FCT Relatório Científico 2009 Print: 01-04-2010 10:00:51 [INESC Porto - Instituto de Engenharia de Sistemas e Computadores do Porto]

General Information

Name of Research Unit:
(LA-Norte-14)
INESC Porto - Instituto de Engenharia de Sistemas e Computadores do Porto

Coordinator: José Manuel de Araújo Baptista Mendonça

Main Scientific Domain: Engenharia Electrotécnica e Informática

Other Subdomains: n/a

Host Institutions

Leading Host Institution: Instituto de Engenharia de Sistemas e Computadores do Porto

Other Institutions Involved:

Objectives & Achievements

Unit Description

IMPORTANT FOREWORD

INESC Porto is organized in multi-disciplinary Units associated to science and technology application areas. Therefore, in a Unit one may find already a blend of several distinct skills or scientific knowledge in distinct areas, as required for technology transfer. The FCT report format assumes that the generic organization of a LA is based on scientific areas and "research groups" per area, with multi-disciplinarity at the research line level. This is not the case with INESC Porto, and a better view of the institution, suited to the organization of this LA, may be found at http://profile.inescporto.pt/.

When examining this report, one must bear in mind that:

a) a research Unit with a scientific multidisciplinary profile has been identified with "research group"

b) under "collaborative work" in a "research line" one may find examples of joint efforts from distinct Units inside INESC Porto and multi-disciplinary work joining people from distinct scientific areas inside a Unit.

"Research lines" are a second tier of interdisciplinary activities. To gauge the full scope of interdisciplinary activity that characterize technology development and transfer, the "research groups" are perhaps even more fundamental and should be read in tandem.

The site http://profile.inescporto.pt/ includes also charts, comparisons 2002-2007, data for 2008 and for 2009, some presentations in power point form and other material relevant to the understanding of all the dimensions of activity of the LA.

The official site is http://www.inescporto.pt. A monthly news bulletin is http://bip.inescporto.pt.

IMPORTANT REMARK

FCT opened a web form for 2009 that did not allow the change (since 2007) of the Principal Investigators of RG or RL - nor the identification of new Research Groups. The correct information has been, therefore, inserted wherever possible.

MANAGEMENT

INESC Porto depends on its GC - General Council, where its Associates take seat:

University of Porto (40%)

INESC (36%)

FEUP (18%)

FCUP (4%)

IPP (2%)

The GC appoints the BD - Board of Directors (5, one full time) for a 2-year mandate.

In 2009, INESC Porto was organized in 6 research Units plus 1 Group (a proto-Unit), 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.). See http://www2.inescporto.pt/ip-en/about-us/organization.

The BD meets every other week with the DIL Coordinator. In alternate weeks, the BD meets in the Units Council (UC) with Unit Coordinators, 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 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 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 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. The members of these councils are appointed by the GC.

The enlargement of the LA to External Groups led to the extension of the UC to a LA Coordinating Council. Also the SAB and the SC have been extended. INESC Porto LA provides scientific and strategic consolidation but INESC Porto continues to exist as an independent private entity.

General Objectives

MISSION

The mission of INESC Porto is:

* To undertake R&D activities in specific areas generating internationally competitive science and technology

* To act as an effective interface between the university and companies, public institutions and services, through contract research, technology transfer, specialized consulting and advanced training

* To actively contribute for the development of the Portuguese science and higher education system and promote its continuous adaptation to societal needs.

DOUBLE ROLE

INESC Porto is recognized by the Ministry of Science as a Unit of 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, public administration and institutions in general, through technology transfer and innovation as well as highly specialized consultancy.

INESC Porto also promotes spin-off and spin-out companies, hosting them during an early-stage pre-incubation phase and often participates in their capital with seed money.

EVOLVING FOOTPRINT

Since 2007, INESC Porto LA has been challenged to integrate research groups that were previously linked to other institutions. Three of these groups underwent an independent evaluation process by FCT and were classified as Very Good. Two of them (LIAAD and CRACS) are mentioned in this report because their integration process in on-going since 2007 (although their officially recognition as part of INESC Porto LA by FCT was still pending in Dec 2009).

STRATEGIC CONCEPT

INESC Porto embodies the concept of knowledge production chain: FROM KNOWLEDGE PRODUCTION TO SCIENCE-BASED INNOVATION. The working organization obeys 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 Porto 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.

Main Achievements during the year of 2009

INTERNATIONALIZATION/WORLD RECOGNITION

* IEEE Fellows regularly spend sabbatical time at INESC Porto

* 2 IEEE Fellows now among permanent research staff

* The no. of papers co-authored with researchers from foreign institutions has increased consistently

* Contracts with ESA (EU), DoE/Argonne NL (USA) and others in Europe and Brazil

* 20 European projects run at simultaneously

* 40% of PhD students are foreigners

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

SUSTAINED GROWTH

* A 10 million Euro plan for 2010 (after 8.5 million in 2009)

* Record number of 104 researchers holding PhD degree in 2009 (98 in 2008)

* Expectation of growth with the negotiated enlargement to 3 external Units CRACS, LIAAD and UGEI (still waiting for 2 years to be recognized by FCT).

* A new project to build a Knowledge Center for Sustainable Energy (including investment of about €3.5 M in 2010-2012)

THE SCIENTIFIC PRODUCTIVITY AND THE POLICIES TO STIMULATE IT

* New record number of 86 papers published in international journals (79 in 2008) and record total number of 321 publications in journals and international conferences

* The no. of international journal papers increased 6 times in 2002-2008 while the no. of researchers holding a PhD degree had only a 2-fold increase

* A rate of approval of FCT funded projects above average

* Creation of the concept of LAI (Inter-unit activity line) to promote cross-fertilization among Research Groups

THE TECHNOLOGY TRANSFER/KNOWLEDGE VALORIZATION

* In 2009, 29 projects were analyzed and 11 projects entered a pre-incubation process

* First companies launched (MOG and Fibersensing) reached €3 M sales in global markets (€2 M in 2008), with 80% exports.

IMPROVEMENT IN INSTITUTIONAL MANAGEMENT

* New concept in Unit leadership implemented

* External impact (national and international) of INESC Porto Bulletin BIP (read in 40 countries on average per month, thousands of hits).

SCIENTIFIC/TECHNICAL ACHIEVEMENT - ONE EXAMPLE PER RESEARCH GROUP

* New concepts integrating renewable generation, leading to the development of an advanced tool for operating reserve evaluation and resulting in a new research contract with the Portuguese and Spanish TSO to deliver such tool for practical application.

* Contributions for innovative concepts and solutions for planning and management of complex supply chains, applied in the automotive industry for the fast production of customized cars (under the ongoing AC/DC European project, for the "5 days cars").

* Novel developments of nonlinear effects for optical sensing based on Raman/Rayleigh scattering

* A project on "A small autonomous vehicle", a research contract with DELTAMATIC - Engenharia e Automação Industrial, S.A, resulted in a fully functional prototype.

* The successful completion of CAALYX Project in 2009, led to several European proposals in this area that were approved (eCAALYX, CAALYX-MV and ICT4DEPRESSION) and that will boost research activities in the Ambient Assisted Living area in the next years.

* Metadata and context-aware techniques applied to networked multimedia applications and content management

Activities

Integrative/multidisciplinary activities during the year of 2009

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 Porto 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 and transiently resources form 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 originate from the Telecommunications and Multimedia Unit, the Power Systems Unit and the Optoelectronics and Electronics Unit.

A scientific discipline may be spread among several Units, due to the organization of INESC Porto. In 2008, a new model started being studied to independently promote a sense of internal recognition and external visibility of this fact. In 2009, invited by the Board of Directors (BD), a member of the Scientific Advisory Board (Prof. Fortes, University of Florida, USA) helped in designing a new strain of activities which received the name of 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 several domains have been proposed and the first launched was in Optimization and Operations Research.

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 considerable number of examples can be found in 2009, 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.

The constitution of a new Knowledge Center for Sustainable Energy, joining external groups in Chemical Engineering (two rated as Excellent by FCT, including part of another LA) under the coordination of INESC Porto is a new organized effort to support research across disciplines. In 2009 the project has been put up and will come to light in 2010 with the erection of a new building next to INESC Porto headquarters.

Outreach activities during the year of 2009

INESC Porto gives great importance to communication with citizens. In 2009 this activity followed the general trend of recent years and the condensed report that can be made is no different from past reports in its broad lines.

The Communication Service was organized and is headed by a specialist graduated in Media and Communication. An external service was contracted to watch the media and allow news and press releases to flow to newspapers, radio and tv, in order to promote public awareness (and understanding) of science and make informal contributions to science education.

The Communication Service, 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. In 2009 this BIP bulletin completed 10 years and 99 issues, which is remarkable together with the general acceptance it receives.

A version of BIP in English (http://bip.inescporto.pt/index.php?lng=en) is also published every 3 months.

Google Analytics provided a counting of accesses to BIP: in the period of October 1-31, 2009, the Bulletin had 2303 hits from 1488 different persons, from 35 countries, the top being Portugal, Brazil, USA, Germany, UK, Spain, France, Argentina, Italy and Belgium. In February 2010 this number amounted to 1714 hits from 1283 visitors in 43 countries.

INESC Porto 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 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.

This cooperation with CV has been extended to the participation of experts from the LA in meetings in the Parliament with its Members to create awareness in the people's representatives of a number of problems linking science and society. Also, a member of the Board of Directors is a member of the Scientific Advisory Board of the Ciência Viva Center of Bragança.

Support to the University of Porto annual event, Mostra da Ciência (Science Exhibit), has also been given as well as support to Engineering and Sciences Faculties Open Days, highlighting the LA activities. INESC Porto also participated in national Exhibitions organized by the Innovation Agency and the Ministry of Science to disseminate science and technology accomplishments by Portuguese researchers.

Public talks and lectures were given by the senior members of the LA in various locations, in secondary schools and in Civic Associations, beside scientific and technical meetings.

Funding

	2005	2006	2007	2008	2009
LA FCT	652.720,00	894.690,00	1.250.000,00	1.447.500,00	1.971.592,05
Units FCT	0,00	0,00	0,00	0,00	
Projects FCT	275.687,00	308.790,00	243.958,00	464.320,00	499.951,10
Other (National)	1.529.888,00	983.733,00	1.343.667,00	998.469,00	381.029,90
Other (International)	1.239.997,00	1.293.840,00	1.417.767,00	1.191.549,00	871.931,86
National Industry	1.216.326,00	1.351.126,00	1.409.480,00	1.636.454,00	2.228.402,57
International Industry	100.325,00	118.670,00	96.110,00	155.477,00	374.263,20
	5.014.943,00	**4.950.849,00**	**5.760.982,00**	**5.893.769,00**	**6.327.170,68**

General Indicators

	2005	2006	2007	2008	2009	Total
No. of Researchers Proposed	2,00	2,00	0,00	0,00	0,00	4,00
No. of Researchers Hired (LA)	1,00	4,00	4,00	0,00	1,00	10,00
Balance	-1,00	2,00	4,00	0,00	1,00	6,00
No. of Researchers Hired (Ciência Programme)	0,00	0,00	0,00	0,00	9,00	9,00
No. of Researchers (FTE)	308,00	2,00	692,00	0,00	102,00	
Training Masters (Master thesis completed)	109,00	106,00	146,00	0,00	198,00	559,00
Training PhDs (PhD thesis completed)	79,00	81,00	93,00	0,00	15,00	268,00

Researchers Hired

Name	Start Date	End Date	Other Institution
agostinho manuel carvalho de oliveira	02-02-2009	01-02-2011	
Alexandre Rocco	01-06-2009	31-05-2010	
Dr. Gali Hema Chandra	29-07-2009	28-07-2010	
Fabien Gouyon	01-06-2009	14-01-2012	
Geral Bernard Sheble	15-04-2009	31-01-2010	
Iryna Yevseyeva	01-06-2009	31-05-2010	
Jorge Costa de Sousa e Castro	01-06-2009	31-05-2010	
Paulo Jorge Brandao Moreira	01-06-2009	31-05-2010	
Pedro Alberto da Silva Jorge	01-01-2009	31-12-2011	
SUMAILI AKILIMALI JEAN	17-07-2009	16-07-2010	

Technical Personnel Hired

Name	Start Date	End Date	Other Institution
No technical personnel found...			

Additional Comments

Additional Comments

1. The columns in the first table (section 1. Composition and Training) referring to the years before 2009 are meaningless. The on-line form did not allow any correction to values that are obviously wrong - see, for instance, the no. researchers FTE, that oscillates between 2 and almost 700!... The dimension of the LA cannot be of 2 researchers for sure... The correct number for 2009 is of 104 and in previous years it was below this number although always in an increasing trend.

2. The lines referring to MSc and PhD thesis have had their meaning changed. In past reports, one would report the number of on-going thesis

supervisions; this table now changes the meaning to "completed theses" so the numbers are not comparable among years although in the same line.

3. The column for 2008 is all in zeros which makes it evident that some kind of error happened when generating this table.

4. Along a number of years, INESC Porto has asked a number of times for some of these numbers to be corrected but until the present moment this has not been possible.

In the site http://profile.inescporto.pt other information is made available about the LA.

Research Groups

Reference	Title / Principal Investigator
RG-Norte-50014-3346	Manufacturing Systems Engineering (Jorge Manuel Pinho de Sousa)
RG-Norte-50014-3347	Telecommunications and Multimedia (José António Ruela Simões Fernandes)
RG-Norte-50014-3348	Optoelectronics and Electronic Systems (José Luis Campos Oliveira Santos)
RG-Norte-50014-3349	Power Systems (Manuel António Cerqueira Costa Matos)
RG-Norte-50014-3351	Innovation and Technology Transfer (Maria Alexandra Neves Soares dos Reis Torgal Lobo Xavier)
RG-Norte-50014-3406	LIAAD Laboratory of Artificial Intelligence and Decision Support (Vladimiro Henrique Barrosa Pinto Miranda)
RG-Norte-50014-3435	Software Engineering and Information Systems (Mário Jorge Moreira Leitão)
RG-Norte-50014-3507	CRACS Center for Research in Advanced Computing Systems (Vladimiro Henrique Barrosa Pinto Miranda)

Research Lines

Reference	Title / Principal Investigator
RL-FIS-LA14-96	FIBER OPTIC DEVICES AND NETWORKS FOR MULTI-PARAMETER SENSING (José Luis Campos Oliveira Santos)
RL-EEI-LA14-97	ENABLING TECHNOLOGIES FOR NETWORKED AUDIOVISUAL SERVICES (José António Ruela Simões Fernandes)
RL-EEI-LA14-98	ELECTRIC SECTOR AND INTEGRATED TERRITORIAL PLANNING (Manuel António Cerqueira Costa Matos)
RL-EGE-LA14-99	ENTERPRISE COOPERATION NETWOKS (Jorge Manuel Pinho de Sousa)

Other Activities

Internal Services and Resources

The LA 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. The research laboratories created by INESC Porto are shared with these departments on a regular basis, especially for post-graduation studies. However, vast support to under-graduation is also real, especially for final year project or thesis work. Also, a diversity of examples of cooperation with other LAs exists.

The LA has built a strong management structure which allows researchers and research units to share many resources. The following services are centrally provided and shared: 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 34 full-time contracted personnel, building a highly efficient and qualified pool of people that help creating the high quality environment provided to the researchers.

Software tools are acquired by the LA and made available to researchers and research units through sharing mechanisms. This process is controlled by SCI (Computer Service).

Resource sharing among internal groups and with external entities is regular. Just a few examples in 2009 follow, parallel to 2008:

Under the responsibility of the Power systems Unit (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. Simulation software like EUROSTAG and PSSE as well as computer resources installed at FEUP.

In the area of UOSE (optoelectronics), sharing the clean room area with the Physics Department of FCUP, enabling pre- and post-graduation training in micro-fabrication technologies. The clean room is also shared with the Associate Laboratory IFIMUP located at the Physics Department. IFIMUP is together in an Associated Laboratory with INESC-Microelectronics and Nanotechnologies (in Lisbon) and INESC Porto is one of the owners/associates of this institution.

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. Some of these activities are formally recognized and funded in a project under the FCT-CAPES bi-lateral agreement.

ITQB and REQUIMTE are other Associate Laboratories with whom INESC Porto LA develops partnerships looking for synergies using complementary competences.

In the area of UTM (telecommunications), sharing with UOSE, and also with FEUP and FCUP of a Photonics and Microwaves laboratory, set-up with funding from FCT.

In the area of software, USIG maintains a software infrastructure sharing costs with other Units, particularly an ORACLE DBMS and associated tools (sharing with UTM and UESP) and ESRI GIS (sharing with USE).

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.

External Services and Resources

In 2009, INESC Porto continued the policy defined in past years of providing assistance to Governmental and other public interest bodies, in the great majority of the cases without any payment for the work done. 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.

Among the actions developed in 2009, and only as examples mostly of non-paid activities, one may identify

- assistance to the Ministry of Economy and Innovation and to Regional Coordination and Development Commissions in the definition of regulations and tenders for national funding programs in the framework of QREN (the framework of the application of the European Regional Development Fund Programs in Portugal).

- advice on technology trends upon request to INOVCAPITAL, the state controlled risk-capital company (since 1999)

- assistance to the Innovation Agency (AdI)

- preparation for the Regional Government of Madeira of Laws for the electric energy sector

- consultancy to the Regional Coordination and Development Commissions of Northern Portugal (CCDR-N) and Lisbon and Tejo Valley (CCDR-LVT)

- support to a NCP of the IST Program resident at INESC Porto

- activity of researchers as National Delegates to the committees of IST and NMP programs (7FP)

- 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

As a member of the Council of the Associated Laboratories (CLA)

- Feedback to FCT on rules to be adopted in national calls for grants and on changes to the Public Contracts Law

- Active role in the discussion of models enabling the eventual inclusion of the Associated Laboratories of the University of Porto in the new juridical Foundation format of this University

- Advice to other Associated Laboratories in specific juridical and accounting procedures

Networking Actions

The LA policy is of strongly supporting networking.

INESC Porto LA has several Agreements with foreign Universities with emphasis to Brazil and the EU, and with companies and research centers. These have originated projects and allowed a great number of exchanges of students and post-docs for short and prolonged stays.

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.

* Regular activity of the Center of Knowledge on the Railway (consortium with FEUP and institutes in Mechanical and Civil Engineering), including Board of Directors.

* Constitution of the Center of Knowledge on Sustainable Energy (together with other FCT Units including another LA in Chemical Engineering).

* Promotion of a cooperation network with the major Brazilian Universities

Examples of actions led by Units (many more exist):

USE

Governing Board of the EES/UETP Euro consortium for adv. training involving universities and companies.

Euro Working Group of Multiple Criteria Decision Aid

UOSE

National network of competence in Sensors and in Optical Fiber Sensors with IT Aveiro and University of Aveiro

CEMICRO, a Portuguese network in Microfabrication

Various Management Committees of COST Actions (members of the INESC Porto LA are National Delegates in 6 COST Actions)

UTM

VISNET II (Networked audiovisual media technologies), Network of Excellence of the FP6 IST programme

EIFFEL Support Action (http://www.fp7-eiffel.eu/home.html) - coordination of the topic "user-provided networking"

Thematic Network on Mobile Communications (http://rtcm.inescporto.pt)

UESP

Manufuture ETP – A highly relevant network of companies and R&D institutions with centers in all Europe and motivated by INESC Porto in Portugal.

SoColnet – Society of Collaborative Networks

ERIMA - European Research in Innovation and Management Alliance

Footwear ETP - Footwear Products and Processes European Technology Platform

ROBIS

UMS (Unmanned Maritime Systems) initiative of the EDA (European Defence Agency)

USIG

ELANET – European Local Authorities Telematic Network

ADDME – Activating Drivers for Digital eMpowerment in Europe (Digital Divide Thematic Network)

CEDT – Association focused on dematerialization solutions.

Training Activities

INESC Porto LA provides internal and external training. A recent survey tracking the carrier of 700 ex-researchers has shown them to have jobs in leading companies in 17 countries.

Internal training is addressed to all its collaborators. The effort in internal training, in 2009, could not benefit from the support that in the past public financing tools were providing, because of a change of policy that left out advanced training from the supported topics. Specific actions supporting individual requests were supported by the LA.

Externally, INESC Porto LA 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:

SPECIFIC TRAINING COURSES FOR THE INDUSTRY:

Organization of EES/UETP (University Enterprise Training Partnership) courses and participation in lecturing activities in other EES/UETP courses organized by other institutions (European scope with several companies and universities as partners), especially addressing the industry and the power sector.

Advanced training of young researchers in the framework of two research contracts with PT Inovação (Portugal Telecom): GrCLIFmcast (Management of multicast sessions for IP based services created by users) and ASP Domestic Networks (Authentication, Security and Privacy solutions for Domestic Network services)

HIGHER EDUCATION:

JADES – Joint Advanced Doctoral programme in Energy Systems (Bosnia and Herzegovina, Macedonia, Serbia), EU-TEMPUS, 2008-2010.

Project "ELLEIEEC-Enhancing Lifelong Learning for the Electrical and Information Engineering Community" (2008-2011) 1428-LLP-1-2008-FR-ERASMUS-ENW.

All Units of INESC Porto LA have also been deeply involved in training actions targeting students at pre-graduation, MSc and PhD levels, namely regular collaboration and student framing by the Research groups in the scope of the MIT-Portugal (area of Engineering Design and Advanced Manufacturing - EDAM), 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

Outreach/Science and Society

INESC Porto gives great importance to communication with citizens. In 2009 this activity followed the general trend of recent years and the condensed report that can be made is no different from past reports in its broad lines.

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the Board of Directors is a member of the Scientific Advisory Board of the Ciência Viva Center of Bragança.

Support to the University of Porto annual event, Mostra da Ciência (Science Exhibit), has also been given as well as support to Engineering and Sciences Faculties Open Days, highlighting the LA activities. INESC Porto also participated in national Exhibitions organized by the Innovation Agency and the Ministry of Science to disseminate science and technology accomplishments by Portuguese researchers.

The UOSE Research Group (RG) participated actively in the Physics Summer School of the Physics Department of Faculty of Science of Porto University (http://e-fisica.fc.up.pt/) directed to high school students. The RG proposed short scientific projects that are realized by groups of five students with ages between 15 and 18 years old during 5 days. Each group of students works under the supervision of a PhD student from the RG. Some projects are: Gas sensors for environmental monitoring, Implementation of a bar code reader, Temperature measurement by luminescence, Holographic interferometry by double exposure: a light ruler, Temperature sensor using Bragg gratings, Fluorescent nanoparticles for sensors and medical imaging, Optical transmission of audio and video signals and Laser scanning system for tridimensional characterization of objects. During the week long period the students also visit the research labs, namely the RG clean room and other microfabrication facilities.

Public talks and lectures were given by the senior members of the LA in various locations, in secondary schools and in Civic Associations, scientific and technical meetings. A few examples (not an exhaustive list) of this participation in the society life collected from the Telecommunications and Multimedia and the Power Systems areas:

J. Ruela, "Quality of Service (QoS) in IP networks", VISNET II Summer School, Koç University, Istanbul, June 2009.

M. T. Andrade / V. Barbosa, "Context-aware content adaptation: standards and research trends", VISNET II Summer School, Koç University, Istanbul, June 2009.

P. Mendes, "BYON: Build your own Network", EIFFEL 3rd think-tank meeting, Athens, October 2009.

R. Sofia, "Ethernet Advanced Forwarding, a Primer", University of Alcala, Madrid, May 2009.

J. Peças Lopes, "Smart Grids and Mobility", Invited talk, Int. Conf. on Technology Policy and Innovation, Porto, 2009 July

Vladimiro Miranda, "Training intelligent systems with entropy concepts: wind power prediction and other applications", invited plenary speaker at the ISSE 2009 (Int. Workshop on Sustainable Energy), Tokyo, Japan, December 2009

Similar examples would be found in the other areas of expertise of INESC Porto, with impact in schools, industry, media and general public.

Organization of International Events

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.

ICTPI'09 - Int. Conf. on Technology, Policy and Innovation, Porto, Portugal, July 2009

U-NET 2009 - 1st international workshop "User-provided Networks, Challenges and Opportunities" (http://conferences.sigcomm.org/co-next/2009/workshops/unet/), Rome, Dec. 2009

SEON – Symposium on Enabling Networks and Sensors, with IT-Aveiro, Lisboa, 26th June 2009

VIII International Workshop on Cutting, Packing and Related Topics, Vila Nova de Foz Côa, Portugal, September 2009 (http://www.fe.up.pt/~esicup/extern/8IWCPRT/).

10th EU/MEeting workshop (the European metaheuristics community) - Debating the future: new areas of application and innovative approaches, Porto, Portugal, April 2009.

SMC 2009 - 6th Sound and Music Computing Conference and SMC Summer School, Porto, July 2009

U-NET 2009 - 1st international workshop "User-provided Networks, Challenges and Opportunities" (http://conferences.sigcomm.org/co-next/2009/workshops/unet/), Rome, Dec. 2009

3rd EIFFEL Think-tank meeting, session "BYON: Build Your Own Network", Athens, Oct. 2009

VISNET II Summer School, Koç University, Istanbul, June 2009

A large number of events in which INESC Porto researchers served as Chair/Vice Chair of the Organization or Members of Technical/Scientific Committees could be listed. Two examples from the USIG RG:

WikiSym 2009, 5th International Symposium on Wikis and Open Collaboration, Oct 25-27 , Orlando, USA – Ademar Aguiar: Symposium Committee, Sponsorships Chair; and Program Committee

SIACG 2009, IV Iberoamerican Symposium in Computer Graphics, Margarita, Venezuela, Jun 15-17 – Augusto Sousa - Member of International Organization Committee

Internal Evaluations

Summary of internal evaluations during 2009

INESC Porto conducts a policy of periodic internal evaluation. In 2009, the procedures adopted were the same as the ones put in place in previous years.

Scientific and technical evaluation:

Every 3 months all researchers, 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.

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 assesses 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 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 Porto is regulated by an annual plan, approved by its General Council.

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

In 2009, taking in account the planned enlargement of INESC Porto LA of the Groups LIAAD and CRACS, plus a new Group UGEI that requested entering the LA, a strategic evaluation was conducted by the President of the SAB in coordination with his Committee fellows. The result was the support of the plans put up by the Board of Directors to admit those Groups and the preparation of written statements that were sent to FCT in due time.

Future internal Evaluations plan for 2010

INESC Porto has always had a policy of interaction with its SAB (Scientific Advisory Board) while respecting its independence.

One has never had a policy of inducing the SAB to generate a ranking or classification of the LA. On the contrary, 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.

Furthermore, without the evidence of independent analysis, an evaluation process led by the SAB risks to appear to the public opinion as lacking credibility. The SAB and its members are hosted and have expenses paid by the institutions they are supposed to analyze and this may place its members in an uncomfortable position.

Having stated this, 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.

This process will naturally be built on top of the regular evaluation procedures that INESC Porto already has in place:

* 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.

Future Objectives

Summary of proposed future objectives

INESC Porto LS plans to have (as soon as FCT formally recognizes the new LA structure) five main research lines, designed to enhance internal coherence and multi-disciplinarity, maximize external impact and guarantee in Portugal a solid knowledge core in key areas. These lines (subject to redefinition, since the definition of the new scenario in pending since 3 years) will be :

1. Networked Multimedia Systems and Services in scenarios of convergence

2. Photonics for Life Sciences: Optical Biochemical Sensing and Imaging

3. Sustainable Energy Systems - bulk and distributed systems in a market environment

4. Advanced Manufacturing Management, Innovation and Enterprise Cooperation Networks

5. Digital Society - large scale platforms, advanced services, citizen participation and policies

The first 4 lines represent an evolution over the 4 lines defined for the 2002-07 period. There will be some reshaping of the objectives for the coming years. The first line has a strong focus on telecommunications and multimedia, the second on sensor technologies, the third on energy systems, the fourth on industrial systems – which are the traditional strong areas of INESC Porto.

The fifth line represents a new catalyst for the activities whose support is software, computer science and artificial intelligence. This is a direct result of the expected integration in INESC Porto LA of the two new autonomous groups LIAAD and CRACS, to be approved by FCT after the evaluation of INESC Porto. These Groups have had independent evaluations by FCT and their effective integration is one of the objectives of the LA for the coming period.

The activity of the LA will not be restrained to these 5 lines, however.

Other objectives include:

1. The increase in productivity: in publications, projects, patents, highly specialized consultancy

2. The increase in the number of spin-off or spin-out companies

3. The acquisition of a sustained international status and enlargement of the geographical area of activity to South America

4. A full integration and real influence in the strategy designed by the University of Porto as a research university

5. Consolidation of a decisive presence in industry partnerships and networks.

Group Description

Title of Research Group:	(RG-Norte-50014-3346) Manufacturing Systems Engineering
Principal Investigator:	Jorge Manuel Pinho de Sousa
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

UESP

Fundação para a Ciência e a Tecnologia: 80.871,29 €

European Commission: 423.290,79 €

QREN: 19.667,25 €

TOTALI: 523.829,33 €

ROBIS

No funding coming directly from state sources

Objectives & Achievements

Objectives

FOREWORD

Because the FCT computer application did not allow the addition of a new Group, we report here that activities of the Manufacturing Systems Engineering (UESP) Research Group plus the activities of the newly formed (mid 2009) Robotics and Intelligent Systems (ROBIS) Group, which is being organized in connection with UESP since June 2009 by decision of the Board of Directors of INESC Porto.

UESP

The main goal of the group is to improve of performance of industrial enterprises through R&D projects, consulting, technology transfer and training services, with a high emphasis on a strong application focus. Its main competences are related to Operations Management and Enterprise Information Systems, applied to industrial companies and enterprise collaborative networks.

The main activity areas include: Enterprise Cooperation Networks, Decision Support Systems; Operations Management and Production Planning, Internal Logistics, Optimization of Cutting and Packing, Systems integration, and consulting, in the following domains:

• Cooperative Enterprise Networks Management: build-to-order strategies for complexity and variety, dynamic capacity management, early warning management, operations co-ordination in dynamic supply networks, semantic and technical Interoperability, collaborative performance management, life-cycle support of self-forming business networks.

• Information Management and Knowledge in Collaborative Networks: socio-technical analysis models in organizational networks, collaborative processes in organizational networks, information and knowledge management in organizational networks.

• Operations Management and Production Planning: structuring of decision processes; optimization methods; Combinatorial Optimization and meta-heuristics; optimization for planning and scheduling problems; Simulation; vehicle routing and transportation systems; Decision Support Systems.

• Optimization of Cutting and Packing: incorporation of real-world constraints and objectives in the pure/theoretical cutting and packing optimization models, integrated resolution of cutting and packing problems and related tactical and operational problems, use of meta-heuristic techniques, often in their multi-objective versions, hybridization of meta-heuristics and exact methods.

ROBIS

This Group was created in INESC Porto LA, linked to UESP, in June 2009, when a number of researchers joined the institution. Therefore this refers to 6 months of activity until December 31, 2009. Its Coordinator (equivalent to Principal Investigator) is Dr. Antonio Paulo Moreira.

The Group is engaged in discovering and developing fundamental scientific principles and practices, such as perception, control and planning, applicable to intelligent robot systems and other complex dynamic systems, in a wide range of application domains, namely robots that navigate through complex indoor and outdoor spaces and advanced flexible manufacturing support systems. Research activities address not only robotics but also application areas where technologies used in robotics play an important role, like control, automation, simulation, modeling, intelligent systems, etc.

The main competences are related to Robotics and Intelligent Systems applied to industrial companies and service companies, 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.

• Intelligent control and simulation: simulation applications for complex dynamic electro/mechanical systems..

Main Achievements

UESP

During 2009 a large number of projects have been launched, namely four new large European RTD projects, one led by INESC Porto, in the fields of Enterprise Collaboration Networks and Operations Management. A very active participation in the Manufuture and Footwear European Technology Platforms played an important role in the preparation and set-up of these projects.

A large number of projects were started also at a national level, including research projects funded by FCT, RTD projects in partnership with companies and consultancy services.

During 2009 the following important achievements are highlighted:

• The e-biz-tcf project (Harmonising eBusiness processes and data exchanges for SME's in the textile/clothing and footwear sectors in the Single Market) has implemented and validated innovative architectures for ebusiness integration in pilot projects at an European level. INESC Porto was responsible for the management of the implementation of the project results in nine Portuguese companies.

• New concepts and approaches for the management of complex supply networks were developed, leading to faster responses in the automotive industry (under the ongoing AC/DC European project).

• A framework for demand forecasting in the Retail Industry was developed. This framework includes methodological support to guide the resolution of problems and a simulation tool that can analyze sales historical data and several simulation scenarios.

• The "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. The distribution network of this software application was extended to a large Portuguese ERP vendor and to one company operating in Germany and Austria. At the moment more than 20 licences have already been sold by I68.

• In the field of multi-criteria operations scheduling, several small research initiatives have been launched or continued, in order to consolidate the scientific leadership of INESC Porto in this field.

• A framework for demand forecasting in the Retail Industry was developed. This framework includes methodological support to guide the resolution of problems and a simulation tool that can analyze sales historical data and analyse several simulation scenarios.

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• In the field of multi-criteria operations scheduling, several small research initiatives have been launched or continued, in order to consolidate the scientific leadership of INESC Porto in this field.

ROBIS

During 2009 the group took a strong effort in promoting new projects and was reinforced with 5 new PhD students. At the end of 2009, 2 new RTD and innovation projects were approved for funding. The following achievement must be noted:

• A project on "Robotized application of non-stick, anti-corrosion and self-lube coatings", a industry contract with FLUPOL – Aplicações Técnicas de Polímeros Fluorados, Lda reached the end with successful results and will constitute a departing point to a new and larger project.

• A project on "A small autonomous vehicle", an industry contract with DELTAMATIC - Engenharia e Automação Industrial, S.A, resulted in a fully functional prototype.

• New concepts for artificial vision applied to industrial manipulators and to mobile robots, were developed.

• Systems for global localization and control of mobile vehicles are in a mature stage of research in the group.

• Realistic simulators and virtual reality were developed and ready to use in robotic systems research.

• The study of coordination, cooperation and formation control of multiples robots is also in a high level of priority with already some results.

As a result of this research activity, during this period the members of the Group concluded 2 prototypes.

Group Productivity

Publications in peer review Journals

UESP

Total number of publications: 6

List can be consulted in: http://profile.inescporto.pt

M Teresa Costa, A. Miguel Gomes, José F. Oliveira, "Heuristic approaches to large-scale periodic packing of irregular shapes on a rectangular sheet", European Journal of Operational Research, vol. 192, January 2009, pp.29-40.

José António Crispim, Jorge Pinho de Sousa, "Partner selection in virtual enterprises: a multi-criteria decision support approach", International Journal of Production Research, Volume 47, Issue 17, January 2009, Pages 4791 – 4812.

Julia A. Bennell, José F. Oliveira , "A tutorial in irregular shape packing problems", Journal of the Operational Research Society, vol. 60, Supplement 1, May 2009, pp.S93-S105.

Claudia Chituc, Américo Azevedo, César Toscano, "A framework proposal for seamless interoperability in a collaborative networked environment", Computers in Industry, vol.60, no.5, June 2009, pp.317-338.

Claudia-Melania Chituc, Américo Azevedo, César Toscano, "Collaborative business frameworks comparison, analysis and selection: an analytic

perspective", International Journal of Production Research, vol.47, no.17, January 2009, pp.4855-4883.

Ana Moura, José F. Oliveira , "An integrated approach to the Vehicle Routing and Container Loading Problem", OR Spectrum, vol.31, no.4, October 2009, pp.775-800.

ROBIS

Patrícia Ramos, M. V. Neves, Monitorização de Descargas de Águas Residuais no Mar através de Veículos Submarinos Autónomos (VSAs), Ingenieria del Agua, vol.16, no.3, pp.201-216

André Conceição, António Paulo Moreira, Paulo José Costa, A Practical approach of Modeling and Parameters Estimation for OmniDirectional Mobile Robots, Proceedings of IEEE, IEEE/ASME Transactions on Mechatronics, vol.14, no.3, pp.377-381

Other publications International

UESP

Total number of publications: 13

List can be consulted in: http://profile.inescporto.pt

Mikio Kubo, J. P. Pedroso, "Metaheuristics: a Programming Guide" (inJapanese). Kyoritsu, Tokyo, 2009 [book].

Roberto Piedade, Américo Azevedo, "An SSM-Based Approach to Implement a Dynamic Performance Management System", in Proceedings of PRO-VE'09 - 10th IFIP Working Conference on Virtual enterprises, November, 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "Short-term Semantic Consensus: Toward Agile Ontology Specification for Collaborative Networks", in Proceedings of PRO-VE'09 - 10th IFIP Working Conference on Virtual enterprises, October, 2009.

Rui J. Rei, Peter Madera, João Pedro Pedroso, "Khronos - a High-level Framework for Discrete Event Simulation in Pyton", CIE39 - 39th International Conference on computers & Industrial Engineering, July, 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "A Socio-Semantic Approach to the Conceptualization of domains, Processes and Tasks in Large Projects", ICEIS 2009 - 11th International Conference on Enterprise Information Systems, in proceedings, 2009.

Ana Rodrigues, José Soeiro Ferreira, "Rural Postman Problem and Related Problems", VIII IWCPRT - VIII International Workshop on Cutting, Packing and Related Topics, 2009.

José Soeiro Ferreira, "Creativity, Soft Methods and Metaheuristics", pp 81-89, EU/Meeting 2009, 29-30 April 2009, Porto, Portugal

Jorge Pinho de Sousa, Luís Guardão, "A flexible multi-objective scheduling system based on configurable heuristics", EURO - 23rd European Conference on Operational Research, Bonn, July 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "A socio-semantic approach to collaborative domain conceptualization", Proceedings of OnToContent 2009 - The 4rth International Workshop on Ontology Content - OnToContent 2009, 2009.

Rui Gomes, Jorge Pinho de Sousa," Dynamic Vehicle Routing for Demand Responsive Transportation", EWGT2009 - 13th Euro Working Group on Transportation Meeting, Padua (Italy), September 2009.

Nazaré Rego, Jorge Pinho de Sousa, "Supporting the definition of strategies for the configuration of health care supply chains", Conference on Logistics Management 2009, Hamburg, September 2009.

Nazaré Rego, Jorge Pinho de Sousa, "Virtually centralized Supply Chain coordination in Hospitals", PRO-VE'09 - 10th IFIP Working Conference on Virtual Enterprises, Thessaloniki, Greece, October 2009.

José A Crispim, Jorge P Sousa, "Uncertainty in partner selection for virtual enterprises", PRO-VE'09 - 10th IFIP Working Conference on Virtual Enterprises, Thessaloniki, Greece, October 2009.

ROBIS

Total number of publications: 9

List can be consulted in: http://profile.inescporto.pt

Pedro Neto, J. Norberto Pires, António Paulo Moreira, Accelerometer-Based Control of an Industrial Robotic Arm, IEEE RO-MAN 2009 - 18th IEEE International Symposium on Robot and Human Interactive Communication, pp.1191-1197

Bruno Miguel Ferreira, Miguel Migueis Pinto, Aníbal Matos, Control of the MARES Autonomous Underwater Vehicle, OCEANS'2009 MTS/IEEE - OCEANS'2009 MTS/IEEE BILOXI, OCEANS 2009, pp.1-10, Biloxi, EUA,

Bruno Miguel Ferreira, Miguel Migueis Pinto, Aníbal Matos, Nuno Cruz, Modeling and motion analysis of the MARES autonomous underwater vehicle, - ., pp.1-10

Nadja Bressan, António Paulo Moreira, Pedro Amorim, Catarina S. Nunes, Target Controlled Infusion Algorithms for Anesthesia: Theory vs Practical Implementation, Proceedings of IEEE - EMBC'09 - 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society , pp.6234-6237, Minnesota,

Miguel Migueis Pinto, Bruno Miguel Ferreira, Aníbal Matos, Nuno Cruz, Side Scan Sonar Image Segmentation and Feature Extraction, OCEANS'2009 MTS/IEEE - OCEANS'2009 MTS/IEEE BILOXI,

Miguel Migueis Pinto, Bruno Miguel Ferreira, Aníbal Matos, Nuno Cruz, Using Side Scan Sonar to Relative Navigation, OCEANS'2009 MTS/IEEE -

OCEANS'2009 MTS/IEEE BILOXI,

José Lima, José Alexandre Gonçalves, António Paulo Moreira, Paulo José Costa, Humanoid Realistic Simulator - The Servomotor Joint Modeling, ICINCO 2009, pp.396-400

Raquel Pinho, Armando Jorge Sousa, Andre Restivo, ILAB - Inventory Manager for Electronics Laboratory, CISTI 2009 - 4ª Conferência Ibérica de Sistemas e Tecnologias de Informação, pp.537-541

Paulo Malheiros, Paulo Santos, António Paulo Moreira, Fernando Veloso Gomes, Francisco Taveira Pinto, Paulo José Costa, Robust and Real-time Motion Capture of Rigid Bodies Based on Stereoscopic Vision, RF'2009 - 3rd International Conference on Integrity, Reliability and Failure, pp.1-1, Julho, 2009.

Other publications National

UESP

No relevant national publications have been produced in 2009. However the participation of several members of the Unit in the conference of the Portuguese Operational Research Society (APDIO), held in Costa da Caparica, Almada, in September, was quite strong and led to several oral communications about the group's research activities.

ROBIS

Total number of publications: 12

List can be consulted in: http://profile.inescporto.pt

Bruno Miguel Ferreira, Miguel Migueis Pinto, Aníbal Matos, Nuno Cruz, Hydrodynamic Modeling and Motion Limits of AUV MARES, IECON09 - IECON2009, pp.2241-2246

André Carvalhosa, Pedro Machado, Armando Jorge Sousa, José Carlos Alves, Soft Core Robot with Joint Wheel Motion Controller, IECON09 - IECON2009

Armando Jorge Sousa, Catarina B. Santiago, Luis Paulo Reis, M. Luisa Estriga, Automatic Detection and Tracking of Handball Players, Proceedings of VipIMAGE 2009 - II ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing, pp.213-219

Patrícia Ramos, Nuno Cruz, Aníbal Matos, Nuno Miguel Abreu, Avaliação de Impacte Ambiental e Modelização de Descargas de Águas Residuais usando Observações Bio-ópticas de Veículos Submarinos Autónomos, Actas das 4ªs Jornadas de Hidrául - 4ªs Jornadas de Hidráulica, Recursos Hídricos e Ambiente da FEUP

Luis Paulo Reis, António J. R. Neves, Armando Jorge Sousa, Real-Time Vision in the RoboCup - Robotic Soccer International Competitions, Proceedings of VipIMAGE 2009 - II ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing, pp.319-324

Manuel Gouveia, António Paulo Moreira, Paulo José Costa, Luís P. Reis, Marcos André Ferreira, Robustness and Precision Analysis in Map-Matching based Mobile Robot Self-Localization, EPIA 2009 - 14th Portuguese Conference on Artificial Intelligence, pp.243-253

Armando Jorge Sousa, Catarina Maria Santiago, Paulo Malheiros, Paulo José Costa, António Paulo Moreira, Using Barcodes for Robotic Landmarks, EPIA 2009 - 14th Portuguese Conference on Artificial Intelligence, pp.299-311

Erik Moreira Pegoraro, Armando Jorge Sousa, FEUP Fuzzy Tool - Renewed and Extended, for Intelligent Control and Education, CISTI 2009 - 4ª Conferência Ibérica de Sistemas e Tecnologias de Informação, pp.639-644,

Rui Filipe Guedes, Luís Paulo Reis, Armando Jorge Sousa, Surpassing the Limitations of the NXT Lego Robot with Distributed Computing, CISTI 2009 - 4ª Conferência Ibérica de Sistemas e Tecnologias de Informação, pp.633-638,

José Lima, José Alexandre Gonçalves, Paulo José Costa, António Paulo Moreira, PLC and Petri Net Training Based on a 3D Virtual Car Park Modelling and Control., Proceedings of PAEE'2009 - 1st Ibero-American Symposium on Project Approaches for Engineering Education

Miguel Migueis Pinto, Bruno Miguel Ferreira, Aníbal Matos, Nuno Cruz, Using Side Scan Sonar for Relative Navigation, IECON09 - IECON2009

Paulo Malheiros, Paulo Santos, António Paulo Moreira, Fernando Veloso Gomes, Francisco Taveira Pinto, Paulo José Costa, Robust and Real-time Motion Capture of Rigid Bodies Based on Stereoscopic Vision, RF'2009 - 3rd International Conference on Integrity, Reliability and Failure, pp.1-1, Julho, 2009.

Master and Ph.D. thesis completed

Ph.D (UESP + ROBIS)

José António Crispim, Partner Selection in Virtual Enterprises (Orientador: Jorge P. Sousa), Doutoramento em Engenharia Electrotécnica e de Computadores da FEUP 2009

José Luis Sousa Magalhães Lima, Construção de um Modelo Realista e Controlo de um Robô Humanóide, Doutoramento em Engenharia Electrotécnica e de Computadores da FEUP (Orientador Paulo Gomes da Costa, Co-orientador António Paulo Moreira, DEEC-FEUP), Julho de 2009.

José Gonçalves, Modelação e simulação realista de sistemas no domínio da robótica móvel, Doutoramento em Engenharia Electrotécnica e de Computadores da FEUP (Orientador Paulo Gomes da Costa), 2009

M.Sc. (UESP + ROBIS)

A total of 50 M.Sc. theses were supervised and concluded in 2009, in the so-called Bologna format. There is no space to list all these theses.

Patents/propotypes

The following are some of the prototypes developed by the Unit during 2009:

UESP

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

Developed under (Project Name): Izaro Grey

Demo Place: INESC Porto, Softi9

Development Period: 2007-2009

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

Developed under (Project Name): eBiz-tcf

Demo Place: Fivelarte, Cindicalfe, Centenário, Lusocal, Maximo Internacional, Trielle, Mystic Sea, Globo Vermelho, Santos e Júnior

Development Period: 2008-2009

Name: A framework for demand forecast in the retail industry

Developed under (Project Name): SPRY

Demo Place: Wipro Retail

Development Period: 2008-2009

Name: Methods and tools for benefit balancing in automotive supply chains

Developed under (Project Name): AC/DC

Demo Place: Continental AG

Development Period: 2008-2009

Name: An agile optimization planning system for footwear producing SMEs – first prototype

Developed under (Project Name): AGILPLAN

Demo Place: Oficina de Soluções

Development Period: 2009

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

Developed under (Project Name): Parque Escolar

Demo Place: INESC Porto

Development Period: 2009

ROBIS

Name: SmallAGV – a small autonomous vehicle

Developed under (Project Name): contract with DELTAMATIC - Engenharia e Automação Industrial, S.A

Demo Place: INESC Porto

Development Period: 2009

Development together with ISR Porto

Name: Robotic Painting

Developed under (Project Name): contract with FLUPOL, S.A

Demo Place: INESC Porto

Development Period: 2009

Development together with ISR Porto

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

Developed under (Project Name): Parque Escolar

Demo Place: INESC Porto

Development Period: 2009

Organization of conferences

UESP

VIII International Workshop on Cutting, Packing and Related Topics , Vila Nova de Foz Côa, Portugal (2009 September 16/20) - Program and Organising Committee: Maria Antónia Carravilla, José Fernando Oliveira, António Miguel Gomes (http://www.fe.up.pt/~esicup/extern/8IWCPRT/)

10th EU/MEeting workshop (the European metaheuristics community) - Debating the future: new areas of application and innovative approaches, Porto, Portugal (2009 April 29/30) – Chair: Ana Viana.

ROBIS

Organizing Committe Members of the IMS10 - 10th IFAC Workshop on Intelligent Manufacturing Systems, Lisboa 1,2 July 2010 (José Gonçalves and José Lima)

Industry contract research

The Unit (UESP + 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.

The main industry research, consulting and technology transfer projects during 2009 were:

UESP

• Wipro – Research project contracted by the consulting company Wiro, aiming at the design and development of a framework for demand forecasting in the Retail Industry. This framework includes methodological support to guide the resolution of these problems and a simulation tool that can analyze sales historical data and study several simulation scenarios.

• MIBEP - Manufacturing Industries Business Performance Toolkit, contracted by the Portuguese company Inovultos. The objective is to design and develop a system to support performance management processes in industrial companies, the respective definition of KPIs and the automatic data collection to monitor those KPIs.

• Izaro Grey – design and implementation of several planned improvements in the scheduling optimization engine previously designed and developed.

• Consulting contracts to support several companies (Silampos, Digital Partners, 3M2P-Construção e Reabilitação de Edifícios, Lda., ANARIC, Confeitaria Mirene S.A., Metalfer, Oxisol, Padinho, Pedrosa&Rodrigues, PHC, SopSec and Waldemar Fernandes da Silva, S.A.) in analyzing their business processes, identifying their requirements in IT, supporting the selection and implementation of the selected solutions.

• Technical support to the implementation of internal logistic systems produced by the partner company Lirel.

ROBIS

• APLICAÇÃO ROBOTIZADA DE ANTI-ADERENTES (FEUP / FLUPOL – Aplicações Técnicas de Polímeros Fluorados, Lda), QREN - Sistema de Incentivos Vale I&DT, contrato nº 2009/3166, concurso nº 11/SI/2008, 2008 – 2009) , Principal Investigator: António Paulo Moreira

• VEICULO AUTÓNOMO PARA MOVIMENTAÇÃO DE PEQUENAS CARGAS, (FEUP/ISR e DELTAMATIC - Engenharia e Automação Industrial, S.A,) QREN - Sistema de Incentivos Vale I&DT, contrato nº 2009/4637, concurso nº 11/SI/2008, 2008 – 2009 - Principal Investigator: António Paulo Moreira

Internationalization

During 2009, UESP has participated in 7 European projects:

• AC/DC (Automotive Chassis Development for 5-Days Cars)

• The e-biz-tcf - Harmonizing eBusiness processes and data exchanges for SMEs in the textile/clothing and footwear sectors in the Single Market.

• Net-Challenge (Innovative networks of SMEs for complex products manufacturing) - this project in the field of Enterprise Collaboration Networks, was launched and is 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)

• DINAMIC - A new methodology for the promotion and dissemination of Innovation activities in European SMEs.

A strong activity in the MIT Portugal Program, in the areas of EDAM (Engineering Design and Advanced Manufacturing) and Transportation Systems, has been pursued.

Contacts with researchers abroad have been strengthened to prepare new research activities (Professors Mikio Kubo, from the University of Tokyo, and Abílio Lucena from Universidade Federal do Rio de Janeiro).

Members of the Unit also have a regular participation in the activities of EURO, the Association of European Operational Research Societies – the same for ESICUP in the area of Cutting and Packing. ESICUP is since 2003 an EURO Working Group and since the year 2000 its coordinator is J F Oliveira from the Unit.

Regular collaboration is on-going with the University of Valencia, under the framework of a project funded by the Spanish Ministerio de Ciencia e Innovación.

Members of ROBIS also established links and cooperation with several Universities abroad: I3S, University of Nice, France, Carnegie Mellon University, U.S.A., University of Dundee – U.K., Georgia Institute of Technology – U.S.A., King's College London – U.K., Universidade da Bahia – Brasil.

Government/Organization contract research

During 2009, the most relevant projects undertaken with the support of national RTD programmes were:

UESP

• Project PmColNet (a multi-paradigm approach to performance management in collaborative networks) and the project CROME (Criativity in optimisation with meta-heuristics) funded by FCT, are ongoing and will be finished during 2010.

• Project AGILPLAN (an agile planning system for footwear companies and networks) is supported by Agência de Inovação and aims at designing a methodology and support system for production planning optimization for SMEs, taking into account uncertainty and incompleteness of information. This project is led by Oficina de Soluções (a software house) and involves the Footwear Technological Centre and the user company AS.

• The RTD project MINERVA aims at designing and developing an innovative Maintenance Management solution for industrial companies. The project leader is Primavera Software and MIIT (a consultancy company) is also a partner.

• The Unit also participates in the FADIS project in partnership with the UITT Unit of INESC Porto. 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 and collaboration with the "European Collaboration for Service Internationalisation" initiative.

ROBIS

• DOLPHIN - Análise do Comportamento Hidrodinâmico de Dispositivos de Acostagem e Amarração. O Caso Crítico do Terminal Petroleiro do Porto de Leixões. (FCT/PTDC/ECM/72835/2006, 2007-2009) , FEUP-Principal Investigator: António Paulo Moreira, Project Member: Paulo Gomes da Costa

• ACORD – Coordenação Adaptativa de Equipas de Robôs (FCT/PTDC/EIA/70695/2006, 2007-2009), Project Members: António Paulo Moreira, Paulo Gomes da Costa, Armando Sousa.

• WWECO - Mapeamento de Plumas de Emissários Submarinos Baseada em Sensores Ópticos, FCT / 2008-2011 / INESC Porto + Águas do Oeste.

Future Research

Objectives

UESP

The research activity of the Unit has a strong interdisciplinary nature covering areas such as Decision Support Systems, Multi-objective Optimisation or Operations Management. Moreover, recently we had the possibility of developing work in topics related to supply-chain management, logistics, and transportation systems, and these opportunities are now leading us to structure our activities in order to handle a few challenging research questions arising in this area.

Under this light, the following themes:

a) Models and integration of cooperative networks

The ultimate goal is to develop: a) a global interdisciplinary theory for relationship management in organizational networks; b) business models and planning tools for creating, managing and dissolving collaborative networks.

Moreover research will be pursued in the domain of semantic integration of organizational structures formed by autonomous, independent and heterogeneous entities acting in a dynamic and competitive environment towards an environment of self-forming collaborative networked organizations. We will also go on contributing for the development of a conceptual framework allowing the integration of all actors involved in cooperative networks, and supported by interoperability protocols and domain semantic standards.

b) Information and knowledge management

The focus of this research line will be on the social process perspective of knowledge creation and use of collaboration as the fundamental instrument for that creation. This will involve working on: a) socially constructed socio-technical artifacts; b) collaborative workspaces for management; c) applications of networking theories.

In particular research will be pursued on "socio-semantics in collaborative networks", aiming at developing innovative concepts and applications for the management of information and knowledge in collaborative networks.

c) Decision Support Systems and Combinatorial Optimization

This research area has a long record in the Unit's activity, being quite relevant, both in scientific and economic terms, as it deals with raw material usage optimization. The research developed by the group has been applied in sectors such as textile, paper, wood, garment, ship construction, transportation. Moreover container and truck loading optimization is critical in many sectors.

Our future research involves issues such as the incorporation of real-world constraints and objectives in the pure/theoretical cutting and packing optimization models or the integrated resolution of cutting and packing problems and related tactical and operational problems.

Our research agenda will be centred in topics such as Multi-objective Metaheuristics, Soft Methods in Decision Making, or Creativity in Optimisation. Innovative concepts previously developed will be enhanced and extended. This is the case of Constraint Oriented Neighbourhoods.

A new research line is related to the design of new hybrid optimization techniques that merge optimization procedures with metaheuristics.

Advanced research on metaheuristics in scheduling will be pursued based on the large practical experience of the innovative "scheduler" developed by the Unit.

d) Logistics, Vehicle Routing and Transportation Systems

We are now defining some new research topics that will cover these problems in a hopefully integrated way. Successful applications and developments are expected in many areas, along with the production of relevant research results.

e) Cutting and Packing

This research area has a long record in the Unit's activity. The research developed by the group has been applied in sectors such as textile, paper, wood, garment, ship construction, transportation. Moreover container and truck loading optimization is critical in many sectors.

Our future research involves issues such as the incorporation of real-world constraints and objectives in the pure/theoretical cutting and packing optimization models or the integrated resolution of cutting and packing problems and related tactical and operational problems.

ROBIS

The general force lines for future research are:

• Autonomous marine vehicles: natural landmark navigation for AUVs; unconventional acoustic navigation networks; coordinated control of

heterogeneous teams; vision based AUV guidance; modelling and control of autonomous sailboats; low bandwidth control of AUV teams.

• Control of mobile platforms: methodologies for automatic generation of mission plans; supervision of autonomous platform operations; cooperative operation of multiple platforms.

• Concerning vision based real time sensors: perception systems as a sensor for on board sensing; real time stereo sensing for mapping and self localization; low latency and robust feature extraction in semi controlled environments.

• In the land robotics field: modelling and control of mobile robots; fast team coordination and global path planning; navigation and localization in semi structured environments (using natural and artificial landmarks); Soccer robotics will continue to be a major test bed for the scientific results in this area.

• Industrial robotic manipulators: vision and manipulator coordination; advanced sensing: measurements and testing of features; rapid teaching and programming interfaces; hyper-flexible cells; development of a universal language with translators to different manipulators.

• Intelligent control and smart sensors: control algorithms for complex dynamic systems, adaptive sampling strategies for environment monitoring.

• To port the previously gathered knowledge in robotic systems and real time vision systems to civil society activities such as tracking of humans in indoor sports. An FCT project is planned to help achieve this goal. The scientific goal of the project will aim at sports teaching (advanced team play analysis) and referee education.

For the future a number of structural actions are planned, including:

• Developing a work of integration of the Group within the INESC Porto LA structure and organization and establish and increase partnerships with other groups of INESC Porto –beside UESP, one envisions UTM (Telecommunications and Multimedia) and UOSE (Optoelectronics and Electronic Systems).

• Continuing the consolidation of the scientific activity in the areas of mobile robotics and intelligent control systems, adopting the quality standards of the INESC Porto LA

• Increasing the GROUP participation and the visibility in European projects.

• Increasing technology transfer and consolidate partnerships with software houses and producers of equipments.

Funding, source, dates

UESP

Fundação para a Ciência e a Tecnologia: 41.248,00 €

European Commission: 569.000,00 €

QREN: 70.000,00€

TOTAL: 680.248,00 €

ROBIS:

Fundação para a Ciência e a Tecnologia: 29.683,95 €

Group Description

Title of Research Group:	(RG-Norte-50014-3347) Telecommunications and Multimedia
Principal Investigator:	José António Ruela Simões Fernandes
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 132.332,39 €

European Commission: 211.751,19 €

QREN: 60.478,84 €

TOTAL: 404.562,42 €

Objectives & Achievements

Objectives

The Telecommunications and Multimedia Unit (UTM) carries out research and development, consulting, technology transfer and advanced training in scientific and technological areas that fostered the convergence between the traditional telecom and broadcast worlds, the Internet and multimedia.

It has a multi and interdisciplinary nature and, for this reason, it is internally organized in four Areas, for management and scientific purposes. Each Area carries out basic and applied research in related topics, under a common strategy and goals determined by the market sector it covers:

• Multimedia Technologies and Systems has two main focus of research: Media Processing, which deals with audiovisual processing and analysis (music, audio, video and image), and Advanced Multimedia Services, which addresses creation and delivery of multimedia services (generation, description, search, adaptation, transmission and distribution of multimedia content over heterogeneous platforms), with applications in such areas as video surveillance, entertainment and culture.

• Wireless Networks addresses the research of innovative architectural solutions and new communications paradigms, covering the following main topics: mobility of networks and terminals in large and multi-technology mesh networks; usage of dynamic radio channel allocation, smart antennas, and cross layer techniques to implement adaptive radio-aware networks; auto-configuration and self-management of networks and terminal; efficient and secure support of new types of traffic (IPTV, peer-to-peer applications, Web-based services) in such networks.

• Internet Architectures and Networking (IAN) is focused on the analysis and development of disruptive Internet paradigms, namely, novel Internet architectures and functionality where the user is an active player and a provider of services, assuming as starting point the current Internet architectures and user requirements. Hence, three main R&D tracks are considered in IAN, being the topics within such tracks addressed from an OSI Layer 2 and 3 perspectives: disruptive Internet architectures and services; cooperative networking; advanced forwarding and routing.

• Optical and Electronics Technologies has two main research lines: Optical Communications and Microwaves, whose main topics are the design of fibre supported microwave / radio systems, Electromagnetic Band-Gap (EBG) components and devices, signal processing techniques applied to optical communication systems, and passive optical access networks; and Microelectronics, which is focused on dynamic reconfigurable logic and custom computing hardware, analogue and RF circuits design, and test and design-for-testability of analogue, mixed-signal and RF circuits.

The Unit pursues a high-level of scientific excellence, with international recognition. Most of its activities, both at national and international level, are carried out under contract and in partnership with telecom and network operators, service providers, broadcasters, content producers and providers, equipment manufacturers, software houses, system integrators, universities and research institutions.

At national level, besides R&D contracts, the Unit is deeply involved in projects funded by R&D programmes (e.g, FCT and Agência de Inovação) and a number of on-going projects in the framework of QREN (Quadro de Referência Estratégico Nacional).

The exploitation of results is carried out by means of R&D contracts, technology transfer and consulting and is playing an important role in the incubation of start-up companies. In this context it is worth mentioning the current partnerships with companies created by former researchers of INESC Porto, such as MOG Solutions, Nonius Software, Xarevision and Next to You.

Main Achievements

The main achievements are tightly connected with R&D activities in projects and contracts, as well as with MSc and PhD theses supervised by senior researchers of the Unit. They are described in scientific papers, project reports and theses and resulted in a large number of prototypes.

The scientific results, summarized below, are in the form of new algorithms, methods, tools and systems; in most cases, prototypes have been developed for a proof of concept and integrated in platforms or testbeds, to support internal research or as demonstrators.

1. Media analysis

Framework for automatic music generation using gestural controllers

Real-time human body skeletonization algorithm for Max/MSP/Jitter

Creation of an automatic rhythm generator

Music similarity software modules based on music audio content

Algorithm for staff line detection in Optical Music Recognition Systems

Algorithm for text line detection in Optical Character Recognition Systems

Algorithm for the assessment of spatial segmentations of images and video

Algorithm for content-aware image retargeting

Method for estimation of musical rhythm by the analysis of human movements captured in video

Hybrid approach for evaluating object tracking algorithms

2. Multimedia systems

Ontology based context-aware and DRM-enabled approach for content adaptation decision taking in networked multimedia applications

Software modules for the MPEG MXM standard specification framework

Machine learning techniques applied to context-aware content adaptation

Metadata models for the digital cinema content value chain

3. Wireless Networks

NS-3 simulation framework for scalable multi-technology mobile wireless mesh networks (WMN)

Radio resource management for interconnected multi-technology wireless networks

Auto-configuration framework for scale-free static WMN

Key Distribution Technique for IPTV Services with Support for Admission Control and User Defined Groups

Scalable Public Key Infrastructure for disruption-tolerant networks

Cross layer optimized peer-to-peer video streaming over WMN

Cognitive stub WMN

4. Internet Architectures and Networking

New International workshop series triggered, User-provided Networking (U-NET), first edition co-located with ACM CoNext conference, Rome, December 2009

EIFFEL Support Action participation and coordination of a new field (user-provided networking)

System specification surveying advances in Ethernet forwarding

System to analyze the performance of relaying in comparison to multihop routing, for few-hop networks

Reactive Management system for Quality of Service in Multimedia OBS Networks Based on GMPLS

Quality of Experience and Quality of Service system for user-centric mesh networks

Framework for the deployment of user-centric wireless networks

Development of a multiple-metric approach for multihop routing

Seamless mobility of senders transmitting multi-user sessions over heterogeneous networks

5. Optical Communications and Microwaves

Assessment of Parallel Equalizer/Phase Estimation Algorithms in Coherent Optical Systems

Performance assessment of simplified back propagation equalization in single/multiple channel transmission

Performance assessment of OFDM signals in frequency-interleaved WDM radio-over-fiber (RoF) links

Performance evaluation of the linear minimum mean-squared error wireless channel estimator for OFDM signals in RoF applications

Printed fractal monopole antenna for WLAN applications

Algorithms in FPGA for signal estimation in coherent optical systems

Printed C-Shaped Monopole Antenna Array with High Isolation for MIMO Applications

6. Microelectronics

In-circuit Test and Correction of Non-linearities of Adaptive RF Transmitters

On-chip Measurement of RF Power

Influence of Parasitic Capacitances in Modeling Advanced Floating Gate Memory Devices

Design of radiation hard analog and mixed-signal ICs

Design, simulation, and electrical characterization of MEMS

Tools for runtime generation of partial FPGA configurations for embedded systems

Architecture and design of e-FPGAs

Group Productivity

Publications in peer review Journals

Total number of publications: 13

List can be consulted in: http://profile.inescporto.pt

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(*) CAMPOS, R.L., DUARTE, R., SOUSA, F., RICARDO, M., RUELA, J., "Network Infrastructure Extension Using 802.1D-based Wireless Mesh Networks", Wireless Communications and Mobile Computing Journal. (*)

(*) Accepted for publication

Other publications International

Total number of publications: 28

List can be consulted in: http://profile.inescporto.pt

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SILVA, S.R., AMARAL, L.S., SIGAUD, C., SALGADO, H. et al, "Characterization of Semiconductor Lasers for Radiation Hard High Speed Transceivers", TWEPP'09 - Topical Workshop on Electronics for Particle Physics, Paris, France, Sept. 2009.

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Total number of publications: 11

List can be consulted in: http://profile.inescporto.pt

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ALMEIDA, F., OLIVEIRA, J.M., CRUZ, J.M., "Risks of Migration to IMS and a Way to their Mitigation", Conftele 2009 - Conference on Telecommunications, Santa Maria da Feira, Portugal, May 2009.

ALVES, P., FERREIRA, J.C., "Generation of Non-Rectangular Reconfigurable Cores for System-on-Chip", REC'2009 - V Jornadas sobre Sistemas Reconfiguráveis, Monte de Caparica, Portugal, Feb. 2009.

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SALTA, N., MORLA, R., RICARDO, M., "Optimizing Video P2P Streaming over Wireless Mesh Networks", DSIE 2009 - 4th Doctoral Symposium on Informatics Engineering, Porto, Portugal, Feb. 2009.

SILVA, M.L., FERREIRA, J.C., "Run-Time Generation of Configurations for Dynamically Reconfigurable", REC'2009 - V Jornadas sobre Sistemas Reconfiguráveis, Monte de Caparica, Portugal, Feb. 2009.

DAMÁSIO, E., FERREIRA, J.C, "Suporte para Reconfiguração Dinâmica Parcial em Linux", REC'2009 - V Jornadas sobre Sistemas Reconfiguráveis, Monte de Caparica, Portugal, Feb. 2009

Master and Ph.D. thesis completed

Authored by members of the Unit

PhD Theses

ABRANTES, F., Explicit Congestion Control Algorithms for Time-Varying Capacity Media (*)

MARTINS, L.G., A computational framework for sound segregation in music signals (*)

CALISTRU, C., Data organization and search in multimedia databases

TEIXEIRA, L.F., Contributions for the Automatic Description of Multimodal Scenes (*)

MSc Theses

BALTAZAR, A.M., Extraction of rhythmic information of dance movement by means of a video signal (P) (*)

ALMEIDA, J.F., Secure domestic networks (P) (*)

CARVALHO, L.M., User-provided Networks: Relaying vs. ad-hoc routing (*)

LOPES, M.A., Automatic classification of Latin music (*)

Supervised by members of the Unit (out of 47)

MSc Theses

FERNANDES, A.M., Mobile Environment Context Agent

MONTEIRO, B.M., Linux support for dynamic reconfiguration of hardware (P)

BARBOSA, F.A., Integration of Web services in Peer-to-Peer clients (P)

BASADRE, F.N., Integration of flash memory units in embedded systems over FPGA platforms (P)

REBOREDO, H.P., Processing of Turbo signal in optical communications systems (P)

RODRIGUES, N.J., Wireless Mesh Networks in Metropolitan Scenarios

ALVES, P.M., Flexible programmable cores for SOC applications

OLIVEIRA, P.M., Service integration in multi-use communications platforms (P)

MOREIRA, A.V., Comparative study of CMOS low-power multipliers (P)

CORTEZ, A.M., Design, simulation, and electrical characterization of mechanically moving components (MEMS) in SOI

MOREIRA, A.R., Reliability of Non-Volatile Devices during Process Development

FERNANDES, A.J., System for dissemination of energy consumption (P)

RESENDE, C.A., Real-time correspondence processor between stereo images (P)

CARRAPA, D.G., Mobile Router

OLIVEIRA, D.J., CMOS-RF Power Amplifier for Wireless Communications

SILVA, F.A., DIP based MPEG-21 Player

SOUSA, F.J., Radiation Tolerant Low power 12 bit ADC in 130 nm CMOS technology

LOPES, F.M., Fractal antenna for applications in wireless networks (P)

RODRIGUES, J.G., Rectification of stereo images in an FPGA-based embedded system (P)

SANTOS, J.P., Implementation of optical flow algorithms in FPGA platforms (P)

PINHEIRO, M.S., Web system for the recognition of music scores (P)

PINA, M.A., Adaptive filter of switched capacitors (P)

PINTO, N.J., FPGA-based implementation of signal estimation algorithms for optical coherent systems (P)

MAIA, P.M., Authentication of Wi-Fi networks based on DNSSEC (P)

SANTOS, P.M., FPGA-based system for detecting hand position using stereo images (P)

VEIGA, R.A, In-circuit observation of the distortion on an RF amplifier (P)

VIDAL, R.J., System for the calibration of temperature sensors based on fibre optic Bragg gratings (P)

FRAGA, S.D., Monitoring of multimedia processes (P)

SÁ, S.M., Predictive Multimedia Content Adaptation

ANTUNES, V.H., Web 2.0 frontend for RADIUS management (P)

RAMOS, D.F., Scheduling algorithm for QoS differentiation in MPLS / DiffServ networks (P)

(P) In Portuguese

(*) Also supervised by members of the Unit

Patents/propotypes

Prototypes

(demos at INESC Porto)

RAMA - Relational artist maps (web-based application for visualizing and interacting with networks of music artists) / on-line at http://rama.inescporto.pt

Automatic music generation using a Wii remote controller (with run-time control of tempo and density of events)

Prototype for adding groove to musical signals

Music recommender, integrated in the web portal of Palco Principal / on-line at http://www.palcoprincipal.com

Staff line detection and removal workstation for Optical Music Recognition Systems

Workstation for text line detection in Optical Character Recognition Systems

Platform for the assessment of spatial segmentations of images and video

Platform for image retargeting

Context-aware adaptation decision mechanism based on MPEG-7, MPEG-21 and ontologies

Simulation platform based on machine learning techniques to predict context changes and automatically adapt video content in multimedia networked applications

Configurable test platform to browse multimedia content represented as MPEG-21 Digital Items

Metadata management system to convert between metadata formats applied to digital cinema

Opportunistic routing protocol for vehicular networks

Peer-to-peer video streaming over WMN

Home gateway for secure, customer-defined, friend-to-friend overlay networks

Autoconfiguration and self-management solution for PANs

WiFix – WMN for extending infrastructure networks

Authentication of Wi-Fi networks based on DNSSEC

Simulator for routing in large scale networks

Printed fractal monopole multiband antenna for wireless LAN applications

Algorithms in FPGA for signal estimation in coherent optical systems

Printed C-Shaped Monopole Antenna Array with High Isolation for MIMO Applications

Orthomode transducer for Ku-band VSAT applications

Transmit-reject filter for Ku-band VSAT applications

Cylindrical horn for Ku-band VSAP applications

RAFTPA (Radio-Frequency Testable Power Amplifier) integrated circuit

Wireless readout of biomedical signals

Organization of conferences

Organization of SMC 2009 - 6th Sound and Music Computing Conference and SMC Summer School, Porto, Portugal, July 2009

SMC 2009 - General Chair, Scientific Programme co-chair, Music Programme co-chair (F. Gouyon)

DCIS 2009 - XXIV Conference on Design of Circuits and Integrated Systems, Zaragoza, Spain, November 2009 (J.S. Matos – member of Steering Committee)

U-NET 2009 - Organization of the 1st edition of the international workshop "User-provided Networks, Challenges and Opportunities", in Rome, together with CoNext09 (R.Sofia, P. Mendes). The programme covered the presentation of 7 scientific publications and a discussion panel "UPNs: challenges and opportunities", http://conferences.sigcomm.org/co-next/2009/workshops/unet/

3rd EIFFEL Think-tank meeting, Athens, Greece, October 2009 - session "BYON: Build Your Own Network" (P. Mendes – session chair). EIFFEL is a Support Action dedicated to mobilizing researchers and experts in Europe and beyond in regards to the development of a Future Networked Society; discussions and debates are present and can be commented on FIpedia.

CRC 2009 – 9ª Conferência sobre Redes de Computadores, Oeiras, Portugal, October 2009, discussion panel on Future Internet (R. Sofia), http://crc2009.inesc-id.pt/Painel+Discussao

REC'2009 - V Jornadas sobre Sistemas Reconfiguráveis, Monte de Caparica, Portugal, Feb. 2009 (J.C. Ferreira – member of Organizing Committee)

RTCM (National Thematic Network in Mobile Communications) – 9th and 10th Workshops, Covilhã, Februray 2009 and Porto, June 2009 (M. Ricardo – member of Organizing Committee)

Researchers of the Unit were members of Technical Program Committees of over 20 national and international conferences and reviewers of scientific papers in international journals and conferences.

Industry contract research

1) Two research contracts with PT Inovação aimed at technology development and transfer and advanced training:

GrCLIFmcast – management of multicast sessions for IP based services created by users; ended in February 2009

ASP Domestic Networks – Authentication, Security and Privacy solutions for Domestic Network services; started in March 2009

2) Nine on-going projects with industrial partners in the framework of QREN (Quadro de Referência Estratégico Nacional), which started by the end of 2008 or during 2009

PALCO 3.0 – Intelligent Web system for supporting the management of music social networks, with Palco Principal (also involving other research groups of INESC Porto); started in December 2008

SEMANTIC PACS – Semantic Picture Archiving Communication System, with Emílio Azevedo Campos; started in January 2009

AHRS - Attitude-Heading Reference System based on MEMS technology, with Spin.Works; started in October 2008

RECOOP - Cooperative wireless networks, with NONIUS Software; started in January 2009

MOBILES –Sustainable electric mobility (with electric vehicles), with Ndrive, Inteli and CEIIA (also involving other research groups of INESC Porto); started in June 2009

Communications system with redundancy and soft degradation of QoS – advanced consulting to a start-up company (NextToYou); started in December 2009

SWIOP – Intelligent and secure webmail system, with Portugalmail; started in September 2009

SITME – Metropolitan multi-technology wireless network for public transportation systems, with Xarevision (INESC Porto spin-off) and STCP (public transportation company); started in September 2009

VSAT-1 – Development of devices for Ku-band Very Small Aperture (VSAT) applications, with SINUTA; started in April 2009

Internationalization

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.

In the framework of the research activities carried out on these projects, a large number of joint papers with researchers of other institutions were published.

1 European Projects (active in 2009):

VISNET II - Networked audiovisual media technologies (Network of Excellence) - FP6 IST programme, ended June 2009

EDCINE - Enhanced Digital Cinema – FP6 IST programme, ended June 2009

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, started September 2009

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

2 INESC Porto hosted short-term scientific missions via the SID (Sonic Interaction Design) COST Action and the FCT/CAPES convention (involving some Brazilian research institutions)

3 Participation in the European EIFFEL Support Action (http://www.fp7-eiffel.eu/home.html); INESC Porto coordinates and contributes to the topic "user-provided networking"

4 Participation in the eMobility platform (http://www.emobility.eu.org/); participation in the Post-IP group

5 Organization of U-NET 2009 workshop, theme "user-provided networking", co-located with ACM CoNext 2009.

6 Disruptive Network Architectures - cooperation with University of Pennsylvania, USA (Prof. Roch Guerin); includes exchange of researchers and of know-how

7 Routing in DTNs - cooperation with Columbia University, USA (Prof. Henning Schulzrinne); includes exchange of researchers and of know-how

Government/Organization   contract

research

Projects funded by FCT (active in 2009):

BCTT – Advanced objective method for the evaluation of the aesthetical result of breast cancer conservative treatment

OMR - Optical Music Recognition of handwritten musical scores

ROFWDM - Design and Optimisation of WDM Millimeter-Wave Fibre-Radio Systems

DR-VidS - Dynamic management of reconfigurable logic resources for real-time foreground/background video segmentation

VECTOR - Software compilation and hardware synthesis tools for automatic translation of MATLAB applications into high-performance custom designed vector processors

MuMoMgt – Multicast and mobility management in heterogeneous access networks

KINETIC – Controller driven adaptive and dynamic music composition systems, in the framework of the programme with University of Texas at Austin

Future Research

Objectives

Some general and common goals will be pursued at Unit level:

• strengthening management and leadership skills and the links between the Areas;

• achieving a high-level of scientific excellence, measured by means of objective indicators;

• establishing strategic partnerships, based on existing scientific and technological know-how.

The Unit will continue to host MSc and PhD students and post-doc researchers, with active involvement in research projects.

Scientific and technical results will be exploited in research contracts with the industry, in particular in the framework of QREN (Quadro de Referência Estratégico Nacional).

The Unit will continue to encourage and help the incubation of new start-up companies and to reinforce the cooperation with former ones.

The specific objectives of each Area are detailed next.

Research in Multimedia Technologies and Systems will address knowledge-based multimedia systems, along two main lines – services in networked heterogeneous environments and media learning. The first includes research in content adaptation strategies based on ontologies, service presentation adaptation, QoS and context-aware service delivery, semantic content search in P2P networks, semantic Web Services, new business models with DRM. The second covers such topics as knowledge extraction from raw data, empirical learning, automatic semantic analysis and mining, community building tools.

Research in Wireless Networks will be focused on designing and evaluating new architectural solutions for well-identified problems in this field, with the purpose of extending-infrastructure networks and enabling the emergence of networks of "things". The main problems being addressed include moving (sub)networks, multi-homing (including load sharing and flow distribution), cross layer mobility, cognitive (radio aware) networks, radio planning and network congestion avoidance, scalable routing techniques aware of network congestion, very large mesh networks, auto-configuration of networks and network elements, efficient and secure support of new types of traffic (IPTV, peer-to-peer applications, Web-based services).

IAN is focused on the analysis and development of disruptive Internet paradigms, namely, novel Internet architectures and functionality where the user is an active player and a provider of services, assuming as starting point the current Internet architectures and user requirements. Hence, three main R&D tracks are considered in IAN, being the topics within such tracks addressed from an OSI Layer 2 and 3 perspective. The research to be developed in IAN follows a two-fold scientific-technologic methodology. Having a long-range (10 year) perspective, IAN explores new technologies and advanced architectures, as well as disruptive communication models. On a short-range perspective (1-3 years) IAN fosters synergies with industry and relevant international research entities. The balanced coordination of industry awareness and exploitation of new technologies with devising disruptive Internet architectures aims at opening new horizons in scientific and technological fields: disruptive technologies are normally left aside by industry due to the high risk they embody, but nonetheless are crucial in what concerns opening new market fronts and impacting the way technology is perceived (and applied) by society. Indicators of success include: patents, projects, journal and conference publications, MSc and PhD theses, event organization, degree of internationalization.

Research in Microwaves and Optical Communications will continue along the main topics already under stuady: design and optimization of fibre supported microwave and radio systems, investigation of fractal geometries combined with EBG (Electromagnetic Band-Gap) techniques for the development of small size microstrip antennas suitable for multiband operation in wireless applications, application of signal processing techniques for coherent optical communication systems. Two new related topics will be added: passive optical networks (PONs), to integrate fixed and wireless services in the access network using radio-over-fiber techniques, and modeling of surface plasmon resonance in optical fibers, for signal processing in optical communications.

Research in Microelectronics will continue along the three main lines outlined in the first section. Research on dynamic reconfigurable logic (DRL) will continue to address the area of application development support and current work on run-time assembly of reconfigurable modules (including on-line routing) will be expanded. The main research effort on analogue and RF circuits design is focused on the design of effective low power and area circuits for signal processing systems. The activity on testing and design for testability of analog and mixed-signal circuits will progress with the design of microsystems for medical applications. The design and test of RF circuits is being extended to the design for testability of wireless sensor networks and NFC (near field communication) applications. The design and test of circuits for radiation environments is being conducted in order to include self-test and self-calibration in order to improve their reliability and durability.

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 256.543,32 €

European Contracts: 157.000,00 €

QREN: 134.481,73 €

TOTAL: 548.025,05 €

Group Description

Title of Research Group:	(RG-Norte-50014-3348) Optoelectronics and Electronic Systems
Principal Investigator:	José Luis Campos Oliveira Santos
Main Scientific Domain:	Física
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 141.221,88 €

European Commission: 25.457,74 €

QREN: 29.187,66 €

TOTAL: 195.867,28 €

In September 2009, a new Principal investigator has been appointed to this RG by the Board of Directors of INESC Porto: Prof. Paulo Vicente da Silva Marques. This information could not be inserted in the report in the proper place because the on-line form of FCT did not allow it.

Objectives & Achievements

Objectives

In September 2009, a new Principal investigator has been appointed to this RG by the Board of Directors of INESC Porto: Prof. Paulo Vicente da Silva Marques. This information could not be inserted in the report in the proper place because the on-line form of FCT did not allow it.

The roots of this Unit (named UOSE) go back to 1985, when INESC 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;

• Interferometric based optical imaging;

• Optical sensing heads and some types of electrical sensing heads based on thin films;

• 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.

Broadly, the actual scientific objectives are pretty much the same as the ones defined for the last period but there are substantial changes and advances; for example in the field of optical sensing there has been a lot more research for new type of optical sensors that can detect other parameters than the more traditional strain, temperature, curvature, etc. The Group has been investing in the in-house development of novel competencies in multidisciplinary subjects that allow the development of these biosensors. These include, beyond the already established competencies (mainly in fiber optics & optoelectronics) new perspectives in materials science, chemistry and microfabrication.

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. Several applications were submitted to the national initiative QREN. From this actions a total of two projects were approved: one in the area of electrodes for wearable textiles and the other in the full life-cycle monitoring of competition kayaks structural health.. These projects had their start during 2009 and are currently being executed. A positive evaluation of these actions has been taken. Another project in the area of photovoltaic cells was approved but it is due to start in early 2010.

Another important objective for 2009 and subsequent years was to strengthen the international relations, with special focus on European research groups/companies. The final aim is to promote a healthy scheme of student/researchers exchange schemes allied to a much higher level of participation in European projects.

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.

Main Achievements

In this period the development of an interdisciplinary attitude within the Unit was always a strategic target in view of the objectives demanded. It built up properly, and constitutes nowadays a clear added-value for the Unit R&D enterprise. It is therefore stated as a strategic main achievement.

- 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
- Hybrid sol-gel planar optics and rapid prototyping of integrated optics beam combiners for astronomical interferometry
- Mechanical characterization of bone cement and crack zone identification in a cemented femoral implant using fiber Bragg grating sensors
- Novel developments of nonlinear effects for optical sensing based on Raman/Rayleigh scattering
- All-fiber hybrid interferometers
- Novel optical fiber geometry designs for sensing purposes (H-shaped, suspended twin core fiber, as examples)
- Wireless power transfer demonstration unit
- Fabrication of Carbon quantum dots by laser ablation
- Use of luminescent carbon dots in sensing applications
- Development of composite luminescent materials for detection of oxidative species
- Development of quantum dot based analytical imaging techniques
- Implementation of interferometric acetic acid sensor for biotechnology application
- Development of virtual instrumentation applications (for frequency domain spectroscopy and interferometry)
- Development of simple, high sensitivity, multiplexable, interrogation scheme for LPG based sensors
- Fabrication of Bragg gratings in pure silica suspended core fibers
- 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
- Fabrication of sub-micrometer gap coupler refractometric sensor
- Modelization and demonstration of effects of dispersion in coaxial mutlibeam combiners for astronomical interferometry.
- Extrinsic and intrinsic fiber optic interferometric sensors for acoustic detection in high-voltage environments
- Laser Direct Writing of integrated Arrayed Waveguide Gratings (AWG) for dense wavelength multiplexing
- Optical fiber sensor for hydrogen and metals
- CdS/CdTe thin film second generation solar cell prepared by RF magnetron sputtering
- Manganite multiferroics thin films prepared by chemical solution deposition
- Optimization process of sol-gel hybrid channel waveguide Bragg gratings patterned using a single photolithographic step.
- Field-Effect transistor based on hybrid sol-gel material interstate for optic and electronic integration
- Sol-gel channel Bragg gratings fabrication using a single photolithographic step
- Development of glasses doped with rare-earth ions
- Development of glasses for biomedical applications (prosthesis)

One outcome of this R&D activity and related achievements was the publication record of the Unit in this period, which stands to 31 works published in international journals and 57 presentations in international and national conferences.

Group Productivity

Publications in peer review Journals

Total number of publications: 31

List can be consulted in: http://profile.inescporto.pt

Due to characters limitation only the most relevant papers are listed here.

PEREZ-HERRERA, R.A., FRAZÃO, O., SANTOS, J.L., ARAÚJO, F., FERREIRA, L.A., BAPTISTA, J.M., LOPEZ-AMO, M., "Frequency Modulated Continuous Wave System for Optical Fiber Intensity Sensors With Optical Amplification", IEEE Sensors Journal, December 2009, vol.9, no.12, p.1647-1653.

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CALDAS, P., JORGE, P., ARAÚJO, F., FERREIRA, L.A., REGO, G., SANTOS, J.L., "Geometrical effects on the refractive index sensitivity of Mach-Zehnder fibre modal interferometers based on long-period gratings", Measurement Science % Tecchnology, July 2009, vol.20, p.75201-75201.

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Other publications International

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AREF, S.H., CARVALHO, J., AMEZCUA-CORREA, R., FRAZÃO, O., CALDAS, P., SANTOS, J.L., ARAÚJO, F., LATIFI, H., FARAHI, F., FERREIRA, L.A., KNIGHT, J.C., "Sensing Characteristics of Modal Interferometers based on HC-PCF", SEON 2009 - VII Symposium on Enabling Optical Networks

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VELOSA, J.E., GOUVEIA, C.A., FRAZÃO, O., JORGE, P., BAPTISTA, J.M., SANTOS, J.L., "System for interrogation of interferometric optical fiber sensors with digital control", SEON 2009 - VII Symposium on Enabling Optical Networks 2009, Lisboa, Portugal.

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Master and Ph.D. thesis completed

1) Thesis completed by members of the unit

Member of the Unit: Orlando José dos Reis Frazão

PhD thesis, Optical Fibre Sensors Based on Non-Linear Effects, FCUP

Member of the Unit: Carlos Avelino de Jesus Gouveia

MSc thesis, Title, Univ. da Madeira

2) Other thesis supervised by members of the group.

Member of the Group: José Luís Santos

PhD thesis, Orlando José dos Reis Frazão, Optical Fibre Sensors Based on Non-Linear Effects, FCUP

Member of the Group: José Manuel Baptista

MSc thesis, Carlos Avelino de Jesus Gouveia, Title, Univ. da Madeira

Patents/propotypes

National patent

• Interferómetro híbrido em fibra óptica, Orlando José dos Reis Frazão

Prototypes

• Interrogation unit for gas sensing

• Optical fiber torsion sensor

• Strain and temperature sensor based in a modal interferometer design

• Refractometers based on end of fiber polymer tips (Fabry-Perot cavities)

• Refractometer based on FBG in a H-shaped fiber

• Novel smart composite structures for sensing heads

• Laser direct writing unit

• Prototypes of methane gas detection based in photonic crystal fibers and wavelength modulation spectroscopy for application in the environmental area

Organization of conferences

The Research Group was involved through several of its members in the Committees of SEON 2009 Symposium on enabling networks and sensors that took place at Lisbon. The workshop had the participation of 50 national and international researchers. The program included invited speakers and poster sessions.

Industry contract research

The Unit continued the contract with Fibersensing in the framework of its first phase of development. Consultancy in monitoring systems for critical infrastructures and perimetric security and the development of an experimental monitoring system for land sliding to be used in transport infrastructure were the subjects considered.

In the framework of the European Space Agency, specifically Flight Hardware Activities and Long-Term Research and Development, the Unit managed to get a contract R&D project, on a competitive basis (ESA Announcement of Opportunity 1-4669/05/NL/HE). The ESA-ONE project is dedicated to technology development for integrated micro-optic filter to address optical signal detection in LIDAR applications. The research program will target future development of spaceborne LIDAR systems, thus providing a compact rugged integrated package with minimal size, weight, and power requirements but still fulfilling mechanical and thermal constrains for space applications.. The project objectives were completely fulfilled and presented in a formal session at ESA Headquarters.

Other projects are related to contracts within QREN. MEMIMETRIA is focused in the production of an industrial prototype for thin films characterization using interferometric imaging setups. The special requirements are related to the high speed for assembly line monitoring and the necessity to withstand the industrial environment. 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. The project E-TÊXTIL developed the production of polymeric fibres than can change their resistivity under deformation. These fibres have the correct mechanical characteristics to endure the process installation and operation within smart textiles (patient movement monitoring, for example).

Internationalization

In international terms, the main contribution of the Group was the participation on the large European consortium NextGenPCF. This project was concluded in the fall of 2009 with all the objectives stipulated for the research unit achieved, and as such it was a success.

However, Internationalization is a point where the Unit has been trying to enhance its performance with the ultimate goal of being involved in more international projects. In this context two main actions were strategically adopted during 2009: active participation in COST actions and in bi-lateral cooperation schemes involving the group and other international research groups, with special focus on European groups (an example is the recent cooperation with Chalmers University of Technology, Sweden). However, it should also be mentioned the strong collaboration with Brazilian groups, which is part of a more general internationalization action of INESC Porto.

As a result several proposals are under evaluation/study and bilateral researchers exchange are common.

LIST OF COST ACTIONS

• MP604, Optical Micro-Manipulation by Nonlinear Nanophotonics

• ICT 299, Optical Fibres for New Challenges Facing the Information Society P18, The Physics of Lightning Flash and Its Effects

• MPNS 539, Electroceramics from Nanopowders Produced by Innovative Methods

• D 41, Inorganic oxides: surfaces and interfaces

• ICT 0806, Intelligent Monitoring, Control and Security of Critical Infrastructure Systems

• MP0803, Plasmonic Components and Devices

• MP 0702, Action : Towards Functional Sub-Wavelength Photonic Structures

• MP0804, Highly Ionised Pulse Plasma Processes

BI-LATERAL ACTIONS

During 2009 there were seven active integrated actions with other countries (2 with Brazil, 1 with Spain, 2 with France, 1 with Italy and 1 with Hungary)

Under all the schemes above the Group received 11 researchers. Also, 6 researchers of our group spent some periods abroad.

Government/Organization contract research

In 2009 the RG was involved in 13 R&D national projects. Of these, 2 dealt with microfabrication, 8 with optical fibre sensors principles and applications, 2 with monitoring of biomedical signals and the other is an application in the optical fiber communications area. Microfabrication projects developed fundamental technology for sensors and communications devices in optical fiber and integrated optics that will enable further development. Developments included add-drop multiplexers for optical communications, and piezoelectric films in optical fibers for sensing and actuation. The sensor projects were dedicated to applications in acoustic emission detection by optical fibers, salinity and temperature monitoring in the geophysical domain, characterization of optical fiber sensing heads for civil engineering applications, measurement of carbon dioxide in algae cell culture, measurement of dissolved oxygen by fluorescence and biochemical sensors. The biomedical signals projects intend to acquire meaning from physiological signals obtained from image processing and embedded smart textiles sensors.

FCT projects (name and coordinator):

•AMDRAPHYD, Adv. Monitoring and Diagnostics of Ria de Aveiro Physical Dynamics, P. Jorge

•OPTIC-ALGAE, Hybrid photobioreactors, containing microstructured OPTICal fibres Aimed at operating with microalgae, J. M. Baptista

•WELDING, Fiber Bragg grating sensors for modeling of friction stir welding and Laser beam welding, O. Frazão

•BIOPELVIC, Study of Female Pelvic Floor Disorders, L. A. Ferreira

•ENDURANCE, Long-Term Reliability of Fiber Bragg Grating Sensors for Structural Health Monitoring in Civil Eng., F. Araújo

•AMBISENSE, Monit. remota de parâmetros ambientais através de sens. fibra óptica, J. L. Santos

•MOTION, Monitoring and compensaTion of Impairments in Opt. Networks, O. Frazão

•NANOCRYSTALLINE, New nanocrystalline glass ceramics with non linear optical properties, M. J. Marques

•OREO2, Self-patternable organic/inorganic hybrids for low cost integrated optics devices, P. V. Marques

•SenRONS, Dev. of optical fiber sensors for the determination of reactive oxygen and nitrogen species in boil. systems, P. Jorge

•SMARTBIO, Hip femoral prosthesis for in vivo loosening data acquisition, O. Frazão

•BIOMOTION, Perception of biological motion - integrating psychophysics, neurophysiology and computational modeling, M. Correia

•BIOSWIM, Body Interface System based on Wearable Integrated Monitorization, M. Correia

Future Research

Objectives

The mainstream R&D activity of the Unit develops along the broad branches of: Microfabrication, Integrated Optics, Optical Systems and Optoelectronic Integration. In particular, in the future a core activity for the next five years will be on Optical Biochemical Sensing and Interferometric Based Imaging.

The LA Research Line will not drain the entire R&D planned for the Unit, as other subjects will also be addressed along consistent and ambitious research and development programs.

One subject is the development of efficient photovoltaic cells based on thin-film technology. The development of the so called "Green Solar Cells" has nowadays a clear opportunity in face of the worldwide energy constraints and environmental concerns. This opportunity started to be explored by the Unit in the last two years and a plan was established aiming the improvement of the efficiency of solar cells fabricated according to a novel proprietary process. A submission to a National financing program (QREN) was submitted together with an Industrial partner MagPower and the project is scheduled to begin in early 2010. With this project the thin film fabrication facility will experience a significant boost.

Another subject is related with the study, design, modelling, fabrication and test of optical recombiners for sky imaging based on astronomical interferometry. Planar optical devices are particularly well suited for this purpose and some encouraging results were already obtained in the Unit. This activity is to be enhanced further and strategic collaborations with prestigious international Groups working in this field have already been established. The group has experience in the design, fabrication and testing of multiaxial and co-axial beam combiners. The future is focused in the development of dichroic functions within the beam combining chip also with possibility for phase tuning. In the particular case of the dichroic function there are no available devices that can perform this function, due to the very large broadband nature of these signals (200nm wide bands). Ultimately, the development will pass through the fabrication of devices in materials with high transparency in the range between 1.8-8.0 m through process of laser direct writing in chalcogenide glasses.

To progress further in the field of optical sensing we are exploring more fundamental concepts, namely non linear effect for distributed sensing, modal interferometers based on new fiber designs, surface Plasmon resonance interactions and applications based on metamaterials. Added with remote electrical powering of sensors, novel applications will emerge (like in the context of real time monitoring of prostheses installed in the human body).

The Research Group Scientific Council has identified that the cooperation with other Research Groups of INESC Porto has to be strengthened through the development of cross-fertilized projects. Identified examples are the specific cases of USE (Power Systems Unit), in the area of development of smart sensing systems and UTM (Telecommunications and Multimedia Unit) in the area of optical communications.

Since 1993, the Unit constructed a small cleanroom and since then has maintained it in a operational condition. In addition to the initial investment, the regular projects and the re-equipment initiative launched by FCT in 2002(?)allowed the Group to take the facility a step further ahead. Recently, the research Unit was involved in a consortium to enhance the microfabrication infrastructure within University of Porto, in close cooperation with other research groups. This initiative was triggered inside the group and is thought to be the way forward because of two factors: the cost is diluted and more importantly, the different varieties of knowledge of the users in a large facility are essential in terms of cross-fertilization; this is especially important for the development of multidisciplinary projects.

The fabrication of nano structures in a top-down and bottom-up approaches are planned for the near future.

The top-down approach will be achieved using femtosecond laser writing. Until now, good results have been obtained through cooperation with our international partners (IPHT, Jena, Germany and University of Toronto, Canada) but a local infrastructure still not fully operational. A laser direct writing unit was developed in house in the recent years and is ready for a simple upgrade to be working with a femtosecond laser source. The laser writing process will allow the fabrication of micro/nanostructures in polymers and silica amongst others. In addition by exploring the selective wet etching induced by laser exposure, microfluidic structures will be developed, aiming at full integration between the optical and the liquids manipulation structures in a monolithic approach.

In a bottom-up approach the group was recently involved in experiments in thin film growing using layer-by-layer self assembly with cooperation with the chemistry group at FCUP. These initial experiments are focused on fabrication of fast optical modulators using polar molecules but the idea is to extend the capabilities of the self assembled films into the sensing areas.

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 159.705, 37 €

QREN: 23.409,73 €

TOTAL: 183.115,11 €

Group Description

Title of Research Group:	(RG-Norte-50014-3349) Power Systems
Principal Investigator:	Manuel António Cerqueira Costa Matos
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 33.147,01 €

European Commission: 143.086,94 €

TOTAL: 176.233,95 €

Objectives & Achievements

Objectives

The mission of the Power Systems Unit (USE) is centered on the development of advanced research in emergent modeling, optimization and control techniques applied to Power Systems characterized by large scale integration of renewable power sources and distributed generation, with technology and know-how transfer to utilities and industrial companies and support to the public sector and energy agencies.

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 Unit 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.

A need also exists of organizing the Unit's know-how in a way that high level consultancy can be provided through specific studies and strategic thinking, supported by the new tools to be developed.

The developments should mainly be driven by the application area, but general-purpose models and tools for optimization, decision and negotiation may also be an objective where the Units' experience suggests further developments of the fundamental tools.

The main application areas are related to the ones defined for the thematic line:

• Intermittent power integration: analysis, control, forecasting, operation optimization;

• Electricity markets: load profiling, regulated remuneration schemes, uncertainty management, optimization and decision-aid, adequacy evaluation;

• Microgeneration and microgrids: conceptualization, components' models, control, stability analysis, operation procedures, islanding, remuneration;

• Electric vehicles integration: business and technical models, consumption patterns, communications, network impact, ancillary services provision.

Main Achievements

Main scientific results:

• Control solutions for fault ride through of wind generators for asymmetrical faults in weak meshed systems

• Integrated multi-level smart control solutions for charging batteries of plugged-in electric vehicles

• Control solutions for Vehicle to Grid (V2G) implementation in isolated systems with a large penetration of wind power

• Decision-aid tool for operating reserve definition based on probabilistic modeling of failures, load and wind power forecasts

• Multicriteria methodology for the technical and economic evaluation of multi-microgrid deployment alternatives

• Voltage control approach to manage the integration of micro-generation of multi-microgrids

• New models for short term wind power forecasting using entropy related concepts

• New model for power system reliability evaluation with evolutionary computing as an alternative to Monte-Carlo simulation

• Negotiation-aid platform for maintenance scheduling using autonomous agent technology

• Platform for simulation of grid integration and dynamic behavior analysis of wave energy systems

Projects

• Successful conclusion of the European project "More Microgrids"

• Successful proposals of the two new European projects MERGE and TWENTIES, to begin in 2010

• Extension of the contract with REN and REE (Portuguese and Spanish TSO) to deliver an advanced tool for operating reserve evaluation, in the sequence of the studies performed in project RESERVAS

Publications

• 17 papers in international journals

• 48 papers in international conferences with peer review

Spin-off

• Provisions to create a company able to deliver wind park forecasts, starting from the results of the project PrevEol

Group Productivity

Publications in peer review Journals

Total number of publications: 17

List can be consulted in: http://profile.inescporto.pt

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Other publications International

Total number of publications: 24

Number publications of this kind: 48

List can be consulted in: http://profile.inescporto.pt

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Madureira, A., Peças Lopes, J. A., Carrapatoso, A., Silva, N., "The New Role of Substations in Distribution Network Management", CIRED2009 - 20th International Conference on Electricity Distribution, Prague, Czech Republic, 8 - 11 June, 2009.

Matos, M., Bessa, R.J., "Operating Reserve Adequacy Evaluation using Uncertainties of Wind Power Forecast", IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Peças Lopes, J. A., Almeida, P. M. R., Soares, F. J., "Using Vehicle-to-Grid to Maximize the Integration of Intermittent Renewable Energy Resources in Islanded Electric Grids", ICCEP 2009 - International Conference On Clean Electrical Power Renewable Energy Resources Impact, Capri, Italy, 9 - 11June, 2009.

Peças Lopes, J. A., Almeida, P. M. R., Soares, F. J., Hatziargyriou, N., "Electric Vehicles Grid Integration Under the MicroGrid Concept", Smart Grids and Mobility, Würzburg, Germany, 16 - 17 June, 2009.

Peças Lopes, J. A., Soares, F. J., Almeida, P. M. R., Silva, A. M., "Smart Charging Strategies for Electric Vehicles: Enhancing Grid Performance and Maximizing the Use of Variable Renewable Energy Resources", EVS24 - The 24th International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium & Exhibition, Stavanger, Norway, 13 – 16 May, 2009.

Pereira, A. J. C., Saraiva, J. T., "A Decision Support Tool for Generation Expansion Planning in Competitive Markets Using System Dynamics Models", in Proceedings of IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Reis, C., Maciel Barbosa, F., "Line Indices for Voltage Stability Assessment", IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Resende, F., Peças Lopes, J. A., "Evaluating the Performance of External Fault Ride-Through Solutions used in Wind Farms with Fixed Speed Induction Generators when Facing Unbalanced Faults", IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Saraiva, J. T., Dantas, H. F., "Evolution of the Marginal Based Remuneration of the Portuguese Transmission Company From 1998 to 2004", IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Silva, N., Marsh, D., Rodrigues, A., Peças Lopes, J. A., Madureira, A., "New Control and Management Architectures for Active Distribution Networks", PowerGrid2009, KoelnMesse, Cologne, Germany, 26 – 28 May, 2009.

Tennakoon, A. P., Arulampalam, A., Leite, H., Ekanayake, J. B., "Operations of DFIG with simplified rotor current reference model and solution to the recent grid code requirements", IECON09 - 35th Annual Conference of the IEEE Industrial Electronics Society (IECON 2009), Porto, Portugal, 3 - 5November, 2009.

Vasiljevska, J., Peças Lopes, J. A., Matos, M., "Multi-Microgrid Impact Assessment Using Multi Criteria Decision Aid Methods", IEEE Bucharest PowerTech 2009, Bucharest – Romania, 28 June - 2 July, 2009.

Wang, J., Botterud, A., Miranda, V., Monteiro, C., Sheblé, G. "Impact of Wind Power Forecasting on Unit Commitment and Dispatch", 8th Int. Workshop on Large-Scale Integration of Wind Power into Power Systems, Bremen, Germany, 14 - 15 October, 2009.

Other publications National

Fonseca, I., Farinha, J. M. T., Simões., A., Maciel Barbosa, F., "Manutenção Preditiva de Geradores Eólicos", APMI- Associação Portuguesa de Manutenção Industrial, 10.º Congresso Nacional de Manutenção, Figueira da Foz, Portugal, 19 - 20 November, 2009.

Peças Lopes, J. A., Messias, A. A., Gonçalvez, R. M. P., "Redes de energia inteligentes como contributo da engenharia portuguesa para o desenvolvimento sustentável", InGenium, no.112, July, 2009, pp.44-47.

Master and Ph.D. thesis completed

PhD:

Eduardo Gouveia, Avaliação da Adequação da Rede de Transporte de Energia Eléctrica em Ambiente Liberalizado [Adequacy Evaluation of the Electrical Transmission Network in a Liberalized Environment], PhD Thesis, 2009 (Manuel Matos)

Pedro Marques, Solutions to Improve the Dynamic Security of Interconnected Systems with Large-Scale Integration of Wind Power Soluções para Melhoria da Segurança Dinâmica de Sistemas Interligados com Grande Integração de Produção Eólica, PhD Thesis, 2009 (João Peças Lopes)

Nuno Gil, Identification of operating conditions and procedures for emergency islanding mode of multi-microgrids [Identificação de Condições de Operação em Modo Isolado e Procedimentos de Controlo de Emergência para Multi-Micro-Redes], PhD Thesis, 2009 (João Peças Lopes)

MSc:

António Santos, Estudo do Comportamento Dinâmico de Redes Eléctricas Industriais - Caso da Refinaria de Matosinhos – Leça [Study of the Dynamic Behaviour of Industrial Electrical Grids - The Case of Matosinhos-Leça Refinery], MSC Thesis, 2009 (João Peças Lopes)

Daniel Burnier de Castro, Simulation of Intelligent Active Distributed Networks - Implementation of Storage Voltage Control, MSc Thesis, (João Peças Lopes)

Mário Neto, Valorização Tarifária de Tecnologias Energéticas Renováve [Valorization of Tariffs for Renewable Energy Technologies], MSc Thesis, (Cláudio Monteiro)

Pedro Correia, Concepção de um Módulo de Gestão para Sistemas Energéticos Híbridos em Redes com Funcionamento Isolado [Development of a Management Module for Hybrid Systems in Networks Operating in Isolated Mode], MSc Thesis, (José Rui Ferreira)

Ricardo Ferreira, Adequação da Reserva em Sistemas com Elevada Integração de Produção Eólica [Reserve Adequacy in Systems with Large-Scale Integration of Wind Power], MSc Thesis, (Manuel Matos)

Tiago Morais, Estudo da Operação de Parques de Sistemas de Conversão de Energia das Ondas em Energia Eléctrica [Study of the Operation of Conversion Systems for Wave Energy to Electrical Energy Parks], MSc Thesis, (João Peças Lopes)

New MSc Thesis (total: 45)

Alexandre dos Santos Dias, Gestão Sustentável da Procura, MSc Thesis, (Maria Teresa Ponce de Leão)

Bernardo Silva, Parques Eólicos com "Ride-trough Fault": Validação de um Novo Sistema de Protecção em Tempo Real com Ajuda do RTDS, (Hélder Leite)

Filipe Gil, Detecção de defeitos em Redes de Distribuição Secundária, MSc Thesis, (Fernando Maciel Barbosa)

Guilherme Fonseca, Simulação de Sistemas Híbridos Insulares com Elevada Penetração de Energias Renováveis, MSc Thesis, (Cláudio Monteiro)

Tiago Pires, Desenvolvimento de um Plano de Eficiência Energética para Transporte Vertical, MSc Thesis, (José Rui Ferreira)

Patents/propotypes

DMS/EMS new modules
Developed under EFACEC-DMS
Demo Place: EFACEC
Development Period: 2008-2009

Reserve evaluation tool
Developed under TSO-Reservas
Demo Place: REN, REE
Development Period: 2009-2010

Operating reserve advice tool
Developed under Anemos.Plus
Demo Place: REN
Development Period: 2008-2009No patents.

Industry contract research

Abridged list of the main contracts with industry:

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

RESERVAS - Medium and long-term evaluation of operational reserve in the Iberian power systems in the presence of a high penetration of renewable sources. Extension to include new features and deliver a prototype of the simulation tool. REN and REE (the TSO of Portugal and Spain). 2009-2010.

ENERCON - Studies for the definition of control parameters of wind generators for new wind parks. ENERCON. Extension 2009-2010.

INOVGRID – Development of advanced telemetering systems able to support the technical and commercial management of distribution networks including micro-generation. EDP, 2007-2009.

REN-Recep, contracted with REN (Portuguese TSO) to estimate limits for the acceptance of new generation in the system nodes, 2007-2010.

ENEOP2, with the objective of developing of a methodology for loss allocation in a common grid connection infrastructure of multiple wind farms, 2008-2009.

ASIRP – Analysis and selection of investments to reduce losses in the distribution system, EDP, 2009-2010

CCR – Characterization of Consumers and Networks. Extension to incorporate new data and update consumer models, EDP Distribution, 2008-09.

Internationalization

European Projects:

MORE MICROGRIDS - Advanced Architectures and Control Concepts for More Microgrids, ended 2009.

ANEMOS-PLUS - Advanced Tools for the Management of Electricity Grids with Large-Scale Wind Generation, 2007-2010. On- going.

International contracts:

JRC - Study on the Impact of Large Renewable Deployment on European Electricity Higher Voltage Systems, EU (JRC-Institute for Energy), 2009

ARGOS – Development of a platform of tools for wind power forecasting tools. Contract with the Argonne National Laboratory, USA, 2008- 2010. On-going.

PARAFUZZY – Development of fuzzy state estimation functions for online network analysis using paraconsistent logic. UNISANTA, Brazil,.2009-2011.

RESERVAS - Medium and long-term evaluation of operational reserve in the Iberian power systems in the presence of a high penetration of renewable sources. Extension to include new features and deliver a prototype of the simulation tool. REN and REE (the TSO of Portugal and Spain). 2009-2010.

International training:

EES-UETP - The unit keeps the coordination of the training activities of the European training consortium EES-UETP, and a member of the unit chair the course programme committee.

JADES – (TEMPUS programme) aims at enhancing the research capabilities in the area of sustainable energy systems, on-going.

SECEEN – (TEMPUS programme) helped the development of joint continuing education curricula and coordinated continuing education organizational structure, ended 2009.

MIT-Portugal programme (MPP):

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 Sustainable Energy Systems

Government/Organization   contract research

Research projects funded by FCT:

PLASM –Platforms for the Simulation of Markets (coord. Gerald Sheble), on-going.
GREEN ISLAND – (coord. J. Peças Lopes), 2009 – 2011.

Future Research

Objectives

Future research will continue to follow the long-term objectives defined for the Unit and the Research Line, but new general objectives are identified:

• Support to the development of active distribution networks

• Conceptualization of new emergency functionalities, like the participation of wind generation and plugged-in electric vehicles in black start and islanding

• Definition of smart metering architectures to extend the capability of monitoring and controlling the LV distribution grid with active loads and microgeneration.

• Monitoring and control schemes and software tools for smart charging of electric vehicle's batteries and exploitation of the presence of this distributed storage for ancillary services provision to the power system

• Scientific support to the design of regulatory schemes

• Development of strategies and technical solutions for the integration of large amounts of off-shore wind power

As more specific scientific objectives, the Unit will address:

• More effective forecasting tools with uncertainty characterization, exploiting new paradigms like entropy minimization and aimed at decision support in specific situations

• Risk evaluation, decision support and negotiation tools for specific agents and circumstances

• Models for Coordinated and Optimized Management of Distribution Networks with Multi-Microgrids

• Advanced control procedures and simulation tools for assessing the steady state and dynamic impact of large scale integration of EV in electricity grids together with large deployment of renewable energy sources

• Multi-agent system approach to the management and control of distribution grids with large scale distributed storage from EV in emergency conditions

• Ancillary services provision from HVDC off-shore wind farms

• Development of prototypes of battery charging systems of EV for flexible smart charging

As instrumental objectives, the Power Systems Group will aim to increase the number of PhD holders, both young and of high level. Another key policy component will be to strengthen present partnerships with international research centers, namely in Brazil and USA (in the framework of the MIT-Portugal and CMU-Portugal programmes and with the ANL – Argonne National Laboratory, USA).

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 147.871,00 €

European Contratcts: 427.000 €

TOTAL: 574.871,00 €

Group Description

Title of Research Group:	(RG-Norte-50014-3351) Innovation and Technology Transfer
Principal Investigator:	Maria Alexandra Neves Soares dos Reis Torgal Lobo Xavier
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

QREN: 28.304,96 €

TOTAL: 28.304,96 €

Objectives & Achievements

Objectives

The purpose of the Unit (UITT) is to consolidate last years' investments and experience of INESC Porto in the development of internal processes and tools to manage their R&D results, and organize this knowledge and competences in a transversal Unit that can take responsibility and leadership of the process of knowledge valorisation.

In this context the main goal of UITT is to develop and promote innovation management practices, acting directly in the internal processes, supporting entrepreneurship activities. Regarding this theme, UITT supports the incubation process of ideas and projects emergent within the several research groups of INESC Porto.

The Group also plays a role in the scientific area of Innovation Management, Technology Transfer and Entrepreneurship. Thus, advanced training - MSc and PhD level training –constitutes a major objective aiming at creating internal excellence in the relevant research areas and to provide the industry with highly qualified professionals, capable of dealing with the challenges of entrepreneurial innovation.

The Group main Research and Development areas and activities are:

• The Innovation Management:

o Act directly in the internal innovation process and practices, by developing, in collaboration with other R&D Units, processes and tools that enable an efficient management of R&D projects results in order to maximize the valorisation opportunities.

o Provide consulting services to companies, concerning the implementation of R&D+I management systems according to NP 4457:2007. These services follow a proprietary methodology, developed in the context of COTEC Portugal project.

o Provide training to companies in order to increase awareness and knowledge concerning the NP R&D+I management systems and methodologies.

o Development research projects in order to increase emergent knowledge that supports internal and external activities.

• Entrepreneurship:

o Promote an entrepreneurship culture behind academic researchers

o Create entrepreneurial awareness through the organization of training actions, development of tools, and giving direct support to promoters in the process of turning ideas into business.

o Supply of incubation services through the recently created incubator LET-IN.

Main Achievements

2.1 Innovation management Systems:

Under this research team UITT development:

1. Two tools concerning :

The diagnosis tool for innovation management audit process

A tool to evaluate ideas portfolio throughout the different s phases of idea development

2. During 2009 UITT integrated the group of national experts represented Portugal in CEN/TC389 European Technical Commit ion CT319 –Innovation Management. UITT participate in two meetings.

3. INESC Port's units offer firms, especially, SMEs, consultancy services which include contents, methodologies, procedures and tools to knowledge and innovation management. Two contracts where established with SME´s.

2.2 Open Innovation:

During 2009 UITT initialize contacts with Portuguese companies in other to development specific projects. UITT was invited (Feb2010) to become a member of Galp Innovation Network, a web 2.0 platform whose prime objective is promote knowledge exchange about technology between Galp Energia's group and the Science and Technology Community. The main aim is to create an innovation market that generates benefits for all Galp Innovation Network members.

Galp Innovation Network portal is available in beta version, being the Innobrokers Community one of the pioneers in this new way of cooperation of Galp Energia with the Science and Technology Community.

Follow-up: active participation on development, proposal for a case study, then bigger research project together with INESC Porto

2.3 Launching and support to Spin-off companies

During 2009 29 projects were studied and 11 projects entered a pre-incubation process.

Group Productivity

Publications in peer review Journals

Total number of publications: 12

List can be consulted in: http://profile.inescporto.pt

Steffen Conn, Marko Torkkeli, Iain Bitran, Assessing the management of innovation with software tools: An application of innovation Enterprizer, International Journal of Technology Management, vol.45, no.3, pp.323-336,

Olli-Pekka Hilmola, Sandor Ujvari, Marko Torkkeli, Harri Lorentz, Thomas Andersson, From Northern Europe to Russia and Asia, and Vice Versa: Traffic Flow Analysis - Current Situation and Development Trends, International Journal of Logistics Systems and Management

Eelko Huizingh, Marko Torkkeli, Steffen Conn, Innovation for Growth, International Journal of Entrepreneurship and Innovation Management, vol.10, no.2, pp.111-226,

Daria Podmetina, Maria Smirnova, Juha Väätänen, Marko Torkkeli, Innovativeness and Internationalisation - Empirical Study of Russian R&D Oriented Companies, International Journal of Innovation Management, vol.13, no.2, pp.1-23, 2009.

Olli-Pekka Hilmola, Marko Torkkeli, Ville-Veikko Savolainen, Intangibles and business performance - a technical efficiency approach, International Journal of Entrepreneurship and Innovation, vol.9, no.4, 2009.

Pekka Salmi, Marko Torkkeli, Inventions utilizing satellite navigation systems in the railway industry - An analysis of patenting activity, Journal of Technology Management & Innovation, vol.4, no.3, pp.46-58

Marko Torkkeli, Daria Podmetina, Anna-Mari Ylä-Kojola, Juha Väätänen, Knowledge Absorption in Emerging Economy - Role of Foreign Investments and Trade Flows in Russia, International Journal of Business Excellence , vol.2, no.3

Pekka Salmi, Marko Torkkeli, Knowledge Transfer in Collaborative Public-Private R&D Project, International Journal of Business Innovation and Research, vol.3, no.3

Marko Torkkeli, Ferdinando Chiaromonte, Steffen Conn, Networks Innovation, International Journal of Entrepreneurship and Innovation Management, vol.10, no.3, pp.227-393

Anna Kyrki, Marko Torkkeli, Subcontracting product development - creating competitiveness through networking, International Journal of Technology Intelligence and Planning , vol.5, no.3, pp.241-257

Carl Kock, Pekka Salmi, Marko Torkkeli, The 'Open Innovation' Paradigm: A Contingency Perspective", Journal of Industrial Engineering and Management, vol.2, no.1, pp.176-207

Ferdinando Chiaromonte, Marko Torkkeli, Ravinder Zutshi, The role of Knowledge in Innovation Management, International Journal of Technology Management, vol.45, no.3, pp.323-336

Other publications International

Total number of publications: 19

List can be consulted in: http://profile.inescporto.pt

Ricardo Madureira, Critical realism and case studies in international business research., In Piekkari, Rebecca & Welch, Catherine (eds.) "Rethinking the Case Study Approach in International

Marko Torkkeli, Olli-Pekka Hilmola, Exploring new research avenues of industrial management, Research report 217, 978-952-214-893-3, Lappeenranta 2009, pp.15

Ricardo Madureira, Scientific method and case study research., Mills, A., Durepos, G. and Wiebe, E. (eds.) Encyclopedia of Case Study Research, Sage Publications.

Marko Torkkeli, The future of innovation in emerging markets, in Future of Innovation, edited by Bettina von Stamm & Anna Trifilova

Antti Lääperi, Marko Torkkeli, Disruptive Elements in the OLED Business Ecosystem, in Proceedings of ISPIM 2009 Symposium - 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management , New York, USA

Daria Podmetina, Juha Väätänen, Marko Torkkeli, Maria Smirnova, Open innovation Business Models in Russia: Role of clusters, stakeholders and networks, in Proceedings of ISPIM 2009 Symposium - 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management , New York, USA

Irina Savitskaya, Marko Torkkeli, Outbound open innovation: a model for external technology commercialization, in Proceedings of ISPIM 2009 Symposium - 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management , New York, USA, Dezembro

Eelko Huizingh, Steffen Conn, Marko Torkkeli, Iain Bitran, Stimulating recovery - The role of Innovation Management, in Proceedings of ISPIM 2009 Symposium - 2nd ISPIM Innovation Symposium - Stimulating Recovery - The Role of Innovation Management , ISBN 978-952-214-864-3; II ISPIM Annual Symposium book of Abstracts ISBN 978-952-214-863-6, New York, USA,

Irina Savitskaya, Marko Torkkeli, Markets for Technology in an Emerging Economy: Case of St. Petersburg Russia, in Proceedings of ISMOT'09 - THE SIXTH INTERNATIONAL SYMPOSIUM ON MANAGEMENT OF INNOVATION AND TECHNOLOGY - Open Network and Total Innovation Toward

Innovative country, Hangzhou, P.R. China

Irina Savitskaya, Marko Torkkeli, Governmental Reforms for Innovation Systems in Emerging Economies: Case Russia, in Proceedings of ECEI 2009 - 4th European Conference on Entrepreneurship and Innovation , Antwerp, Belgium,

Antero Kutvonen, Marko Torkkeli, Opening the Fuzzy Front End: A Synthesis of Two Theories, in proceedings of PICMET'09 - Portland International Center for Management of Engineering and Technology, Portland, USA,

Antti Lääperi, Marko Torkkeli, Disruptive Innovation and Innovation Ecosystem in the Display Industry, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, Viena, Austria,

Antero Kutvonen, Marko Torkkeli, Enabling innovativeness: Parallel development of business plan and technology, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, Viena, Austria,

Irina Savitskaya, Marko Torkkeli, Implementation of Open Innovation Paradigm in Russia. Case studies, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, Viena

Daria Podmetina, Juha Väätänen, Marko Torkkeli, Maria Smirnova, Marina Aleksandrova, Open Innovation vs. Technology Commercialization in Russia. Conceptualization and New challenges, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, Viena

Eelko Huizingh, Steffen Conn, Marko Torkkeli, Iain Bitran, The Future of Innovation, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, ISBN 978-952-214-767-7; Annual Conference Book of Abstracts , Viena

Maria Smirnova, Daria Podmetina, Juha Väätänen, Marko Torkkeli, Sergey Kouchtch, The Role of Cooperation with Internal and External Stakeholders in NPD processes: the Case of Russia, in Proceedings of ISPIM 2009 - The XX ISPIM Conference - The Future of Innovation, Viena

Marko Torkkeli, Daria Podmetina, Juha Väätänen, Marina Aleksandrova, The study of innovations in Russia: Possibilities for Open innovations, in proceedings of 11th SGBED Conference - 11th International Conference of the Society for Global Business & Economic Development - Striving for Competitive Advantage & Sustainability: New Challenges of Globalization, Bratislava, Slovak Republic

Daria Podmetina, Marko Torkkeli, Juha Väätänen, Towards Open Innovations: Technology Acquisition and Technology Commercialization. Case of Russia, in Proceedings of IAMOT'2009 - The 18th International Conference on Management of Technology - Management of Green Technology, EUA

Industry contract research

The relationship of this Unit with the industry has been focused on the support to technology transfer and to spin-off company incubation.

Incubation of spin-off companies:
• Process –net : development of a new service in the ICT area
• Next To You

Pre- incubation services - Feasibility Studies (Technology and Market) for the projects:
Alter Ego
Há coisas de cartão
Hesvi
Wallprinter
Água de Prata
Vision Soccer pro
By GG
Deep Sea Portugal
Quizionário

Projects with industry:
Shortcut -Implementation of Innovation Management Systems
M.A.R. Kayakes - Implementation of Innovation Management Systems
Training
Executive Training on "Innovation Management Systems" organized by Cotec
Consulting services for companies in order to increase their potential for Innovation.

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 concerning idea evaluation and Innovation process diagnosis

Internationalization

During 2009 UITT integrated the group of national experts represented Portugal in CEN/TC389 European Technical Commit ion CT319 –Innovation Management

Future Research

Objectives

As main future research goals, UITT will address the main areas:

1. Open innovation in innovative firms - Gathering of best practices and models of innovation management in companies of several countries (China, Finland, Portugal, Russia, and Spain). Through an overall quantitative survey and an in-depth study of a selective sample of highly dynamic firms in terms of innovation, this research endeavors to illuminate and add empirical evidence to a scarcely analyzed phenomenon. The Open Innovation study is likely to contribute to a broader understanding of the linkages and cooperation between firms, R&D institutes, Universities and Government facilities and policies, and the critical issue of knowledge transference and property rights management among the different players. This issue directly links with the entrepreneurial process and R&D valorization target, often representing a nebulous and almost unreachable subject for both firms and R&D agents.

2. "Enabling the Fuzzy Front End of Innovation (EFFE)": The innovation process may be divided into three areas: the fuzzy front end (FFE), the new product development (NPD) process, and commercialization. In this research area we will put our effort and focus in the Fuzzy Front End of Innovation, namely in the multidisciplinary methods and tools, that enable the unfolding of the so-called New Concept Development phase that is illustrated in this picture. (PDMA1)

Examples of research topics include & combine (but are not restricted to) issues such:

- Network Enabled Organizations

- Collaborative Innovation Networks

- The role of IT, Supporting Technologies and Interoperability

- Roadmaping and Foresight

- Negotiation

- Cultural Issues

- Qualitative Research Methods applied to the FEE (e.g.: ethnographic research)

The wide scope of this topic as a research topic, lead to focusing the research effort of this new UITT Area in particular topics that reflect the interests and motivations of the starting team.

Idea Projects (at kick-off)

1. PhD Research Projects:

   (PDEIG): Enterprise interoperability in collaborative networks: The strategic role of ICT in the promotion of collaborative innovation

   (PRODEI): Enabling Product Co-Creation at the FFE

2. MSc Projects

   Modelling the Value Creation Process Contracts (foreseen)

   Roadmaping project for the Sea Life Sciences and Industry

3. Measuring R&D+I - One of the dilemmas which challenge scholars, policymakers, and business managers is how to conveniently assess whether R&D investments are coming to fruition or not. Since R&D activities still have a central place in the innovation process for many, measuring the impact of R&D spending, tracking its effectiveness, checking whether the costs justify the expenses, are not clichés, but real concerns that are not to be overlooked in both public and private sectors, since R&D activities compete with other activities in the run for (scarce) resources allocation.

4. Development entrepreneurship tools : The main objective for 2010 is the development of three manuals in the areas of Digital Media, Valorization Open Source Software and Services.

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5. CEN/TC389 European Technical Commit ion CT319 –Innovation Management

UITT represent Portugal in two working :

Working Group 1: Collaboration and creativity management,

Working Group 6: Intelligence Strategic Management

Funding, source, dates

QREN: 57.772,45 €

TOTAL: 57.772,45 €

FCT Relatório Científico 2009 Print: 01-04-2010 10:17:30 [INESC Porto - Instituto de Engenharia de Sistemas e Computadores do Porto]

Group Description

Title of Research Group:	(RG-Norte-50014-3406) LIAAD Laboratory of Artificial Intelligence and Decision Support
Principal Investigator:	Vladimiro Henrique Barrosa Pinto Miranda
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 26.450,64

QREN: 2.623,79 €

TOTAL: 29.074,43 €

Objectives & Achievements

Objectives

The reference to this Group is included in this report only to indicate that the evolution of INESC Porto LA includes associating LIAAD to the LA.

LIAAD - Laboratory of Artificial Intelligence and decision Support, is a Group with some 17 PhDs, coordinated by Prof. Pavel Brazdil. Most of the researchers have a link with the School of Economics in the University of Porto. Its main areas of activity are linked with Machine Intelligence and Data Mining and this generates an extremely interesting synergy with the historical INESC Porto Groups, especially with USIG, and also with CRACS.

LIAAD received an evaluation from FCT of VERY GOOD in 2008, for the previous 3 year period.

Informally, LIAAD and INESC Porto Groups have already started, during 2008, and continued in 2009, cooperation in joint projects - with Power Systems (USE), Information Systems (USIG), Telecommunications and Multimedia (UTM). Joint papers have already been written and submitted to journals.

FCT has delayed the recognition of the enlargement of the LA since 2008, until the end of the institution evaluation process (which is not completed yet by March 2010!) and did not recognize the integration until the end of 2009.

This 3-year delay is objectively harmful for the organization of the LA and research activities and does not allow the factual reporting of the global activities carried out, also because of the format imposed for the reports.

The activity of LIAAD is reported independently in a different report.

In this report one has indicated Prof. Vladimiro Miranda as the PI for lack of a better way to indicate that the relations between the group and INESC Porto, to enlarge the LA, are held under Prof. Miranda's responsibility.

Main Achievements

(n.a.)

Group Productivity

Future Research

Objectives

n/a

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 59.331,02 €

QREN: 12.717,90 €

TOTAL: 72.048,92 €

Group Description

Title of Research Group:	(RG-Norte-50014-3435) Software Engineering and Information Systems
Principal Investigator:	Mário Jorge Moreira Leitão
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 28.741,65 €

European Commission: 52.617.93 €

QREN: 113.512,86 €

TOTAL: 194.872,44 €

Objectives & Achievements

Objectives

Historically, the group's activity has been mostly in the area of Advanced Information Systems Engineering with a large emphasis on technology transfer and high level consultancy, and less on fundamental research. The group has contributed significantly in application areas with high social impact, namely in e-Government and e-Health, and has been engaged in many national and European competitive projects.

Following the recommendations of the INESC-Porto's SAB, the group was re-structured in 2009 to integrate INESC Porto internal competences in Computer Graphics, Information Management and Systems, and Software Engineering. The group was renamed as the "Information and Computer Graphics Systems (USIG)" group. It includes researchers from the former group, from other groups inside INESC Porto, but also new researchers that joined INESC Porto during 2009.

The group objectives encompass several types of activities, namely: research, development, technology transfer, consulting, auditing and advanced training. These activities are anchored on three main research areas: Information Management and Systems, Software Engineering and Computer Graphics and Virtual Environments. The research goals include work geared to:

• 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.

• 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 is leading us into 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.

• Devise models, methods and tools for digital preservation, namely in the area of database preservation and scientific data repository management. There is preliminary work on the transformation of databases into preservation-friendly representations along under the framework established by the OAIS, and on the development of descriptions for scientific datasets.

• to develop innovative models, methodologies and architectures for large scale information systems. We focus on systems integration and interoperability, authentication, access authorization, security and auditability mechanisms.

• Investigate innovative methods in computer graphics and virtual environments, especially in application to serious games, immersive and interactive urban planning based on virtual environments, modeling and visualization of large scenes for immersive environments and mobile devices, and image synthesis.

Research will be closely matched with application areas in which the group has large experience and established successful partnerships. The main applications areas are: public administration (local, regional and central government), healthcare, telecommunications, transport and industry, commerce and services sectors. It is expected that e-Government and e-Health will be major application areas in the near future.

The group is composed by a heterogeneous team, composed by 49 collaborators, a combination of researchers, professionals and post-graduate students with skills and competences in diversified areas: information systems, information management, computer graphics, simulation, telecommunications, computing sciences, software engineering and geographic engineering.

Management will be performed by two coordinators. Both have previous experience, one in operational management of INESC Porto groups and another one in research management. The latter is also coordinator of CRACS, an INESC Porto Associated Laboratory Autonomous Group. This will ensure also a transversal coordination in Computer Science areas inside the Associated Laboratory.

Main Achievements

One main achievement was the restructuring of INESC Porto R&D internal competences in Computer Graphics, Information Systems and Software Engineering into a new group. This, together with the groups of CRACS and LIAAD, will enforce a new strategic research line, named "Digital Society – Large Scale Platforms, Advanced Services, Citizen Participation and Policies", proposed to be developed in the future at INESC Porto Associated Laboratory.

The group was very successful in obtaining competitive funding, over 1 M€ from diversified sources, roughly one third from each source (national programs, European programs and consulting and services). Some new projects are eCAALYX - Enhanced Complete Ambient Assisted Living Experiment, under (AAL Joint Programme), CAALYX-MV – CAALYX Market Validation (CIP PSP), ICT4DEPRESSION - User-friendly ICT Tools to Enhance Self-Management and Effective Treatment of Depression in the EU (7FP), ADDME - Activating Drivers for Digital eMpowerment in Europe (ICT PSP), DB Preserve - Data Warehouses for the Long-term Preservation of Institutional Electronic Records and Databases (FCT), URBIS - Efficient management and

visualization of spatiotemporal urban data (FCT), and 3DWikiU - 3D Wiki for Urban Environments (FCT).

There has been also a reinforcement of the activity around collaborative platforms and social software. Examples are the work performed for CCDR LVT (PROT OVT, PROT AML, Lisboa 2020), CCDR-Norte (PROT-N, Atlantic Region, Norte em Rede), ANAFRE, Wiki Wipro and Palco 3.0. Prototypes were obtained in CAALYX, EI-Nautilus – Escola Interactiva NAUTILUS and Wiki Wipro.

New collaborations were created with AMAVE (regional association of local municipalities), ANAFRE (national association of small local authorities), WIPRO Retail (software services for retail multinational) and GENERG (renewable energies producer) and reinforced with CCDR-N and IVDP.

Two members were involved in two spin-offs, one is Tecla Colorida focused on Colaborative and Social Software for Primary Schools and the other is Strongstep specialized in Software Engineering, particularly Software Development Processes.

3 PhD and 42 MSc thesis were completed under the supervision of members of the group, thus showing the strong group's commitment in advanced training of young researchers.

The group maintained its participation in several industrial fora, like DANOTEC (association in the area of defense, security, naval and aerospace industries) and CEDT (association for the promotion of IT for dematerialization of traditional processes). Additionally, in 2009 it started to participate in several new industrial clusters (ICT, forests and ocean).

Group Productivity

Publications in peer review Journals

Total number of publications: 4

List can be consulted in: http://profile.inescporto.pt

CALISTRU, C.M., RIBEIRO, C., DAVID, G., "Multimedia in cultural heritage manuscripts:Integrating description, transcription, and image content", EURASIP Journal on Image and Video Processing 2009.

FONSECA, T., RIBEIRO, C., GRANJA, C., "Vital Signals in Intensive Care: Automatic Acquisition and Consolidation into Electronic Patient Records", Journal of Medical Systems 2009, vol.33, no.1, p.47-57.

GONÇALVES, A., MAGALHÃES, L.G., CHALMERS, A., "High Dynamic range - A gateway for predictive ancient lighting", ACM Journal on Computing and Cultural Heritage, July 2009, Article 3, vol.2, no.1.

PEREIRA, J.E., COSTA, L.M., CABRITA, A.M., COUTO, P.A., FILIPE, V.M., MAGALHÃES, L.G., FORNARO, M., DI SCIPIO, F., GEUNA, S., MAURICIO, A.C., VAREJÃO, A.S., "Methylprednisolone fails to improve functional and histological outcome following spinal cord injury in rats", Experimental Neurology, a Journal of Neuroscience Research, November 2009, vol.220, no.1, p.71-81.

Other publications International

Total number of publications: 34

List can be consulted in: http://profile.inescporto.pt

AGUIAR, A., MERSON, P., DEKEL, U., "Wikis for Software Engineering Workshop", ICSE 2009, Vancouver, Canada.

AMARO OLIVEIRA, M., "Interoperable Geographic Information Services from crisis Management perspective", DSIE 2009, Porto, Portugal.

BARROSO, I., AZEVEDO, M., RIBEIRO, C., "Thematic digital libraries at the University of Porto: metadata integration over a repository infrastructure", ECDL 2009, LNCS, vol.5714, Corfu, Grécia, p.392-395.

CARVALHO, A., DE SOUSA, A.A., RIBEIRO, C., COSTA, E., FRANCHIN, W., "Interactive focus + context visualization of spatio-temporal urban data models", GeoViz 2009, Hamburg, Germany.

CARVALHO, R., PORTELA, L., VARAJÃO, J., MAGALHÃES, L.G., "Actividades do gestor de sistemas de informação", ADM 2009, Ponta Grossa, Brasil.

CORDEIRO, M., RIBEIRO, C., "Reuse of Video Annotations Based on Low-Level Descriptor Similarity Techniques", WIAMIS 2009, London, UK, p.193-196.

CORREIA, F.F., FERREIRA, H.J., AGUIAR, A., "Design for an Adaptive Object-Model Framework; An Overview", PLOP'2009 - Workshop MODELS@runtime2009, Chicago-Illinois, USA.

CORREIA, F.F., FERREIRA, H.J., FLORES, N., AGUIAR, A., "Incremental Knowledge Acquisition in Software Development using a weakly-Typed Wiki", WikiSym 2009, Orlando, USA.

CORREIA, F.F., FERREIRA, H.J., FLORES, N., AGUIAR, A., "Patterns for Consistent Software Documentation", PLOP'2009, Chicago-Illinois, USA.

COUTO, T., RIBEIRO, C., NUNES, S., "Characterizing the Portuguese blogosphere", ICWSM 2009, San José, USA.

CRUZ, A.M.R., PASCOAL FARIA, J., "Automatic Generation of User Interface Models and Prototypes from Domain and Use Case Models ", ICSOFT 2009, vol.1, Sofia, Bulgaria.

DORES, A.R., CARVALHO, I., ABREU, C., GUERREIRO, S., ALMEIDA, I., ROMERO, L., NUNES, J., LEITÃO, M., BARBOSA, J., CALDAS, A.C., "New Answers for Old Questions in the Domain of the Cognitive Rehabilitation", IADIS 2009, Roma, Itália.

DORES, A.R., CARVALHO, I., ABREU, C., NUNES, J., LEITÃO, M., CALDAS, A.C., "Virtual Reality: Application to Cognitive Rehabilitation after Acquired Brain Injury", DSAI 2009, Lisboa, Portugal.

FREITAS, M., DE SOUSA, A.A., COELHO, A., "Evaluation of Visualization Features in Three-Dimensional Location-Based Mobile Devices", GRAPP 2009, Lisboa, Portugal, p.328-336.

FREITAS, T., COELHO, A., ROSSETTI, R., "Improving Digital Maps Through GPS Data Processing", IEEE ITSC09, St. Louis, Missouri, USA, p.480-485.

KAJKO-MATTSSON, M., AGUIAR, A., BONESS, K., KAINDL, H., POOLEY, R., TAEL, A., "Long-Term Perspective of Agile Methods", ICSEA 2009, Porto, Portugal.

LIBERATO, N., PERES, E., VARAJÃO, J., BESSA, M., "LBES:Location-Based E-Commerce System", Centeris´2009, Ofir, Portugal, p.145-151.

MORAIS, R., CUNHA, C.R., PERES, E., BESSA, M., REIS, M.C., "Contextualized Ubiquity: A New Opportunity for Rendering Business Information and Services", CENTERIS'2009, Ofir, Portugal, p.573-581.

MOREIRA DA SILVA, P., CORREIA LOPES, J., SILVA, M.J., "Ubiquitous Computing in Children Education: Framework for Georeferenced Multisensory Information", SIIE'09, Coimbra, Portugal.

MOREIRA, P.M., REIS, L.P., DE SOUSA, A.A., "Jumping Jack: A Parallel Algorithm for Non-Monotonic Stream Compaction", GRAPP 2009, Lisboa, Portugal, p.137-146.

MOREIRA, P.M., REIS, L.P., DE SOUSA, A.A., "New Algorithms for GPU Stream Compaction: A Comparative Study", GRAPP 2009, Lisboa, Portugal, p.119-128.

NUNES, S., RIBEIRO, C., DAVID, G., "Improving web user experience with document activity sparklines", EPIA 2009, Aveiro, Portugal, p.601-604.

NUNES, S., RIBEIRO, C., DAVID, G., "Using Temporal Evidence in Blog Search", ECIR 2009, Toulouse, France, p.22-26.

OANCEA, D., SILVA MOREIRA, R., CORREIA LOPES, J., "Controlling Complex Multimedia Systems via Reflection and Ontologies", ICC-WCSS 2009, Lisboa, Portugal.

PERES, E., LIBERATO, N., BESSA, M., "Events Promotion: An E-Business Solution", 13th IBIMA conference 2009, vol.11, no.11, Marraquexe, Marrocos, p.255-265.

RAHMAN, A., DAVID, G., RIBEIRO, C., "Model Migration Approach for Database Preservation", IDCC 2009, London, United Kingdom.

RESTIVO, A., AGUIAR, A., "drUID - Unexpected Interactions Detection", AOSD.09 - Charlottesville, Virginia, USA.

ROCHA, T., GONÇALVES, M., MAGALHÃES, L.G., GODINHO, F., BESSA, M., "Accessibility and Usability on the Internet for people with intellectual disabilities", DSAI 2009, Lisboa, Portugal.

RODRIGUES, N., LINO OLIVEIRA, J., COELHO, A., "Adapting traditional web applications to new user interfaces provided by rich internet applications", IADIS 2009, vol.2, Roma, Itália, p.395-398.

SILVA, A.R., MARTINHO, D., AGUIAR, A., FLORES, N., CORREIA, F.F., FERREIRA, H.J., "An Implementation Model for Agile Business Process Tools", IWODE09, Lisboa, Portugal.

SILVA, A.R., MEZIANI, R., MAGALHÃES, R., MARTINHO, D., AGUIAR, A., FLORES, N., "AGILIPO: Embedding Social Software Features into Business process Tools", BPMS2'09, Ulm, Alemanha.

SOARES, G., ROSETI, R., FLORES, N., AGUIAR, A., FERREIRA, H.J., "Towards a Cooperative Personal Agenda in a Collaborative Team Environment", CDVE 2009, Luxembourg.

SOUSA RODRIGUES, N.C., MAGALHÃES, L.G., MOURA, J., SANTOS, F., MORGADO, L., CHALMERS, A., "ArchHouseGenerator - A Framework for House Generation", Slactions 2009, Braga, Portugal.

VAN DE VEN, P., BOURKE, A., TAVARES, C.E., FELD, R., ROCHA, A., NELSON, J., "Integration of a suite of sensors in a wireless health sensor platform", IEEE Sensors Conference 2009, Christchurch, New Zealand.

Other publications National

Total number of publications: 17

List can be consulted in: http://profile.inescporto.pt

AGUIAR, A., MERSON, P., DEKEL, U., "Proceedings of the Wikis for Software Engineering Workshop" 2009.

BESSA, M., BULAS-CRUZ, J.A., CHAMBERS, A., "Selective Rendering for 3D Maps: High-Fidelity Graphics on Mobile Devices" 2009.

CUNHA, N., MOREIRA, M., VAREJÃO, A., COSTA, L., PEREIRA, J., COUTO, P., MELO-PINTO, P., BULAS-CRUZ, J., MAGALHÃES, L.G., FILIPE, V., "Colour Marker Segmentation in Biomechanics Applications", RECPAD 2009, Aveiro, Portugal.

CUNHA, V., LEITÃO, M., "Exploração da Remoção Hierárquica por Oclusão em Simulações em Tempo Real", 17º EPCG 2009, Covilhã, Portugal.

FERREIRA, H.J., AGUIAR, A., PASCOAL FARIA, J., "Adaptive Object-Modelling: Patterns, Tools and Applications", SEDES- Software in ICSEA 2009, Porto, Portugal, p.530-535.

FLORES, N., AGUIAR, A., "Patterns and Tools for improving Framework Understanding: a Collaborative Approach", SEDES 2009, Porto, Portugal.

FRANCHIN, W., CARVALHO, A., MOREIRA, J., DE SOUSA, A.A., RIBEIRO, C., "An importer of virtual 3D City Models datasets into a spatiotemporal database" [Um importador de modelos de cidades virtuais 3D para base de dados espaço-temporal], September 2009, INFORUM (Xata) 2009.

GRILO, A., PAIVA, A.C., PASCOAL FARIA, J., "Reverse Engineering of GUI Models", INFORUM/XATA 2009 - Lisboa, Portugal, p.527-538.

MARTINS, J., SILVA, J., DE SOUSA, A.A., "Reconhecimento de Fachadas de Edifícios em Imagens de Ambientes Urbanos", 17º EPCG 2009, Covilhã, Portugal.

ORTEGA, M.D.R., COELHO, A., DE SOUSA, A.A., ALVARADO, L.O., "Modelling a virtual urban environment with realistic terrain features", 17° EPCG 2009, Covilhã, Portugal, p.313-314.

PEREIRA, F., MOURA, J.P., BULAS-CRUZ, J.A., MAGALHÃES, L.G., CHALMERS, A., "Efficient use of Multiple Hardware Components for Image Synthesis", 17° EPCG 2009, Covilhã, Portugal.

RESTIVO, A., AGUIAR, A., "Testing for Unexpected Interactions in AOP", SEDES 2009, Porto, Portugal.

RODRIGUES, R., COELHO, A., REIS, L.P., "Modelação Expedita de Edifícios Monumentais a partir de Descrições Textuais" [Expeditious Modelling of Monumental Buildings from Textual Descriptions], 17° EPCG 2009, Covilhã, Portugal, p.35-43.

SILVA, J., RIBEIRO, C., CORREIA LOPES, J., "Sharing botanical information using geospatial databases", INFORUM/XATA 2009, Lisboa, Portugal.

SILVA, M.J., GOMES, C.A., PESTANA, B., CORREIA LOPES, J., MARCELINO, M.J., GOUVEIA, C., FONSECA, A., "Adding Space and Senses to Mobile World Exploration" 2009, Cap.8, Mobile Technology for Children: Designing for Interaction and Learning, p.147-169.

URBANO, C., MAGALHÃES, L.G., MOURA, J.P., BESSA, M., MARCOS, A.F., "Desenvolvimento de um operador de tone mapping para dispositivos com ecrã pequeno", 17° EPCG 2009, Covilhã, Portugal.

VAREJÃO, A.S., COSTA, L.M., PEREIRA, J.E., COUTO, P.A., FILIPE, V.M., MAGALHÃES, L.G., MELO-PINTO, P., BULAS-CRUZ, J., MAURÍCIO, A.C., GEUNA, S., "The effect of gait speed on three-dimensional analysis of hindlimb kinematics during treadmill locomotion in rats", 11° Meeting SPN 2009, Braga, Portugal.

Master and Ph.D. thesis completed

Thesis completed by members of the unit.

PhD Thesis:

CARVALHO, A., "Spatio-Temporal Information Management Visualization"

MSc Thesis:

GASPAR, A., "Definição Arquitectura Empresarial: Caso Observatório Mobilidade Região Metropolitana de Lisboa".

BARROS, R., "Definição de uma Framework para Municípios de Pequena Dimensão".

Thesis supervised by members of the group:

PhD Thesis:

MOREIRA, P., "Intelligent Optimization Methodologies Applied to the Visualization of Virtual Environments"

CALISTRU, C., "Data Organization and Search in Multimedia Databases".

Selected MSc Thesis from a total of 42:

ALMEIDA, J. "Visualização de Documentos Partilhados em Colecções Dinâmicas".

AMARAL, L., "A gap analysis methodology for the Team Software Process".

AZEVEDO, M., "Biblioteca Digital de Alimentação e Nutrição Humana".

BARROSO, I., "BDArt - Biblioteca Digital de Arte Arquivo e Biblioteca: A Integração de Fundos de Diferentes Proveniências numa Infra-Estrutura de Repositório".

COSTA, G., "Implementação de uma ferramenta para auditoria de software clínico"

COSTA, T., "Avaliação da Medida "h-index" na Ordenação de Resultados na Blogosfera".

COUTO, O., "Characterizing the Portuguese Blogosphere".

CUNHA, V., "Detecção de oclusão em ambientes 3D".

DINIS, A., "Reengenharia de Software - Contributos para a melhoria no desenvolvimento de sistemas de informação nas organizações".

ESPINHEIRA, E., "A Requirements Development Methodology Compatible with CMMI".

FERNANDES, C., "Novos Serviços de Rede Inteligentes Redes Móveis de Dados".

FERREIRA, R., "Development of GUI Test Coverage Analysis and Enforcement Tools".

FRANCISCO, V., "Business Intelligence - Um Caso Prático".

FREITAS, T., "Geospatial Data Processing for GPS Navigation Systems".

GOMES, P., "Integração de modelos de desenvolvimento de software mais e menos ágeis".

GONÇALVES, M., "Mapas de Importância para a Web"

GONÇALVES, R., "Projecção de Vídeo em Ambientes Virtuais; Enriquecimento de cenários tridimensionais com base em imagens recolhidas por veículos robóticos".

GUEDES, J., "Gestão de Informação na Documentação de Software".

HENRIQUES, P., "Information System Strategic Planning - A Case Study in the Public Sector".

MANO, L., "Novos Padrões de Interacção com o Utilizador em Aplicações Web usando Ajax".

MOREIRA, J., "Sistemas de Informação para avaliação de desempenho na administração local"

MOURA, S., "Modelo conceptual de base de dados para Web sobre Espaços Verdes Urbanos com a utilização dos Sistemas de Informação Geográfica

(SIG)".

NUNES, T., "Towards a Pedestrian Navigation System".

QUEIROZ, N., "CrystalBox - Uma Ferramenta para Documentação Ágil de Sofware"

RESENDE, H., "Web Social em Serviços Móveis baseados na localização".

RODRIGUES, N., "Aplicação Web para Classificação de Parcelas Agrícolas".

SILVA, J., "Sharing botanical information using geospatial databases".

VILAS BOAS, M., "Avaliação da Maturidade Organizacional em Gestão de Projectos de SI/TI - Administração Pública Portuguesa".

Patents/propotypes

Three prototypes were developed in 2009:

CAALYX, - The final prototype of this ambient assisted living FP6 project. The group developed a mobile telephone based system that interacts with several sensors, evaluates the data gathered and, based on context and medical patterns, alerts a care centre.

EI-Nautilus - Escola Interactiva NAUTILUS – First version of NET_SCHOOL, 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. This project was developed for NAUTILUS, a producer of classroom material (with integrated PCs) and retailer of interactive classroom boards.

Wiki Wipro – A JAVA based collaborative platform for the creation and re-use of commercial presentations, developed for WIPRO Retail, a software services multinational in the retail area, specialized in the implementation of ORACLE Retail solutions.

Organization of conferences

IWODE'09 – International Workshop on Organizational Design and Engineering
11 - 12 December 2009, Lisboa, Portugal
Ademar Aguiar - Program Committee

PLOP'2009- Pattern Languages of Programs Conference
28 – 30 August 2009, Chicago, USA
Ademar Aguiar - Program Committee

SEDES 2009 – Simpósio para Estudantes de Doutoramento em Engenharia de Software
20-25 September 2009, Porto, Portugal
Ademar Aguiar - Technical Program Committee

WikiSym 2009 – The 5th International Symposium on Wikis and Open Collaboration
25-27 October, Orlando, USA
Ademar Aguiar – Symposium Committee: Sponsorships Chair; and Program Committee

ADM 2009 - Congresso Internacional de Administração, Ponta Grossa, Brasil, 21-25 Setembro 2009.
Luís Magalhães – PC member

17º Encontro Português de Computação Gráfica, Covilhã, Portugal, 29-30 Outubro 2009.
Luís Magalhães – PC member]

17º Encontro Português de Computação Gráfica, Covilhã, Portugal 29 - 30 de Outubro de 2009
António Coelho - co-Chair

CLOUDVIEWS.ORG – Cloud Computing Conference 2009, Porto, Portugal, 28-29 May 2009
Miguel Leitão - Organization

17º Encontro Português de Computação Gráfica; Covilhã, 29 e 30 de Outubro de 2009.
Augusto Sousa - Member of Scientific Committee

SIACG 2009 - SIACG 2009 IV Iberoamerican Symposium in Computer Graphics; Margarita island, Venezuela, 15 a 17 de Junho.
Augusto Sousa - Member of International Organization Committee

CEIG'09 - CONGRESO ESPAÑOL DE INFORMÁTICA GRÁFICA; 9-11 de Septiembre 2009 - San Sebastian, Spain.
Augusto Sousa - Member of Scientific Committee

XATA2009, "XML: Aplicações e Tecnologias Associadas", INFORUM, Simpósio de Informática, Universidade de Lisboa, Portugal, 10 e 11 de Setembro de 2009
Correia Lopes - Membro do Comité de Programa

Membro do Comité de Organização e do Comité de Programa da CISTI2009, "4ª Conferência Ibérica de Sistemas e Tecnologias de Informação", Póvoa de Varzim, Portugal, 17-20 de Junho de 2009

Membro do Comité de Programa da ICEIS2009, "11th International Conference on Enterprise Information Systems", Milan, Italy, 6-10 de Maio de 2009

Industry contract research

EI-NAUTILUS - The EI-NAUTILUS is a QREN funded project, developed in co-promotion with NAUTILUS, which aims to create a set of applications, NET_SCHOOL, which will allow integrated management of electronic equipment in classrooms.

Escolinhas - Consulting and development services for an educational collaborative and social platform for Tecla Colorida, an INESC Porto/FEUP spin-off involved in educational software for the K12 market.

GENERG - Consulting services for GENERG, a renewable energy power producer, addressing their telecommunications network, mainly their wireless part.

Mobiles - The development of electric mobility creates new logistic needs. This is particularly true if electric batteries are changed instead of charged. This QREN funded project addresses the IT needs of this business model and will prototype several solutions.

NIDT FORUM - Consulting services for Forum Sistemas de Informação, a small software house, in the area of healthcare information systems.

NIDT PROCESSNET - Consulting services for Process.Net, a small software house, in the area of locationb based dispatch systems.

Palco Principal - This QREN project aims to develop the base platform of an already existing music content portal (http://palcoprincipal.com/), by innovating in several processes, such as content identification, automatic classification, selective research, organization, sharing, recommendation and intelligent treatment of all types of data involved (music, preferences, texts, photographs, posts, among others).

WIKI WIPRO - Development of a collaborative plataform, wiki-based, for WIPRO Retail, an Indian multinational specialized in retail, addressing the collaborative elaboration of business proposals

Internationalization

The internationalization of the group has been accomplished mainly through European projects and collaborative initiatives.

ADDME - Activating Drivers for Digital eMpowerment in Europe, an Thematic ICT PSP project, aiming to fight the digital divide.

CAALYX - Complete Ambient Assisted Living Experiment - 6FP-IST - CAALYX's main objective is to develop a wearable light device able to measure specific vital signs of the older person, to detect falls and to communicate automatically in real time with his/her caregiver in case of an emergency, wherever the older person happens to be, at home or outside. The project was finished in the beginning of 2009.

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, development new features.

ELANET - European Local Authorities'Telematic Network, an association promoted by CEMR, with the goal to develop the Information Society at local and regional level. One collaborator is member of the Steering Committee.

HILLSIDE Group - Is a private non-profit devoted to the advance of software patterns. It organizes several PLoP conferences and the WikiSym. One collaborator is member

Initiatives with US Universities - Partnerships are being initiated with US Universities which could generate joint R&D projects. Examples are the UT Austin Portugal (in the area of e-Gov) and CMU Portugal (with the Software Engineering Institute, in the area of Software Quality).

RAIA - Oceanic Observatory of the Iberian Coast - This project aims to improve the real time knowledge of ocean conditions, thanks to data services using an extensive maritime sensor network.

Government/Organization   contract research

ANAFRE - Development of a collaborative platform and Internet portals for small local authorities.

CCDR-LVT - Collaborative platforms for the elaboration and public discussion of two regional master plans (Oeste e Vale do Tejo and Lisbon) and participation in the thematic working group ICT. Collaborative platform for the Lisboa 2020 Regional Strategic Plan

CCDRN-RJUE - Specification and implementation support of a regional interoperability platform between municipalities and central administration, in the area of urbanization and building construction licensing.

CCRDN-TIC - Implementation of collaborative platforms for PROT N, Norte em Rede and Atlantic Area INTERREG Programme.

DB Preserve -Data Warehouses for the Long-term Preservation of Institutional Electronic Records and Databases, a FCT project.

IVDP - Consulting in Geographic Information Systems for the Porto and Douro wine industry regulator.

Portal Douro -Consulting and development of a regional Portal for the Douro region.

SAMA2007 - Consulting for CCDR-N in the evaluation of SAMA Call proposals.

SIGAVE - Development of a regional solution for the integration of georeferenced content in AMAVE portal, using geographic web services.

SIVIDA - Specification of an Information System for AIDS data collection and processing, for the Healthcare High Commissioner.

URBIS - Efficient management and visualization of spatiotemporal urban data, a FCT project.

Future Research

Objectives

USIG research objectives are in line with those of INESC Porto, focusing in the development of fundamental and applied research strongly anchored in industrial partnerships and technology transfer in the application areas of e-Government and e-Heal. A major goal of the group is also to contribute the advanced training of young researchers and professionals. The future research goals of the group are highlighted through the specific research goals of each area:

1. Information Management and Systems

The work in this area encompasses information systems, information retrieval and digital repositories and preservation. Future work plans are:

• Development of new models of integration of the authentication and digital signature facilities provided by the Portuguese Citizen Card in organizational information systems.

• Research on models of leveraging the intra-organizational communication by the adequate use of social software tools.

• Development of tools for enhanced web retrieval, based on temporal analysis, citation patterns and user context modelling.

• Continuing the development of image retrieval methods and tools, using state-of-the-art feature extraction techniques and exploring user feedback on specialized collections.

• Exploring a set of case studies in database transformation, using the results of the DBPreserve project. Test the resulting data warehouse representation and generate XML preservation version. Define the submission, archive and dissemination packages of the OAIS framework, applied to the case of DB preservation.

• Design preservation procedures and description models for a set of scientific datasets. Experiment with the deposit of the datasets into a data repository

2. Computer Graphics and Virtual Environments

The work in this area encompasses virtual environments, geo-spatial systems, and image synthesis and visual perception. Future work plans are:

• Research on modeling and visualization of large and/or complex 3D Virtual Environments. We will focus on using and extending the Geo-Spatial L-Systems developed within the group to develop new and efficient methods to introduce information rules to model historical buildings, specially monuments. This opens new research lines combining Procedural Modeling, Machine Learning, Natural Language Understanding and Information Extraction. One PhD student is working in this area.

• Continue research work on methodologies for Spatio-Temporal Information Representation and Visualization. These areas require 3D modeling of similar objects, but a major challenge is introduced when integrating temporal information as buildings and other objects need to be recovered only by means of old texts and other expertise information. Information Visualization is very important in this context and the methodologies used to make a simultaneous representation in space and in time have to be further developed. This work will benefit from the existing experience within the group on Geographical Information Systems that lead to the development of the Geo-Spatial L-Systems.

• Develop new metaphors in interactive and immersive environments for collaborative task performance, namely in 3D virtual environments. We will combine with the work on serious games frameworks within a FCT funded project starting in 2010.

• Work on new mobile solutions, namely on defining new methodologies for augmented/virtual reality applications on urban environments and new interaction techniques based on augmented and mixed reality for open spaces.

• Continue research on the visualization of 3D, namely deriving new visualization and image synthesis techniques based on human image perception. We aim to achieve different and better levels of realism, new usability and accessibility tests based to improve and bring efficiency to web pages, and the development of ontology for transcoding web pages based on Visual Perceptual Information.

3. Software Engineering

The work in this area encompasses software development processes, software architecture and design, collaborative environments, software testing and software quality. Future work plans are:

• Mining, capturing and description of patterns to enhance software documentation, understanding, and visualization, especially for reusable complex software systems, such as object-oriented application frameworks.

• Development of innovative collaboration features and tools to support knowledge management in software projects, taking advantage of social software and collaboration tools.

• Development of tools to support a disciplined reuse of aspect-oriented software, based on testing tools and techniques.

• Definition of custom software processes for software projects combining best practices of both agile processes and quantitative methods.

• Definition of advanced design techniques for software systems with high-demand on variability based on meta-modelling techniques and run-time adaptation, such as adaptive object modelling, virtual machines, and meta-programming.

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 60.280,03 €

QREN: 161.288,35 €

European Commission: 81.187,43 €

TOTAL: 302.755,81 €

FCT Relatório Científico 2009 Print: 01-04-2010 10:18:10 [INESC Porto - Instituto de Engenharia de Sistemas e Computadores do Porto]

Group Description

Title of Research Group:	(RG-Norte-50014-3507) CRACS Center for Research in Advanced Computing Systems
Principal Investigator:	Vladimiro Henrique Barrosa Pinto Miranda
Main Scientific Domain:	Engenharia Electrotécnica e Informática
Group Host Institution:	Instituto de Engenharia de Sistemas e Computadores do Porto

Funding, source, dates

Funding, source, dates

n/a

Objectives & Achievements

Objectives

The reference to this Group is included in this report only to indicate that the evolution of INESC Porto LA includes associating CRACS to the LA.

CRACS - Center for Research in Advanced Computing Systems, is a Group with some 9 PhDs, coordinated by Prof. Fernando Silva. Most of the researchers have a link with the Faculty of Sciences in the University of Porto. Its main areas of activity are linked with Computer Science and this generates an extremely interesting synergy with the historical INESC Porto Groups, especially with USIG, and also with LIAAD.

CRACS received an evaluation from FCT of VERY GOOD in 2008, for the previous 3 year period.

Informally, CRACS and INESC Porto Groups have already started, during 2008, and continued in 2009, cooperation in joint projects - namely with the Information Systems Group (USIG).

FCT has delayed the recognition of the enlargement of the LA since 2008, until the end of the institution evaluation process (which is not completed yet by March 2010!) and did not recognize the integration until the end of 2009.

This 3-year delay is objectively harmful for the organization of the LA and research activities and does not allow the factual reporting of the global activities carried out, also because of the format imposed for the reports.

The activity of CRACS is reported independently in a different report.

In this report one has indicated Prof. Vladimiro Miranda as the PI for lack of a better way to indicate that the relations between the group and INESC Porto, to enlarge the LA, are held under Prof. Miranda's responsibility.

Main Achievements

(n.a.)

Group Productivity

Future Research

Objectives

n/a

Funding, source, dates

Fundação para a Ciência e a Tecnologia: 37.214,48
QREN: 3.820,00 €
TOTAL: 41.034,48 €

Group Description

Title of Research Group:	(RL-FIS-LA14-96) FIBER OPTIC DEVICES AND NETWORKS FOR MULTI-PARAMETER SENSING
Principal Investigator:	José Luis Campos Oliveira Santos
Main Scientific Domain:	Física

Objectives & Achievements

General Objectives

Increasing social awareness of safety issues and more demanding regulatory framework ask for continuous, remote, real time and distributed multiparameters measurement. Present systems have limitations concerning these requirements specially if connected with the need of a new proactive paradigm of environmental and structural health integrity monitoring.

Within this overall context, the Research Line deals with the acquisition of know-how and competences for implementation of sensing devices and networks based in optical fiber technologies.

Novel sensing heads, robust and reliable interrogation techniques, multiplexing issues and optoelectronic system integration are the operational objectives.

An integrated approach to the creation of a sustainable framework in terms of human and financial resources, addressing R&D progress, partnership and networking consolidation, post-graduation training, and know-how economic valorization, is the underlying objective of the Research Line.

Main Achievements

In the framework of this Research Line several achievements were attained:

• 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

• Mechanical characterization of bone cement and crack zone identification in a cemented femoral implant using fiber Bragg grating sensors

• Novel developments of nonlinear effects for optical sensing based on Raman/Rayleigh scattering

• All-fiber hybrid interferometers

• Novel optical fiber geometry designs for sensing purposes (H-shaped, suspended twin core fiber, as examples)

• Use of luminescent carbon dots in sensing applications

• Development of composite luminescent materials for detection of oxidative species

• Development of quantum dot based analytical imaging techniques

• Implementation of interferometric acetic acid sensor for biotechnology application

• Development of virtual instrumentation applications (for frequency domain spectroscopy and interferometry)

• Development of simple, high sensitivity, multiplexable, interrogation scheme for LPG based sensors

• Fabrication of Bragg gratings in pure silica suspended core fibers

• Fabrication of refractive index sensors in slotted multimode integrated devices for chemical and biochemical sensing

• Fabrication of sub-micrometer gap coupler refractometric sensor

• Extrinsic and intrinsic fiber optic interferometric sensors for acoustic detection in high-voltage environments

• Optical fiber sensor for hydrogen and metals

• Optimization process of sol-gel hybrid channel waveguide Bragg gratings patterned using a single photolithographic step.

• Sol-gel channel Bragg gratings fabrication using a single photolithographic step

One outcome of this R&D activity and related achievements was the publication record of the Unit in this period, which stands to 31 works published in international journals and 57 presentations in international and national conferences.

Research Line Output

Collaborative Publications in peer review Journals

LIMA, S.E., FRAZÃO, O., ARAÚJO, F., FERREIRA, L.A., MIRANDA, V., SANTOS, J.L., "Extrinsic and intrinsic fiber optic interferometric sensors for acoustic detection in high-voltage environments", Optical Engineering, February 2009, vol.48, no.3.

FRAZÃO, O., CORREIA, C., ROCCO GIRALDI, M., MARQUES, M.J., SALGADO, H., MARTINEZ, M., COSTA, J., BARBERO, A., "Stimulated Raman Scattering and its Applications in Optical Communications and Optical Sensors", The Open Optics Journal, February 2009, vol.3, no.2, p.1-11.

FRAZÃO, O., MARTYNKIEN, T., BAPTISTA, J.M., SANTOS, J.L., URBANCZYK, W., WOJCIK,, J., "Optical refractometer based on a birefringent Bragg grating written in an H-shape fiber", OPTICS LETTERS, January 2009, vol.34, no.1, p.76-78.

VIEGAS, D., GOICOECHEA, J., CORRES, J.M., SANTOS, J.L., FERREIRA, L.A., ARAÚJO, F., MATIAS, I.R., "A fibre optic humidity sensor based on a long-period fibre grating coated with a thin film of SiO2 nanospheres", Measurement Science % Tecchnology 2009.

MAYEH, M., VIEGAS, J., SRINIVASAN, P., MARQUES, P., SANTOS, J.L., JOHNSON, E.J., FARAHI, F., "Design and fabrication of slotted multimode

interference devices for chemical and biological sensing", MDPI Sensors Journal 2009.

SIMEÃO CARVALHO, P., FIGUEIRAS, F., MENDONÇA, S.L., M. FERREIRA, C., RODRIGUES, M., "Dielectric Relaxation and Optical Transmittance of PVC Membranes Modified by Nematic Liquid Crystal", International Journal of Polymeric Materials 2009, vol.58, no.11, p.588-603.

FRIAS, C., FRAZÃO, O., TAVARES, S., VIEIRA, A., TORRES MARQUES, A., SIMÕES, J., "Mechanical characterization of bone cement using fiber Bragg grating sensors", Materials & Design 2009, vol.30, no.5, p.1841-1844.

FRAZÃO, O., BAPTISTA, J.M., SANTOS, J.L., KOBELKE, J., SCHUSTER, K., "Refractive index tip sensor based on Fabry-Perot cavities formed by a suspended core fibre", JOURNAL OF THE EUROPEAN OPTICAL SOCIETY-RAPID PUBLICATIONS 2009, vol.4, no.1990.

Collaborative Other Publications

GOUVEIA, C.A., et al "LPG-based interferometric sensor for measurement of dissolved CO2", SEON 2009 - VII Symposium on Enabling Optical Networks 2009, Lisboa, Portugal.

AREF, S.H., et al "Sensing Characteristics of Modal Interferometers based on HC-PCF", SEON 2009 - VII Symposium on Enabling Optical Networks 2009, Lisboa, Portugal.

DIAZ-HERRERA, N., NAVARRETE, et al, "Nuevas Herramientas de Producción e Interrogación de Sensores de Fibra Óptica Basados en Resonancia de Plasmones Superficiales", RNO 9 - VI Reuniõn Nacional de Óptica, September 2009, Ourense, Espanha.

MAGALHÃES, F., et al "DEVELOPMENT OF AN OPTOELECTRONIC GAS MONITORING UNIT BASED IN WAVELENGTH MODULATION SPECTROSCOPY", IRF'2009 - INTEGRITY - RELIABILITY - FAILURE CHALLENGES AND OPPORTUNITIES , July 2009, paper: S0213_A0381, Porto, Portugal.

FRAZÃO, O., et al., "Novel sensing head geometry based on smart composite with embedded FBGs for strain and temperature discrimination", SMART09 - International Conference Smart Structures and Materials, July 2009, Porto, Portugal.

DIAZ-HERRERA, N., et al., "Nuevo método de interrogación para sensores SPR basado en redes de Bragg", OPTOEL'09 - VI Reunión Espanhola de Optoelectrónica, July 2009, Málaga, Espanha.

FRAZÃO, O., et al "Curvature sensor based on a fibre Bragg grating embedded in a laminated composite", ICCS15 - 15th International Conference on Composite Structures, June 2009, Porto, Portugal.

QUEIRÓS, R., et al "(Bio)Sensors for detection/quantification of aquatic bacterial contamination in waters for Human use ", NN09 - 6th International Conference on Nanoscience and Nanotechnology 2009, THessaloniki, Greece.

MARQUES, P., et al "Integrated hybrid sol-gel devices for astronomical interferometry", ICTON 2009 - 11th International Conference on Transparent Optical Networks 2009, Island of S. Miguel, Azores, Portugal.

Master and PhD thesis completed

PhD Theses

Orlando José dos Reis Frazão, Optical Fibre Sensors Based on Non-Linear Effects, FCUP, (sup. J.L. Santos)

Future Research

Other Information

Photonics for Life Sciences: Optical Biochemical Sensing and Imaging

General Objectives

It is proposed an advanced follow-up of the previous Research Line framed now by the central objective of to develop know-how and technological competences oriented to optical biochemical sensing and imaging. In sensing, the R&D of fibre optic/integrated optics platforms and functionalization techniques for highly sensitive and selective sensing of chemical and biochemical parameters, compatible with multi-point measurement using optical multiplexing approaches will be privileged. In imaging, focus will be on the R&D of solutions based in optical interferometry (white light) and signal processing that, to some extent, has been explored in the context of fibre optic sensing. This central objective addresses also system development for application of these technologies in the chemical, biological and medical domains.

It is also an objective of this new Research Line to research further new optical fibre based sensing solutions for measurement of physical parameters exploring the large opportunities provided by novel developments in fibre optic technology, such as those associated with the outcome of photonic crystal fibres (which show also large potential for biochemical sensing).

The planned local development of an infra-structure for femtosecond laser writing will allow extra flexibility in the design and fabrication of optical microstructures (in fibre optics and in planar optical waveguides) optimized to address specific sensing targets, particularly in the context of utilization of microfluidics concepts and techniques.

Multiplexing of biochemical parameters is a crucial issue when looking for the application of optical technologies in the monitoring of natural environments, water quality, chemical plants, and others. Depending on the measurement concept, to handle in a proper way the multiplexing related topics of sensor networking and sensor addressing/interrogation can be an highly complex task, that involves the mastering of different optoelectronic technologies and of sophisticated signal processing techniques. In view of this, sensor multiplexing will be for the next period an important subject of study and development.

Therefore, one key characteristic of this new research line will be the development of innovative solutions in a multidisciplinary approach, involving guided wave optics, material science, micro and nanofabrication, chemistry, etc.

Outcomes

The central objective that frames the new Research Line is grounded on the broad experience that was gathered with the implementation of the previous Associate Laboratory Programme, from where resulted large R&D background in Optoelectronics.

Optical biochemical sensing and optical imaging will benefit from the R&D going on, or planned to the near future, in the Optoelectronics and Electronics System Unit in topics such as new optical fibre/integrated optics structures with tailored spectral responses, fibre lasers optimized for sensing, thin-film based micro-actuators, micro-optics devices, microfluidics, contactless device electrical powering, multiplexing and signal processing. Of crucial importance is also the reinforcement of the national and international R&D collaborations, in particular with Groups working in biochemical sensing, establishing a network of complimentary competences that is essential when dealing with the multidisciplinarity required for addressing optical biochemical sensing.

From the actions to be undertaken to achieve these objectives, it is expectable the following outcomes:

• Acquisition of know-how and competences in several Optoelectronic related technological domains;

• Framework for post-graduation training in the related subjects;

• Test-beds for parameter selective point and multiplexed biochemical optical sensing systems; environmental and medical applications;

• Test-bed for a medical imaging system based on optical interferometry;

Future Plans

This new Research Line will benefit from on-going or planned R&D activity in integrated and fibre optics structures, thin-films, microfluidics, remote electrical powering, signal processing and multiplexing.

The established internal competences in optical fibre sensing (fibre gratings and other microstructures, interferometry, signal processing, etc.), in integrated optics (photolithography and direct laser writing, sol-gel fabrication techniques, interferometry), and in materials (thin films fabrication supported by several physical/chemical methods), is reflected in a strong potential for biochemical sensing based on refractometry, absorption, fluorescence and electroluminescence. This potential will be explored in the development of promising sensing technologies, such as those that result from the combination of plasmonics with microstructured optical fibres and the combination of electrochemistry with integrated optics (hybrid – electro optic - sensing chips).

The biochemical sensing activities will focus on design, fabrication, characterization and optimization of physical sensing platforms, and also on the functionalization of the sensing heads, through chemical and biochemical processes.

Imaging will also be a strategic focus of the Unit, particularly imaging based in interferometric techniques and oriented to medical applications. In particular, it is foreseen that local recent progresses in micro-optics technology will have substantial impact in optical coherence tomography based imaging configurations, towards higher imaging speed, improved signal-to-noise ratios and, ultimately, to reach cell imaging scales. As a complimentary approach to performance enhancement, it is planned research on signal processing techniques based on detailed physical models as well as in light diffraction tomography.

The general objectives include the perspective of new patents submission and either new technology licensing or new spin-off company launching.

Group Description

Title of Research Group:	(RL-EEI-LA14-97) ENABLING TECHNOLOGIES FOR NETWORKED AUDIOVISUAL SERVICES
Principal Investigator:	José António Ruela Simões Fernandes
Main Scientific Domain:	Engenharia Electrotécnica e Informática

Objectives & Achievements

General Objectives

A variety of digital technologies is necessary to create advanced audiovisual services and distributed multimedia applications, in particular audio, video and image processing, communication systems and networks, knowledge-based systems, metadata and data models. This research line aims at consolidating and exploiting the existing know-how on these technologies in order to design and develop new systems and advanced services for the citizens. This requires the expertise of different R&D groups as well as addressing new research topics; for instance, developing advanced video-surveillance systems implies not only video processing but also multimodal processing, including joint processing of video, audio and signals of other sensors, supported by high capacity communication systems and networks with good quality of service. The research objectives also include the set up of demonstrators and pilot trials, technical advice, strategic consulting and advanced training,.

Main Achievements

Taking into account the general framework and objectives previously outlined, the major achievements of this research line are related with activities carried out in research projects (at European and national level) and contracts, with a focus on integrating and extending the scientific results achieved by the research groups. Most of these results have associated prototypes and a list follows:

- Framework for automatic music generation using gestural controllers

- Creation of an automatic rhythm generator

- Music similarity software modules based on music audio content

- Novel image and video processing algorithms: staff and text line detection in Optical Music and Optical

- Character Recognition Systems, respectively; assessment of spatial segmentations of images and video; content-aware image retargeting

- New results in the evaluation of the breast cancer conservative treatment

- Ontology based context-aware and DRM-enabled approach for content adaptation decision taking in networked multimedia applications

- Machine learning techniques applied to context-aware content adaptation

- Metadata models for the digital cinema content value chain

- NS-3 simulation framework for scalable multi-technology mobile wireless mesh networks (WMN)

- Radio resource management for interconnected multi-technology wireless networks

- Auto-configuration framework for scale-free static WMN

- System specification surveying advances in Ethernet forwarding

- System to analyse the performance of relaying in comparison to multihop routing, for few-hop networks

- Framework for the deployment of user-centric wireless networks

- Printed fractal monopole antenna for WLAN applications

- Algorithms in FPGA for signal estimation in coherent optical systems

- Printed C-Shaped Monopole Antenna Array with High Isolation for MIMO Applications

It should also be mentioned the organization of international conferences and other events (detailed in the respective session).

Research Line Output

Collaborative Publications in peer review Journals

CALISTRU, C.M., RIBEIRO, C., DAVID, G., "Multimedia in cultural heritage manuscripts: Integrating description, transcription, and image content", EURASIP Journal on Image and Video Processing, 2009.

FONSECA, T., RIBEIRO, C., GRANJA, C., "Vital Signals in Intensive Care: Automatic Acquisition and Consolidation into Electronic Patient Records", Journal of Medical Systems, vol.33, no.1, p.47-57, 2009.

VIANA, P., PIMENTA ALVES, A., "A Semantic Management Model to enable the integrated management of media and devices", Multimedia Tools and Applications, Springer, October 2009, p.1-26.

CARDOSO, J.S., CARVALHO, P.M., TEIXEIRA, L.F., CORTE-REAL, L., "Partition-distance methods for assessing spatial segmentations of images and videos", Computer Vision and Image Understanding, vol.113, no.7, July 2009, p.811-823.

CAMPOS, M.J., CARDOSO, J.S., WILD, T., KROIS, W., FITZAL, F., "Comparing Two Objective Methods for the Aesthetic Evaluation of Breast Cancer Conservative Treatment", Breast Cancer Research and Treatment, vol.116, no.1, p.149-152, July 2009.

CARDOSO, J.S., REBELO, A.M, GUEDES, C.A., PINTO DA COSTA, J., "Staff Detection with Stable Paths", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.31, no.6, p.1134-1139, June 2009.

PESSOA, L.M., SALGADO, H., DARWAZEH, I., "Performance Evaluation of Phase Estimation Algorithms in Equalized Coherent Optical Systems", Photonics Technology Letters, vol.21, no.17, September 2009, p.1181-1183.

SOFIA, R., "A Survey of Advanced Ethernet Forwarding Approaches", IEEE Communications Surveys & Tutorials, vol.11, no.1, January 2009, p.92-115.

SANTOS, A.P., RICARDO, M., "Header Compressed VoIP in IEEE 802.11", IEEE Wireless Communications Magazine, vol.16, no.3, June 2009, p.69-75.

TEIXEIRA, L.F., CORTE-REAL, L., "Video object matching across multiple independent views using local descriptors and adaptive learning", Pattern Recognition Letters, vol.30, no.2, January 2009, p.157-167.

Collaborative Other Publications

ANDRADE, M.T., COSTA, A., "Enabling Semantic search in structured P2P Networks via distributed Databases and Web Services", WWW/Internet 2009, Rome, Italy, Nov. 2009.

BARROSO, I., AZEVEDO, M., RIBEIRO, C., "Thematic digital libraries at the University of Porto: metadata integration over a repository infrastructure", ECDL 2009, LNCS, vol.5714, p.392-395.

CAMPOS, R.L., RICARDO, M., "A New Efficient Mechanism for Establishing IP Connectivity between Ambient Networks", ICC 2009, Germany, June 2009.

CARDOSO, J.S., SOUSA, R.J., TEIXEIRA, L.F., CAMPOS, M.J., "Breast Contour Detection with Stable Paths", BIOSTEC08, Funchal, Portugal, 2009.

CARRERAS, A., ANDRADE, M.T., BARBOSA, V.H., DOGAN, S., et al, "Contextual Information in Virtual Collaboration System beyond Current Standards", WIAMIS 2009, London, UK, May 2009.

KONDOZ, A., DOGAN, S., PEREIRA, F., ANDRADE, M.T., RUELA, J., et al, "Visual Media - Coding and Transmission", Wiley, May 2009.

MADISON, G., GOUYON, F., ULLEN, F., "Musical Groove is Correlated With Properties of the Audio Signal as Revealed by Computational Modelling, Depending on Musical Style", SMC 2009, Porto, Portugal, July 2009.

NUNES, S., RIBEIRO, C., DAVID, G., "Improving web user experience with document activity sparklines", EPIA 2009, Aveiro, Portugal.

OANCEA, D., SILVA MOREIRA, R., CORREIA LOPES, J., "Controlling Complex Multimedia Systems via Reflection and Ontologies", ICC-WCSS 2009, Lisboa, Portugal.

SOUSA, R.J., BARBERO, B., CARDOSO, J.S., "An Ordinal Data Method for the Classification with Reject Option", ICMLA2009, Miami Beach, USA, Dec. 2009.

VAN DE VEN, P., BOURKE, A., TAVARES, C.E., FELD, R., ROCHA, A., NELSON, J., "Integration of a suite of sensors in a wireless health sensor platform", IEEE Sensors Conference 2009, Christchurch, New Zealand.

VELOSO, L., CERQUEIRA, E, MENDES, P., MONTEIRO, E., "Seamless Mobility of Senders Transmitting Multi-user Sessions over Heterogeneous Networks", WWIC09, The Netherlands, May 2009.

Master and PhD thesis completed

PhD Theses

ABRANTES, F., Explicit Congestion Control Algorithms for Time-Varying Capacity Media

MARTINS, L.G., A computational framework for sound segregation in music signals

CALISTRU, C., Data organization and search in multimedia databases

TEIXEIRA, L.F., Contributions for the Automatic Description of Multimodal Scenes

MSc Theses

BALTAZAR, A.M., Extraction of rhythmic information of dance movement by means of a video signal (P)

BARBOSA, F.A., Integration of Web services in Peer-to-Peer clients (P)

RODRIGUES, N.J., Wireless Mesh Networks in Metropolitan Scenarios

OLIVEIRA, P.M., Service integration in multi-use communications platforms (P)

FERNANDES, A.J., System for dissemination of energy consumption (P)

CARRAPA, D., Mobile Router

SILVA, F.A., DIP based MPEG-21 Player

LOPES, F.M., Fractal antenna for applications in wireless networks (P)

PINHEIRO, M.S., Web system for the recognition of music scores (P)

MAIA, P.M., Authentication of Wi-Fi networks based on DNSSEC (P)

FRAGA, S.D., Monitoring of multimedia processes (P)

SÁ, S.M., Predictive Multimedia Content Adaptation

RAMOS, D.F., Scheduling algorithm for QoS differentiation in MPLS / DiffServ networks (P)

OLIVEIRA, D.J., CMOS-RF Power Amplifier for Wireless Communications

ALMEIDA, J.F., Secure domestic networks (P)

CARVALHO, L.M., User-provided Networks: Relaying vs. ad-hoc routing

LOPES, M.A., Automatic classification of Latin music

FERNANDES, A.M., Mobile Environment Context Agent

ANTUNES, V.H., Web 2.0 frontend for RADIUS management (P)

REBOREDO, H.P., Processing of Turbo signal in optical communications systems (P)

PINTO, N.J., FPGA-based implementation of signal estimation algorithms for optical coherent systems (P)

SANTOS, P.M., FPGA-based system for detecting hand position using stereo images (P)

RESENDE, C.A., Real-time correspondence processor between stereo images (P)

RODRIGUES, J.G., Rectification of stereo images in an FPGA-based embedded system (P)

SANTOS, J.P., Implementation of optical flow algorithms in FPGA platforms (P)

VIDAL, R.J., System for the calibration of temperature sensors based on fibre optic Bragg gratings (P)

MANO, L., New user interaction patterns in Web applications using Ajax (P)

FREITAS, T., Geospatial Data Processing for GPS Navigation Systems

NUNES, T., Towards a Pedestrian Navigation System

COUTO, O., Characterizing the Portuguese Blogosphere

RESENDE, H., Social Web in location-based mobile services (P)

AZEVEDO, M., Digital library for human food and nutrition (P)

GONÇALVES, M., Importance maps for the Web (P)

GONÇALVES, R., Video projection in virtual environments – enrichment of 3D scenarios with images taken with robotic vehicles (P)

COSTA, T., Evaluation of the "h-index" measure for ordering results in the blogosphere (P)

VIANA, J.A., Technologies for monitoring the flow of people and control of accesses (P)

GONÇALVES, A.S., Automatic content generation for Second Life

MAIA, J.P., Interference of wind parks on the transmission of analogue and digital TV signals (P)

(P) In Portuguese

Future Research

Other Information

Conferences (organization)

SMC 2009 - 6th Sound and Music Computing Conference and SMC Summer School, Porto, Portugal, July 2009

U-NET 2009 - 1st edition of the international workshop "User-provided Networks, Challenges and Opportunities", together with CoNext09, Rome, Dec. 2009

EIFFEL session on "Build your own Networks", Athens, Greece, Oct. 2009

CLOUDVIEWS.ORG – Cloud Computing Conference 2009, Porto, Portugal, May 2009

Conferences (TPC)

CRC 2009 – 9ª Conferência sobre Redes de Computadores, Oeiras, Portugal

E-DTN 2009 – 1st Workshop on the Emergence of Delay-/Disruption-Tolerant Networks, St. Petersburg, Russia

ICC 2009 - IEEE International Conference on Communications, Dresden, Germany

ICDT 2009 - The Fourth International Conference on Digital Telecommunications, Colmar, France

ICIAR 2009 - International Conference on Image Analysis and Recognition, Halifax, Canada

ICT 2009 - 16th International Conference on Telecommunications, Marrakech, Morocco

JCNN2009 - International Joint Conference on Neural Networks, Atlanta, USA

MICC 2009 - 9th IEEE Malaysia International Conference on Communications

MOBIWAC 2009 – 7th ACM International Symposium on Mobility Management and Wireless Access, Canary Islands

Networking 2009 - 8th IFIP International Conference on Networking, Aachen, Germany

NEW2AN 2009 - 9th IEEE/ITC International Conference on Next Generation Teletraffic and Wired/Wireless Advanced Networking, St. Petersburg, Russia

SMC 2009 (details above)

U-NET 2009 (details above)

WWIC 2009 - 7th IEEE/COST290 International Conference on Wired/Wireless Communications, Twente, The Netherlands

Prototypes

CAALYX - final prototype of the FP6 project "Complete Ambient Assisted Living Experiment" (mobile telephone based system that interacts with several sensors, evaluates the data gathered and, based on context and medical patterns, alerts a care centre)

RAMA - Relational artist maps (web-based application for visualizing and interacting with networks of music artists) / on-line at http://rama.inescporto.pt

Music recommender / on-line at http://www.palcoprincipal.com

Staff line detection and removal workstation for Optical Music Recognition Systems

Workstation for text line detection in Optical Character Recognition Systems

Platform for the assessment of spatial segmentations of images and video

Simulation platform based on machine learning techniques to predict context changes and automatically adapt video content in multimedia networked applications

Context-aware adaptation decision mechanism based on MPEG-7, MPEG-21 and ontologies

Configurable test platform to browse multimedia content represented as MPEG-21 Digital Items

Metadata management system to convert between metadata formats applied to digital cinema

ReCoop, Wireless Wide Internet Zone (WIZ), pre-product version

WiFix – WMN for extending infrastructure networks

Peer-to-peer video streaming over WMN

Home gateway for secure, customer-defined, friend-to-friend overlay networks

Autoconfiguration and self-management solution for PANs

Devices for for Ku-band VSAT applications

Industry contract research

GrCLIFmcast – management of multicast sessions for IP based services created by users, with PT Inovação

ASP Domestic Networks – Authentication, Security and Privacy solutions for Domestic Network services, with PT Inovação

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

RECOOP - Cooperative wireless networks, with NONIUS Software

MOBILES –Sustainable electric mobility (with electric vehicles), with Ndrive

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

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

SWIOP – Intelligent and secure webmail system, with Portugalmail

AHRS - Attitude-Heading Reference System based on MEMS technology, with Spin.Works

VSAT-1 – Development of devices for Ku-band Very Small Aperture (VSAT) applications, with SINUTA

Future Plans

The ubiquity of the Internet and the web are fostering the convergence of traditional telecom and broadcast services and new interactive multimedia services, in an environment characterized by heterogeneous wired and wireless access networks and a diversity of fixed and mobile terminal devices with rather different capabilities.

Moreover the traditional roles of customers and providers are also changing. On one hand, the end-user will no longer be a mere customer, but rather an active player in emerging community networks and services; on the other hand, a separation of network access and service providers is already occurring. Such scenarios not only require new technical solutions but also the exploitation of new business models that take into account new players and business roles.

In this context, the planned research work will follow these trends and will focus on "Networked Multimedia Systems and Services in scenarios of convergence". This work will build on existing know-how and previous achievements, but will go a step forward into integrating them in more advanced systems and services, such as:

• workflow in digital media production and distribution;

• multimedia information archives, with semantic content search and retrieval (with a possible application to the preservation of the cultural heritage);

• content and context-aware service delivery and ontology-based content adaptation;

• automated multiplatform distribution systems;

• semantic analysis of multimedia information and knowledge extraction from data;

• novel Internet architectures (e.g., mobile Internet, delay tolerant networks, self-spreading networks, etc.);

• community networks and services (both from a technical and a business perspective).

To carry out this research plan, strategic partnerships will be sought and established in the framework of research projects and contracts and funding programmes (both European and national) and in close connection with post-graduate research activities.

Group Description

Title of Research Group:	(RL-EEI-LA14-98) ELECTRIC SECTOR AND INTEGRATED TERRITORIAL PLANNING
Principal Investigator:	Manuel António Cerqueira Costa Matos
Main Scientific Domain:	Engenharia Electrotécnica e Informática

Objectives & Achievements

General Objectives

EU goals. Consultancy to government, agencies and TSO, studies and tools to support the increase of renewable energy, development of new control strategies for distributed generation and forecasting tools for intermittent sources, including large off-shore wind parks.

Iberian Electricity Market. Development of specific simulation tools. Conceptualization of the remuneration of ancillary services by DG. Development of new methodologies for market settlement and tariff design.

Emerging organization schemes for the electric sector. Microgeneration, microgrids and integration of plugged-in electric vehicles. Models for components, monitoring and control mechanisms, evaluation tools and market integration models, including remuneration measures.

Urban and regional integrated territorial planning of energy and environment: creating geo-referenced solutions, addressing interoperability problems, collaborative edition of geographical information, information fusion, open software use and adoption of emergent standards.

Main Achievements

Electric Sector

• Successful conclusion of the European project "More Microgrids"

• Successful proposals of the two new European projects MERGE (Mobile Energy Resources in Grids of Electricity) and 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), to begin in 2010

• Extension of the contract with REN and REE (Portuguese and Spanish TSO) to deliver an advanced tool for operating reserve evaluation, in the sequence of the studies performed in project RESERVAS

• Development of new models, control solutions and methodologies for wind power safe integration, electric vehicles deployment support, micro-generation integration, forecasting and reliability evaluation

• Important collaborative research (power systems/telecommunications) in project INOVGRID

• Publication of the main results in top international journals of the Power Systems area

• Provisions to create a company able to deliver wind park forecasts, starting from the results of the project PrevEol (concluded in 2008)

Urban and regional integrated territorial planning of energy and environment

• New collaborations with different entities: AMAVE (regional association of local municipalities), ANAFRE (national association of small local authorities) and GENERG (renewable energies producer) and reinforced with CCDR-N and IVDP.

Research Line Output

Collaborative Publications in peer review Journals

Collaborative papers involving researchers of other units or groups:

Bessa, R. J., Miranda, V., Gama, J., "Entropy and Correntropy against Minimum Square Error in Off-Line and On-Line 3-day ahead Wind Power Forecasting", IEEE Transactions on Power Systems, vol.24, no.4, November, 2009, pp.1657-1666.

Khodr, H., Martinez-Crespo, J., Matos, M., Pereira, J. C., "Distribution Systems Reconfiguration Based on OPF Using Benders Decomposition", IEEE Transactions on Power Delivery, vol.24, no.4, October, 2009, pp.2166-2176.

Matos, M., Peças Lopes, J. A., da Rosa, M. A., Ferreira, R., Leite da Silva, A., Salles, W., Resende, L., Manso, L., Cabral, P., Ferreira, M., Martins, N., Artaiz, C., Soto, F., Lopéz, R., "Probabilistic evaluation of reserve requirements of generating systems with renewable power sources: The Portuguese and Spanish cases", Electrical Power and Energy Systems, 2009, pp.562-569.

Miranda, V., Carvalho, L., da Rosa, M. A., Leite da Silva, A., Singh, C., "Improving Power System Reliability Calculation Efficiency With EPSO Variants", IEEE Transactions on Power Systems, vol.24, no.4, November, 2009, pp.1772-1779.

Miranda, V., Santos, A., Pereira, J., "State Estimation Based on Correntropy: A Proof of Concept", IEEE Transactions on Power Systems, vol.24, no.4, November, 2009, pp.1888-1889.

Moyano, C. F., Peças Lopes, J. A., "An optimization approach for wind turbine commitment and dispatch in a wind park", Electric Power Systems Research, vol.1, no.79, January, 2009, pp.71-79.

Ramirez-Rosado, I. J., Fernandez-Jimenez, L. A., Monteiro, C., Sousa, J.N., Bessa, R. J., "Comparison of two new short-term wind-power forecasting systems", Renewable Energy, vol.34, no.7, July, 2009, pp.1848-1854.

Schweickardt, G., Miranda, V., "A two-stage planning and control model toward Economically Adapted Power Distribution Systems using analytical hierarchy processes and fuzzy optimization", International Journal of Electrical Power & Energy Systems, vol.31, no.6, July, 2009, pp.277-284.

Collaborative Other Publications

Collaborative papers involving researchers of other units or groups or with multidisciplinary nature:

Blanquet, A., Santos, J., Carrapatoso, A., Teixeira, C., Madureira, A., Alves, F., "From DA to SmartGrids - Evolution or Revolution? A Path to Improve the Utility Efficiency", CIRED2009 - 20th International Conference on Electricity Distribution, Prague, Czech Republic, 8 - 11 June, 2009.

Botterud, A., Wang, J., Monteiro, C., Miranda, V., "Wind Power Forecasting and Electricity Market Operations", IAEE32 - 32nd International Association for Energy Economics (IAEE) International Conference, San Francisco, CA USA, 21 - 24 June, 2009.

Carvalho, A., De Sousa, A.A., Ribeiro, C., Costa, E., Franchin, W., "Interactive focus + context visualization of spatio-temporal urban data models", GeoViz 2009 - Contribution of Geovisualization to the concept of the Digital City 2009, Hamburg, Germany.

da Rosa, M. A., Miranda, V., Matos, M., Sheblé, G., Leite da Silva, A., " Intelligent Agent-based Environment to Coordinate", ISAP 2009 - The 15th International Conference on Intelligent System Applications to Power Systems, Curitiba, Brazil, 8 – 12 November, 2009.

Freitas, T., Coelho, A., Rossetti, R., "Improving Digital Maps Through GPS Data Processing", IEEE ITSC09 - 12th International IEEE Conference on Intelligent Transportation Systems 2009, St. Louis, Missouri, USA, p.480-485.

Tennakoon, A. P., Arulampalam, A., Leite, H., Ekanayake, J. B., "Operations of DFIG with simplified rotor current reference model and solution to the recent grid code requirements", IECON09 - 35th Annual Conference of the IEEE Industrial Electronics Society (IECON 2009), Porto, Portugal, 3 - 5November, 2009.

Wang, J., Botterud, A., Miranda, V., Monteiro, C., Sheblé, G. "Impact of Wind Power Forecasting on Unit Commitment and Dispatch", 8th Int. Workshop on Large-Scale Integration of Wind Power into Power Systems, Bremen, Germany, 14 - 15 October, 2009.

Master and PhD thesis completed

PhD Theses:

Alexandre Miguel Barbosa Valle de Carvalho; Spatio-Temporal Information Management and Visualization; PhD Thesis, 2009. (A. A. de Sousa, Maria Cristina Ribeiro)

Eduardo Gouveia, Avaliação da Adequação da Rede de Transporte de Energia Eléctrica em Ambiente Liberalizado [Adequacy Evaluation of the Electrical Transmission Network in a Liberalized Environment], PhD Thesis, 2009 (Manuel Matos)

Nuno Gil, Identificação de Condições de Operação em Modo Isolado e Procedimentos de Controlo de Emergência para Multi-Micro-Redes [Identification of operating conditions and procedures for emergency islanding mode of multi-microgrids], PhD Thesis, 2009 (João Peças Lopes)

MSc Theses:

António Gaspar, Definição da Arquitectura Empresarial: O Caso do Observatório de Mobilidade na Região Metropolitana de Lisboa [Enterprise Architecture Definition: The Case of the Lisbon Metropolitan Region's Mobility Observatory], MSc Thesis, 2009 (João Pascoal Faria)

António Santos, Estudo do Comportamento Dinâmico de Redes Eléctricas Industriais - Caso da Refinaria de Matosinhos – Leça [Study of the Dynamic Behaviour of Industrial Electrical Grids - The Case of Matosinhos-Leça Refinery], MSc Thesis, 2009 (João Peças Lopes)

Daniel Burnier de Castro, Simulation of Intelligent Active Distributed Networks - Implementation of Storage Voltage Control, MSc Thesis, 2009 (João Peças Lopes)

Mário Neto, Valorização Tarifária de Tecnologias Energéticas Renováveis [Valorization of Tariffs for Renewable Energy Technologies], MSc Thesis, 2009 (Cláudio Monteiro)

Pedro Correia, Concepção de um Módulo de Gestão para Sistemas Energéticos Híbridos em Redes com Funcionamento Isolado [Development of a Management Module for Hybrid Systems in Networks Operating in Isolated Mode], MSc Thesis, 2009 (José Rui Ferreira)

Ricardo Ferreira, Adequação da Reserva em Sistemas com Elevada Integração de Produção Eólica [Reserve Adequacy in Systems with Large-Scale Integration of Wind Power], MSc Thesis, 2009 (Manuel Matos)

Rui Barros, Definição de uma Framework para Municípios de Pequena Dimensão [Definition of a Framework for Small Municipalities], MSc Thesis, 2009 (Ademar Aguiar)

Tiago Morais, Estudo da Operação de Parques de Sistemas de Conversão de Energia das Ondas em Energia Eléctrica [Study of the Operation of Conversion Systems for Wave Energy to Electrical Energy Parks], MSc Thesis, (João Peças Lopes)

New MSc Theses

André Santos, Application of Entropy Concepts to Power System State Estimation, MSc Thesis, 2009 (V Miranda)

Bruno Tomé, Previsão de Preços de Energia Eléctrica em Mercados de Electricidade - Horizonte de 24 horas [Energy Price Forecasting in Electricity Markets] , MSc Thesis, 2009 (JT Saraiva, JN Fidalgo)

Eduardo Gomes Santos, Monitorização de Desempenho de Produção de Microgeração Fotovoltaica Utilizando Sistemas de Inferência e Simulação Computacional [Using inference systems and computational simulation to monitor the performance of micro-PV generation], MSc Thesis, 2009 (Cláudio Monteiro)

Future Research

Other Information

Prototypes

DMS/EMS new modules [USE/UESP]

Developed under EFACEC-DMS

Demo Place: EFACEC

Development Period: 2008-2009

Reserve evaluation tool [USE/USIG]

Developed under TSO-Reservas

Demo Place: REN, REE

Development Period: 2009-2010

CAALYX

Developed under CAALYX (FP6 project): mobile telephone based system that interacts with several sensors, evaluates the data gathered and, based on context and medical patterns, alerts a care centre.

Demo Place: INESC Porto

Industry Contract Research

DMS - Development of new modules for the DMS/EMS system of EFACEC, in the framework of a sustained partnership of more than ten years. [USE/UESP]

RESERVAS - Medium and long-term evaluation of operational reserve in the Iberian power systems in the presence of a high penetration of renewable sources. Extension to include new features and deliver a prototype of the simulation tool. REN and REE (the TSO of Portugal and Spain). 2009-2010. [USE/USIG]

INOVGRID – Development of advanced telemetering systems able to support the technical and commercial management of distribution networks including micro-generation. EDP, 2007-2009. [USE/UTM]

CCR – Characterization of Consumers and Networks. Extension to incorporate new data and update consumer models, EDP Distribution, 2008-09. [USE/INESC Coimbra]

Future Plans

Development of new managing tools for the dispatch center level, to allow large scale integration of on-shore and off-shore intermittent generation, namely wind power. Identification of new balancing schemes, by energy storage, conventional generation or demand-side participation, involving use of ICT. Identification of new emergency functionalities.

Development of new distributed control architectures for active distribution networks, following the concept of smart grid. This will favor the deployment of distributed generation and microgeneration and will support the networks at times of stress on the main grid, and also enable new actors, such as aggregators and virtual power plants, to enter the market to provide balancing services. This will involve smart metering architectures to address LV distribution grids with active loads and microgeneration.

Analysis of the impact of a large scale integration of electric vehicles (pure electric vehicles and plug in hybrid vehicles). This will require the development of specific monitoring and control schemes and software tools related with smart charging of the vehicle's batteries and the exploitation of the presence of this distributed storage for ancillary services provision. A strong interaction with ICT is foreseen, associated to billing systems. Development of prototypes for smart charging and increase of laboratorial capabilities for testing purposes is envisaged.

Research on modeling and visualization of large and/or complex 3D Virtual Environments, focusing on using and extending the existing Geo-Spatial L-Systems to model historical buildings.

Continue research work on methodologies for Spatio-Temporal Information Representation and Visualization.

Develop new metaphors in interactive and immersive environments for collaborative task performance, namely in 3D virtual environments.

Work on new mobile solutions, namely on defining new methodologies for augmented/virtual reality applications on urban environments

Group Description

Title of Research Group: (RL-EGE-LA14-99)
ENTERPRISE COOPERATION NETWOKS

Principal Investigator: Jorge Manuel Pinho de Sousa

Main Scientific Domain: Economia e Gestão

Objectives & Achievements

General Objectives

Collaborative networks of enterprises are becoming an important research area of a clear interdisciplinary nature. This broad domain encompasses Supply Chain Management, Virtual Organizations, Collaborative Networks, and covers both complex design and management problems.

Traditional research in the area has been concentrated on issues such as distributed information technology infra-structures and architectures, or novel organizational structures, with much less attention paid to important issues related to inter-organizational collaboration, and to the particular roles of the different actors.

Our research is intended to cover this gap. It is focused on a set of topics in which the group has developed competences and know-how for many years: a) models for cooperative networks and business; b) information and knowledge management; c) Decision Support Systems; d) multi-objective heuristic optimization; e) integration in collaborative networked organizations.

Main Achievements

During 2009 the following important achievements can be highlighted:

• The e-biz-tcf project (Harmonising eBusiness processes and data exchanges for SME's in the textile/clothing and footwear sectors in the Single Market) has implemented and validated innovative architectures for e-business integration in pilot projects at a European level. INESC Porto was responsible for the management of the implementation of the project results in nine Portuguese companies.

• Following the good results achieved in the e-biz-tcf project, INESC Porto participated in the definition of a similar project for the automotive industry, which was the winner of the tender opened by the European Commission. This new project (Assisting SMEs to participate in global digital supply chains in the automotive sector in the Single Market) will start in January 2010.

• Contributions for innovative concepts and solutions for planning and management of complex supply chains, applied in the automotive industry for the fast production of customized cars (under the ongoing AC/DC European project, for the "5 days cars").

• Design, development and demonstration of an aggregate planning system for shoe supply networks, using a large shoe making Group as the focal point for planning and organisation.

• Research on multi-criteria approaches for partner selection in Virtual Organizations and Collaborative Networks.

• Development of the innovative, advanced concept of SME's knowledge community; new empirical knowledge generated about virtual communities in an SME context and new business/IS architecture for information management in industrial associations.

In 2009, a PhD was concluded on "Partner Selection in Virtual Enterprises" (author: José António Crispim) and there were 3 publications in peer review journals, and one other paper has been published on-line (normally this will appear on a printed version during 2010).

Research Line Output

Collaborative Publications in peer review Journals

José António Crispim, Jorge Pinho de Sousa, "Partner selection in virtual enterprises: a multi-criteria decision support approach", International Journal of Production Research, Volume 47, Issue 17, September 2009, Pages 4791 – 4812.

Claudia Chituc, Américo Azevedo, César Toscano, "A framework proposal for seamless interoperability in a collaborative networked environment", Computers in Industry, vol.60, no.5, June 2009, pp.317-338.

Claudia-Melania Chituc, Américo Azevedo, César Toscano, "Collaborative business frameworks comparison, analysis and selection: an analytic perspective", International Journal of Production Research, vol.47, no.17, January 2009, pp.4855-4883.

Collaborative Other Publications

Mikio Kubo, J. P. Pedroso, "Metaheuristics: a Programming Guide" (inJapanese). Kyoritsu, Tokyo, 2009 [book].

Roberto Piedade, Américo Azevedo, "An SSM-Based Approach to Implement a Dynamic Performance Management System", in Proceedings of PRO-VE'09 - 10th IFIP Working Conference on Virtual enterprises, November, 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "Short-term Semantic Consensus: Toward Agile Ontology Specification for Collaborative Networks", in Proceedings of PRO-VE'09 - 10th IFIP Working Conference on Virtual enterprises, October, 2009.

Rui J. Rei, Peter Madera, João Pedro Pedroso, "Khronos - a High-level Framework for Discrete Event Simulation in Pyton", CIE39 - 39th International Conference on computers & Industrial Engineering, July, 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "A socio-semantic approach to collaborative domain conceptualization", Proceedings of OnToContent 2009 - The 4rth International Workshop on Ontology Content - OnToContent 2009, 2009.

Carla Pereira, Cristovão Sousa, António Lucas Soares, "A Socio-Semantic Approach to the Conceptualization of domains, Processes and Tasks in Large

Projects", ICEIS 2009 - 11th International Conference on Enterprise Information Systems, in proceedings, 2009.

Nazaré Rego, Jorge Pinho de Sousa, "Supporting the definition of strategies for the configuration of health care supply chains", Conference on Logistics Management 2009, Hamburg, September 2009.

Nazaré Rego, Jorge Pinho de Sousa, "Virtually centralized Supply Chain coordination in Hospitals", PRO-VE'09 - 10th IFIP Working Conference on Virtual Enterprises, Thessaloniki, Greece, October 2009.

José A Crispim, Jorge P Sousa, "Uncertainty in partner selection for virtual enterprises", PRO-VE'09 - 10th IFIP Working Conference on Virtual Enterprises, Thessaloniki, Greece, October 2009.

Master and PhD thesis completed

PhD Theses:

José António Crispim, Partner Selection in Virtual Enterprises, FEUP.

MSc Theses:

Rui Pinto Ferreira, Development of a multi-criteria collaborative decision model for performance management in networks of organizations, FEUP.

Bruno Paulino, Strategies for information classification in RTD organizations, FEUP.

Jorge Silva, Management of information of performance of organizational networks: The case of virtual communities, FEUP.

José Augusto, Approach for the implementation of knowledge communities in enterprise associations, FEUP.

Tiago Leite, Técnicas heurísticas para sequenciamento multi-projecto, ISEP.

João Miguel Rodrigues Carneiro, Estudo de melhoria do processo de subcontratação na ADIRA, FEUP.

João Ricardo Pires Teixeira, Supply Chain Planning na Qimonda, FEUP.

Miguel João da Silva Fonseca, Optimização do QCD nos fornecedores, FEUP.

Alexandre Ferreira, Rotas de "Milk run" no aprovisionamento externo da Bosch Termotecnologia, FEUP.

Miguel Montenegro Aguiar de Araújo, Lean nos Serviços de Saúde, FEUP.

Ricardo Luís Pinheiro Gonçalves Teixeira, Adaptação e implementação do Oracle Retail Merchandising System para suportar adequadamente os processos de negócio do retalhista, FEUP.

Nuno Emanuel Ferreira Fleming de Oliveira, A evolução organizacional das empresas nacionais nas cadeias de fornecimento da indústria de componentes para automóvel, FEUP.

Future Research

Other Information

Conferences:

10th EU/MEeting workshop (the European metaheuristics community) - Debating the future: new areas of application and innovative approaches, Porto, Portugal (2009 April 29/30) – Chair: Ana Viana.

Prototypes:

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

Developed under (Project Name): eBiz-tcf

Demo Place: Fivelarte, Cindicalfe, Centenário, Lusocal, Maximo Internacional, Trielle, Mystic Sea, Globo Vermelho, Santos e Júnior

Development Period: 2008-2009

Name: Methods and tools for benefit balancing in automotive supply chains

Developed under (Project Name): AC/DC

Demo Place: Continental AG

Development Period: 2008-2009

Name: An agile optimization planning system for footwear producing SMEs – first prototype

Developed under (Project Name): AGILPLAN

Demo Place: Oficina de Soluções

Development Period: 2009

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

Developed under (Project Name): Parque Escolar

Demo Place: INESC Porto

Development Period: 2009

Future Plans

Our research activity has a strong interdisciplinary nature covering areas such as Decision Support Systems, Multi-objective Optimisation or Operations Management. Competences and know-how on these areas have been consolidated in the last few years and we intend to strengthen the application of that know-how in the broad domain of Collaborative Networks, with a strong application focus.

In line with these general concerns, our future research will focus on the following themes:

a) Models and integration of cooperative networks

The goal is to develop: a) a global interdisciplinary theory for relationship management in organizational networks; b) business models and planning tools for creating, managing and dissolving collaborative networks.

Research will also be pursued in the domain of semantic integration of organizational structures formed by autonomous, independent and heterogeneous entities acting in dynamic and competitive environments.

b) Information and knowledge management

The focus of this research line will be on the social process perspective of knowledge creation and use of collaboration as the fundamental instrument for that creation. This will involve working on: a) socially constructed socio-technical artefacts; b) collaborative workspaces for management; c) applications of networking theories.

In particular research will be pursued on "socio-semantics in collaborative networks", aiming at developing innovative concepts and applications for the management of information and knowledge in collaborative networks.

c) Decision Support Systems

Our research agenda will be centred in topics such as Multi-objective Metaheuristics, Soft Methods in Decision Making, or Creativity in Optimisation. Innovative concepts previously developed will be enhanced and extended.

A new research line we have started recently and intend to deeply explore is related to the design of new hybrid optimization techniques that merge optimization procedures with metaheuristics.