launched and co-ordinated Optimization Interunit Line (OIL), an inter-unit line created at INESC Porto LA to promote and cross-fertilize research on optimization. The main activities of the OIL during this period were: the organization of the Weekly Optimization

Workshop (WOW); the promotion of joint multidisciplinary project proposals and publications; the joint supervision of graduate students by researchers from different Units.

UGEI has also collaborated with UESP on the research project ShoeID related to supply chain management in the shoe industry. The contribution of UGEI was focused on demand forecasting and planning.

Moreover, members from LIAAD have participated in the UGEI multidisciplinary research project related to the optimization of operating room planning and scheduling and on the proposal that was approved "Solving Management Decision Problems by Genetic Programming".

1. Projects carried out in cooperation among several RG:

2. An integrated framework for operating room capacity planning and scheduling Funded by FCT (FCT, PTDC/EGE-GES/102681/2008): UGEI, LIAAD

3. PPExt—Industrial Extensions to Production Planning and Scheduling, UGEI, UESP

Funded by European Commission – call FP7-PEOPLE-2009-IRSES, Proposal n° 24688

4. Industrial Extensions to Production Planning, Funded by FCT/CAPES 4.4.1.00, UGEI, UESP

5. Solving Management Decision Problems by Genetic programming. Funded by FCT (FCT, PTDC/EGE-GES/117692/2010): LIAAD, UGEI, UESP

6. ShoeID

7.3 Research Line Output (RL-EGE-LA14-193)

This section allows you to provide the productivity of the Research Line during the reporting period.

7.3.1 Collaborative Publications in peer review Journals (2000 ca.)

(Include only if more that one Research Groups of the LA is involved. Give title and full citation in original language)

Morais, P., Camanho, A.S. Evaluation of performance of european cities with the aim to promote quality of life improvements, OMEGA, The International Journal of Management Science, vol.39, nº4, pp.398-409, 2011

Patrício, L., Fisk, R.P., Cunha, J.F., Constantine, L. Multilevel Service Design: From Customer Value Constellation to Service Experience Blueprinting, Journal of Service Research, vol.14, nº 2, pp.180-200, 2011

Amorim, P., Antunes, C., Almada-Lobo, B. Multi-Objective Lot-Sizing and Scheduling Dealing with Perishability Issues, Industrial & Engineering Chemistry Research, , vol.50, nº6, pp.3371-3381, 2011

Portela, M.C., Camanho, A.S., Borges, D. BESP - Benchmarking of Portuguese Secondary Schools, Benchmarking: An International Journal, vol.18, nº 2, pp.240-260, 2011

7.3.2 Collaborative Other Publications (2000 ca.)

(Include only if more than one group is involved and only include here Books, chapters or full papers published in conference proceedings. Give title and full citation in original language)

Miguéis, V.L., Camanho, A.S., Cunha, J.F. Mining customer loyalty card programs: The improvement of service levels enabled by innovative segmentation and promotions designing Lecture Notes in Business Information Processing, vol. 82, pp.83-97, 2011

Gomes, C., Sperandio, F., Borges, J.L., Almada-Lobo,B., Brito, A.C. A Decision Support System for Surgery Theatre Scheduling Problems in ENTERprise Information Systems - Communications in Computer and Information Science vol. 221, Springer, pp.213-222, 2011

Mourinho, J., Dias, T.G., Cunha, J.F. Spider Maps for Location-Based Services Improvement in Lecture Notes in Business Information Processing, vol. 82, pp.16-29, 2011

Teixeira, J., Patrício, L., Nunes, N.J., Nóbrega, L.: Customer Experience Modeling: Designing Interactions for Service Systems. in Proceedings of INTERACT 2011, 13th Conference on Human-Computer Interaction 2011: 136-143

Almada-Lobo, B., Borges, J.L., Brito, A.C., Stocco, M., Sperandio, F., Gomes, C. Simulating a Portuguese Hospital Master Surgery Schedule in Proceedings of the 1st International Conference on Serious Games and Applications for Health - SeGAH 2011, pp.1-4, 2011

7.3.3 PhD thesis completed (3000 ca.)

Co-supervision or clearly multidisciplinary projects are allowed here

Bruno de Athayde Prata, Uma Nova Abordagem para a Programação Integrada de Veículos e Tripulações, Industrial Engineering and Management Doctoral Program, Supervisors: T.G.Dias, J.P.Sousa., 2011 (UGEI and UESP)

8 Other Activities

This section is designed so that the LA can report on its efforts to promote activities that include multiple Research Lines and or multiple Research Groups. In this section the LA can also indicate efforts made towards the implementation of services for Researchers Groups within the LA but also for services in collaboration with other Institutions of Research, Higher Education Government or the community in general. This section also contains information regarding the Networking activities of the LA, its involvement in training efforts (PhD programs) and its activities designed to promote communication between Science and Society. The final Section is designed to provide an overview of the original aims of the LA is all these respects and how they compared with their implementation

8.1 Internal Services and Resources (3000 ca).

Indicate here sharing of equipment and other resources both within the LA, between LAs or with other institutions of Higher Education nationally or internationally)

INESC TEC has a deep cooperation with three Departments at FEUP (Fac. Engineering UP): Electrical Engineering; Informatics Engineering; and Management and Industrial Engineering. The same occurs with the Department of Physics at the Faculty of Sciences (FCUP) of the Univ. Porto and with ISEP and, more recently, with the University of Minho. The research laboratories created by INESC TEC are shared on a regular basis, especially for post-graduation studies.

INESC TEC has built a management structure that allows the sharing of many resources. The following services are centrally provided by INESC Porto: juridical, human resources, insurance, administrative and financial management of projects, accounting, media and image, translation, information management, communication and computing support, transportation and fleet management, drivers, facilities management, room and equipment reservation, acquisition of equipment/services, event organization, bar, cleaning, library and secretarial assistance. These services are assured by a team of some 30 full-time personnel, an efficient and qualified pool of people that help in creating a high quality environment.

The Associate Units are given the choice of using INESC Porto resources or the resources at their home schools. A majority has been steadily moving into deeper integration and to more extensive resource sharing.

EXAMPLES

With USE, sharing of computer facilities and specific simulation software, like PSS/E, used by FEUP students in their assignments and MSc dissertations. Also, sharing of lab facilities, involving the RTDS hardware/software, installed at FEUP and simulation software like EUROSTAG and PSSE as well as computer resources installed at FEUP.

With UOSE, sharing the clean room area with the Physics Department of FCUP and IFIMUP, enables pre- and post-graduation training in micro-fabrication technologies. IFIMUP is in an Associate Laboratory with INESC-MN (in Lisbon).

With UTM (telecommunications), sharing with UOSE, and also with FEUP and FCUP of a Photonics and Microwaves laboratory, set-up with funding from FCT. An Electronic Music laboratory shared with FEUP – supports the master course in Multimedia and the doctoral programme in Digital Media (with the University of Texas at Austin).

USIG maintains a software infrastructure sharing costs with other Units, particularly an ORACLE DBMS and associated tools (sharing with UTM and UESP).

The ROBIS group has several robotic equipments (manipulators, mobile platforms, autonomous vehicles) that are used as test beds shared by students both at pre and post-graduation levels.

By initiative of INESC TEC, a shared infrastructure involving several Research centers in the University of Porto was approved. It involves the construction of a state of the art clean room (ISO 6/ISO 7) and the purchase of key equipment. The clean room area is also shared with a set of Brazilian universities that develop theoretical work and come to Porto to manufacture and test devices at INESC Porto.

ITQB and REQUIMTE are other Associate Laboratories with whom INESC TEC develops partnerships looking for synergies using complementary competences.

8.2 External Services and Resources (3000 ca)

Indicate here scientific or technical services provided both nationally or internationally to Governments/Institutions or the community

In 2011, INESC TEC continued the policy defined in past years of providing assistance to Governmental and other public interest bodies, as a part of its obligations. It must be noted that in many cases this assistance is not liable to be reported. This activity demonstrates the deep involvement of the LA and the sense of mission that presides to its action.

Some examples of mostly of non-paid activities in this context:

- assistance to Government bodies (Ministries, Innovation Agency, QREN management…) in the definition of regulations and tenders for national funding programs in Science and Technology
- advice on technology trends upon request to INOVCAPITAL, the state controlled risk-capital company (since 1999)
- consultancies to the Regional Coordination and Development Commissions of Northern Portugal (CCDR-N) and Lisbon and Tejo Valley (CCDR-LVT) in regional planning
- support to a NCP of the IST Program resident at INESC Porto
- leadership of the Portuguese participation in the European Technology Platform Manufuture, with roles in the High Level and Implementation Support Groups and founding member of the European Factory of the Future Research Association
- membership of the Council of the Associate Laboratories (CLA)
- membership of the Ciencia Viva association and cooperation with its actions
- participation in several Sectorial Clusters aiming to promote Competitiveness and Innovation through collective actions.
- implementation of e-Inclusion strategy in the Municipality of Santa Maria da Feira, supported by Gulbenkian Foundation.
- development of studies leading to national regulations published by ERSE (Regulatory Authority for Energy Services)
- Study “Recommendations for a sustainable strategy for Energy Efficiency and Renewable Energy in Portugal” (with AT Kearney), financed by FAI (Innovation Support Fund), from the Ministry of Economy, Innovation and Development, 2011-2012
- Cooperation with the UTEN Portugal (and maintaining the links to the University of Texas at Austin), namely hosting its scientific coordination

8.3 Networking Actions (2000 ca)

Indicate here both national and international activities)

Examples of actions led by the Board of Directors:

- Participation in 6 national Technology and Competitiveness Poles and 2 Regional Clusters promoted by the Ministry of Economy
- Involvement in the FCT partnership programs with MIT, CMU and UT Austin, with leadership and management in doctoral programs and research projects.
- Center of Knowledge on the Railway (consortium with FEUP and institutes in Mechanical and Civil Engineering) and constitution of the Center of Knowledge on Sustainable Energy (together with other FCT Units including another LA in Chemical Engineering).
- Cooperation network with the major Brazilian Universities leading to the constitution of INESC P&D Brasil.

EXAMPLES

of actions led by Units - membership (in many cases with management responsibility):

- European Energy Research Alliance (EERA) – INESC TEC is a member of EERA and collaborates in the Joint Programme on Smart Grids. Within this group INESC TEC is leader of sub-task Network Operations of the Transmission Network.
- Representative of Portugal in the European Electricity Grids Initiative (EEIG) of the European Strategic Energy Technology Plan (SET-Plan)
- Representation in the Mirror Group for the Technological Platform on Smart Grids
- National network of competence in Sensors and in Optical Fiber Sensors with IT Aveiro and University of Aveiro
- Various Management Committees of COST Actions (members of the INESC TEC are National Delegates in 8 COST Actions).
- Sound and Music Computing Network (http://smcnetwork.org/)
- Marie Curie Initial Training Network programme – participation with CERN in ACEOLE (Data Acquisition, Electronics, and Optoelectronics for LHC Experiments)
- FCT/CAPES transnational cooperation programme
- Thematic Network on Mobile Communications (http://rtcm.inescporto.pt)
- EES/UETP European consortium for advanced training involving universities and companies.
- CIGRE working groups
- MANUFUTURE ETP and EFFRA Association
- Footwear ETP
- PRODUTECH – Competitiveness Pole for Production Technologies
- ELANET – European Local Authorities Telematic Network
- ADDME – Activating Drivers for Digital eMpowerment in Europe (Digital Divide Thematic Network)
- DANOTEC – Defence, Armament and New Technologies Association.
- IDCEM – Institute for the Development of the Knowledge and the Economy of the Sea.
- HILLSIDE GROUP – Participation in the Board (Software Engineering area).

8.4 Training Activities (2000 ca)

Indicate here activities of the LA as a whole)

INESC TEC provides internal and external training.

Internal training is addressed to all its collaborators. Externally, INESC TEC offered advanced training to academics, industry and services, at national and international level. The training offer was carried by the research Units. Some examples are:

EXAMPLES OF SPECIFIC TRAINING COURSES FOR THE INDUSTRY:

Advanced training of young researchers in the framework of two research contracts with PTIN (Portugal Telecom Inovação): ASP (Authentication, Security and Privacy solutions for Home Networks) and ContextAware (Context-aware and personalized multimedia services)

An intensive course on Proposal Writing organized by WelcomeEurope, focusing on individual Marie Curie Career Integration Grant (CIG), took place at INESC Porto under the framework of the ACEOLE project – 15 CERN researchers participated.

Advanced training of young researchers in the framework of two research contracts with PTIN (Portugal Telecom Inovação): MRA (Multi Radio Access) and ContextAware (Context-aware and personalized multimedia services).

BEST Summer School 2011 – Co-organised with the Board of European Students of Technology (BEST) a summer school on Music and Technology, from August 30 to September 13, 2011, in Porto, Portugal.

EES/UETP course “Impact of Large Scale Deployment of Electric Mobility in Power System Operation and Planning”, 3-4 October 2011, Porto, Portugal

Advanced Training courses developed for the EFACEC Academy.

Training course developed for COGEN (Associação Portuguesa para a Eficiência Energética e Promoção da Cogeração) on Reactive Power.

HIGHER EDUCATION:

Project “ELLEIEEC-Enhancing Lifelong Learning for the Electrical and Information Engineering Community” (2008-2011) 1428-LLP-1-2008-FR-ERASMUS-ENW.

Collaboration and student framing by the Research groups in the scope of the MIT-Portugal, CMU-Portugal and UT Austin Programs.

INVOLVEMENT IN TECHNOLOGY TRANSFER AND TECHNOLOGY-BASED ENTREPRENEURSHIP TRAINING PROGRAMS OF ACADEMIC AND ALSO NON-ACADEMIC STAFF:

Support to MIETE, Master in Innovation and Technological Entrepreneurship, of FEUP

8.5 Outreach/Science and Society (4000 ca)

Indicate here activities that the LA as a whole

INESC TEC gives great importance to communication with citizens. In 2011 this activity followed the general trend of recent years:

- The Communication Service (SCom) includes three specialists with post-graduation in Media and Communication and in Translation. It originated 192 (112 in 2010) news items from press releases. Monitoring in 2010 identified a total of 385 news items regarding INESC Porto/INESC TEC in the main Portuguese media – plus 11 in internacional media.
- The SCom, among other duties, runs a digital monthly Bulletin (BIP, http://bip.inescporto.pt/) in Portuguese, with news on science and projects developed, that reaches a vast community of readers in Portugal and Brazil. A version of BIP in English (http://bip.inescporto.pt/en) is also published every 3 months.
- AWStats provided a counting of accesses to BIP. In the first half of 2011, the Bulletin had visits from 106 countries, the top being Portugal, USA, Germany, Russia, Brazil, Czech Republic, Ukraine, China, Sweden and Japan, with a total number of about 400,000 pages viewed, an average of more than 2000 per day.
- INESC TEC developed a consistent action of presence in the civil society with participation in a diversity of events and initiatives. As a consequence, experts from INESC Porto are regularly interviewed by TV and radio stations (beside the press) on the hot topics that the society is debating.
- INESC Porto, the coordinator of INESC TEC, is one of the partners of the Ciência Viva (CV) association whose aim is to promote science among youth. It has regularly cooperated with the CV initiatives, namely in the annual programs to receive students from secondary schools for short periods of time in its laboratories. Also, a member of the Board of Directors is a member of the Scientific Advisory Board of the Ciência Viva Center of Bragança.
- INESC TEC also participated in several national Exhibitions (e.g. Forum do Mar), and supported to the University of Porto annual event as well as the Engineering and Sciences Faculties Open Days.
- The SCom also organised diverse external and internal initiatives.
- Public talks and lectures were given by the senior members of INESC TEC in various locations, in secondary schools and in Civic Associations, beside scientific and technical meetings.

COMMENT

This section reproduces the content of section 3. (Activities), sub-section 3.2. (Outreach activities during the year of 2011 - Science and Society/general public/schools, etc.).

8.6 Organization of International Events (2000 c.)

Indicate here events that are international in dimension and required the involvement of the LA for their implementation)

INESC Porto LA was involved in the organization of International Events at various levels: from fully organizing the event to having its researchers serve as Chair of Conferences or as members of Technical or Scientific Committees.

The following is a list with a few examples on events with organization or co-organization of INESC Porto:

- SEON – Symposium on Enabling Networks and Sensors, with IT-Aveiro, Porto, 25th June 2011
- International Conference on Applications of Optics and Photonics (AOP'2011), with SPOF, Braga, 3-7 of May 2011

- ELAB 2011 - Encontro Luso-Afro-Brasileiro para a Energia 2011, 20-21 October 2011, ENDIEL, Porto
- IX International Workshop on Cutting, Packing and Related Topics, Porto, Portugal, 14-17 Sep 2011.
- VII ALIO-EURO Workshop in Applied Combinatorial Optimization, Porto, Portugal, 4-6 May 2011.

A large number of events in which INESC TEC researchers served as Chair/Vice Chair of the Organization or Members of Program/Technical/Scientific Committees could be listed. Some examples:

- ADM 2010 – Brasil, Luís Magalhães – PC member
- DSAI 2010 - UK, António Coelho – PC member
- EuroPLoP'2010 – Germany, Ademar Aguiar – PC member
- GRAPP 2010 – France, A. Augusto de Sousa, Miguel Leitão, António Coelho – PC member
- IEEE IWEA 2010 – Japan, Ricardo Costa – PC member
- PLOP'2010 – USA, Ademar Aguiar – PC member
- WikiSym 2010 – Poland, Ademar Aguiar – PC member
- WSCAD - SCC 2010 – Brasil, A. Augusto de Sousa – PC member
- VECPAR2010 - USA, João Correia Lopes – Web-chair, A. Augusto de Sousa – PC member
- ROBOTICA2011 – Portugal, A. Paulo Moreira – PC member
- ICINCO 2011 – The Netherlands, A.Paulo Moreira – PC member
- IROBOT 2011 – Portugal, A.Paulo Moreira – PC member
- VII ALIO-EURO – Portugal, Ana Viana – Organizing and Program Committee Chair
- 8th ESICUP – Denmark, José Fernando Oliveira – Program Committee Chair
- iNet-IMS Workshop – Germany, Luís Carneiro – Co-organizer.
- IX International Workshop on Cutting, Packing and Related Topics - Portugal, Maria Antónia Carravilla, António Miguel Gome;, José Fernando Oliveira – Organising Committee
- DCIS 2011 – XXVI Conference on Design of Circuits and Integrated Systems – Portugal, J. S. Matos – member of Steering Committee, José Machado da Silva – General Chair
- KISS 2011 – Portugal, Carlos Guedes – Co-organiser
- TSIO 2011 – "Turning Subjective Into Objective": Cosmetic Assessment of Breast Cancer Local Treatment – Portugal, Jaime Cardoso, Maria João Cardoso – Organisers

9 Internal Evaluations

In this section you should include a summary of internal evaluations during the report period and the future internal evaluation plans for 2011.

9.1 Summary of internal evaluations during 2011 (3000 ca.)

REGULAR SCIENTIFIC AND TECHNICAL EVALUATION

Every 3 months all researchers within INESC Porto, either grantees or faculty from the University schools and other Higher Education schools are subject to a performance evaluation by their hierarchical superiors. This leads to a classification with reflex on performance prizes and bonuses. This classification is discussed in a meeting of the Council of Research Units. The Associate Unites put in action their autonomous evaluation processes.

Annually, a global performance assessment is conducted by the Board of Directors, with the cooperation of the Group and Project leaders. This is a participated evaluation exercise beginning with a self-assessment by each researcher. A workflow tool has been put in place to assist in the evaluation procedures.

Regularly the Scientific Council assesses the value of published material and decides on which journal papers should entitle their authors to bonuses or scientific prizes, given by the Board of Directors.

On a case basis, the Board of Directors and the Coordinating Council of the Associate Laboratory assess the merits of new research line proposals, proposed by the research groups, in special presentation sessions, and approves their plan, budget and reinforcement of human resources.

The Board of Directors at INESC Porto also always assesses the global performance of each researcher with a Ph.D. degree, contracted under the LA program, following a report and a special presentation, with consequence to the renewal of contracts.

FINANCIAL AND MANAGEMENT EVALUATION

The activity of INESC TEC is regulated by an annual plan, approved by the General Council of INESC Porto.

Every 3 months an evaluation session is conducted, during a meeting of the Council of Research Units, to assess the deviation to the plan as well as the financial health of the institution. Corrections are introduced then in the trajectory.

A midterm evaluation session (in July) assesses the scenario of a simulation of the activity for the whole year. Policy measures are then taken to assure that the year closure will not represent a problem.

STRATEGIC EVALUATION

INESC Porto has always objected to the on-line reporting forms imposed by FCT, because they do not allow adequate reporting – especially for an Associate Laboratory with a double mission of Science and of Technology Transfer. This position has been supported by the SAB (Scientific Advisory Board).

Intense interaction with the SAB led to missions targeting the integration of the computer science cluster and to missions that helped in preparing a global strategic proposal to enhance cros-unit cooperation and multidisciplinary collaborative research. These missions occurred in the first half of 2011.

A new mission has been prepared for the beginning of 2012, to perform a global evaluation and help in defining the strategy for the coming years.

9.2 Future internal Evaluations plan for 2012 (3000 ca.)

INESC Porto has always had a policy of interaction with its SAB (Scientific Advisory Board) while respecting its independence.

INESC Porto LA has always dealt with the SAB as a fundamental tool to influence its strategic planning. The discussions of the SAB with the Board of Directors have been extremely useful and fruitful. However, INESC Porto does not see the SAB as a governing body of the institution nor has the perspective that all the recommendations of the SAB should be followed or implemented. They are a means to provide insight and vision, and highly respected for that – but the policy is dictated by the owners of INESC Porto. Therefore, an evaluation process based on assessing if the recommendations of the SAB are followed (and to which extent) or not does not seem productive at all nor does it contribute to the independence of the analysis by the SAB and risks limiting the boldness of suggestions.

Consistently with the enlargement and growth of the LA and in line with the constitution of INESC TEC as a tightly interweaved cluster of 12 Units, the SAB has been reinforced with new members. In 2012, INESC Porto will conduct a full visit of the full SAB to all the Units member of the LA, followed by an evaluation process, strategic assessment and action plan to assure the cohesion of the Associate Laboratory.

Also, INESC Porto implements a regular evaluation based on a differential principle, i.e., referring to variations relative to a base date. Several criteria are identified (and sub-criteria) but one does not envisage reaching a global and unique mark as a result of the process. The indices associated to each criterion serve as indicators of performance under a multiple criterion framework.

The regular evaluation procedures that INESC TEC already has in place for most of its units (namelt all inside INESC Porto) are:

- Evaluation of individual performance every 3 months
- Complementary evaluation of individual performance on an annual basis
- Evaluation of the performance of the researchers contracted under programs supported by FCT 6 months before contract renewal
- Evaluation of publication performance and other indicators on an annual basis
- Financial and management evaluation every 3 months
- Scientific global evaluation by the SAB on an annual basis.

10 Strategic Project Adjustments

In this section you may indicate the changes to the approved Strategic Project proposal (2011-2012) and their justifications.

10.1 Strategic Project Adjustments (2000 ca.)

Please indicate the adjustments to the approved proposal. Summary of internal evaluations during 2011 (3000 ca.)

No relevant change or improvement in the Strategic Project requires reporting.

However, one must stress that the constraints to current management, derived from the financing scheme depending on the QREN, imposed a severe administrative and financial burden.

In fact, the financing scheme and procedures are bureaucratic beyond any possible imagination. Furthermore, they result in considerable delays in obtaining the funding for expenses already made. This mode of action is in strong contrast with the past experience and practice of FCT, when a substantial advance payment was provided.

The procedures now in place force the institutions to incur in higher financial responsibilities and severely increase the risk of a financial rupture.

This forced INESC Porto to hire more staff just to place cost statements and reimbursement requests according to the monstruous paperwork imposed upon, built to deal with the financing of an LA with headquarters in a region out of Lisbon (therefore, with financing entirely depending on QREN).

The administrative procedures are furthermore characterized by the application "backwards" of rules that were never in place before and by the non-recognition of sound practices for years accepted by FCT and certified by the European Commision. A bureaucratic delirium has taken over the QREN and the administrative control of projects, which causes great stress to the R&D organizations.