

CALL FOR GRANT APPLICATIONS (AE2021-0264)

INESC TEC is now accepting grant applications to award 1 Research Grant (BI) within the scope of the INESC TEC LA funded by National Funds through FCT - Portuguese Foundation for Science and Technology, I.P., project (reference UIDB/50014/2020)

1. GRANT DESCRIPTION

Type of grant: Research Grant (BI)

General scientific area: ENGINEERING

Scientific subarea: Electrical engineering

Grant duration: 3 months, starting on 2022-01-04 with the possibility of being renewed for a maximum term of one year, in cases where the grant has been awarded to students who are enrolled in non-award courses, or up to two years, in the cases of students enrolled in a master's degree.

Scientific advisor: Nuno Miguel Paulino

Workplace: INESC TEC, Porto, Portugal

Maintenance stipend: € 835,98, according to the table of monthly maintenance stipend for FCT grants (<http://www.fct.pt/apoios/bolsas/valores>), paid via bank transfer. Grant holders may be awarded potential supplements, according to a quarterly evaluation process (Articles 19, 21 and 22 of the Regulations for Grants of INESC TEC and Annex II), up to a maximum limit of 50% of the monthly maintenance stipend.

Costs attributable to INESC TEC may include registration, enrolment or tuition fee stipend, either directly or through reimbursement, during the grant duration.

The grant holder will benefit from health insurance, supported by INESC TEC.

2. OBJECTIVES:

- Expand the knowledge of the state of the art in the area of BLE-based location systems;
- Identify and select the appropriate methods to develop the proposed work plan;
- Develop research capacity through the application of selected methods;
- Exercise a critical spirit in evaluating the research process and the results obtained.
- Writing of a co-authored scientific article to disseminate the results.

3. BRIEF PRESENTATION OF THE WORK PROGRAMME AND TRAINING:

Context: the system consists of a printed circuit board with a microcontroller and 8 antennas, connected by UART/USB to a controller device (e.g., laptop, PC, tablet, etc). The computation pipeline consists of: obtaining phase samples for the 8 antennas -> calculation of phase differences -> incidence angle estimation -> data communication. Various incidence angles allow the estimation of the receiver's physical position in the space.

Plan:

- Familiarization with the current status of the implementation of an indoor location system based on BLE 5.1 (printed circuit board with array of 8 antennas for receiving BLE transmissions, and embedded software for the Nordic nRF microcontroller family)
- Setup of software development environments (Segger Embedded Studio) and software repositories
- Considering the computation pipeline, (re-)implement the algorithms of each step in the microcontroller (in C) (based on existing C/Octave code), and characterize the computation time required for each step as a function of the number of samples and adjustments to algorithms.

- According to the previous characterization, allocate each pipeline step to the micro-controller, or the master device (e.g., PC), in order to maximize the packet reception rate
- At this optimal operating point, implement receiver auto-localization through multiple angles-of-arrival, and determine the localization accuracy (error in meters against the known real position) as a function of the number of transmitters (beacons), period of transmission, and environmental characteristics (position calculation methods already validated by simulation will be used)
- (Optional) Integrate machine learning models to estimate placement
- Contribute to the writing of a project activity report
- Writing of the grant report

4. REQUIRED PROFILE:

Admission requirements:

Licenciatura in Electrical Engineering, or similar.

The awarding of the fellowship is dependent on the applicants' enrolment in study cycle or non-award courses of Higher Education Institutions.

Preference factors:

- Experience with BLE-based localization systems. - Programming experience using python language.

Minimum requirements:

- experience in software development embedded in baremetal systems (without operating system), with interfaces to external peripherals (through direct control of GPIOs and standard protocols, e.g., SPI)
- C/C++ programming experience

5. EVALUATION OF APPLICATIONS AND SELECTION PROCESS:

Selection criteria and corresponding valuation: the first phase comprises the Academic Evaluation (AC), based on the criteria referred to in Article 12 of the Regulations for Grants of INESC TEC, while the second phase comprehends the Individual Interview (EI). All factors are evaluated on a scale of 0 to 100, taking into account the applicants' merit, suitability and conformity with the preference factors.

The weight of the AC factors are as follows: Academic Qualifications (FA, 40%), Scientific Publications (PC, 10%), Experience (EX, 40%) and Motivation Letter (CM, 10%).

Candidates who score less than 50 points in the AC average will be considered excluded on absolute merit. The top five candidates approved on absolute merit will be qualified for the individual interview. The Final Grade (CF) is obtained by the weighted average of AC (70%) and EI (30%).

The Selection Jury is composed of the following members:

- President of the Jury: Luís Manuel Pessoa
- Full member: Nuno Miguel Paulino
- Full member: Rui Lopes Campos
- Substitute member:

Release of results and prior hearing: the results of the selection process, as well as the terms and procedures for prior hearing, will be released to the applicants by email, under the terms referred to in Article 13 of the Regulations for Studentships and Fellowships of INESC TEC.

6. FORMALISATION OF APPLICATIONS:

Application Documents:

1. Motivation letter;
2. Curriculum Vitae (must include the list of previous fellowships, their type, beginning and end dates, funding entities and host institutions);
3. Certificate or diploma degree dully recognised in Portugal;
 - Documents proving the awarding of academic degrees and diplomas, or the according recognition - in cases of academic degrees or diplomas granted by a foreign higher education institution - can be dismissed in the application process, and replaced by the applicant's declaration of honour, with the verification of said condition taking place during the grant's hiring stage. The submission of

the certificate is mandatory when signing the contract.

- Academic degrees or diplomas awarded by a foreign higher education institution require an authentication by a Portuguese higher education institution, and the corresponding registration on the DGES platform, in conformity with Decree-Law no. 66/2018, of August 16, and Ordinance no. 33/2019, of January 25. More information available on the website <https://www.dges.gov.pt/pt/pagina/reconhecimento?plid=374>

4. Proof of enrollment in a degree awarding study cycle or in a non degree awarding Higher Education program.
 - The proof of enrollment may be presented just during the grant hiring stage.
5. Signed declaration stating the infringement of the grant holder's duties (article 14, no. 4)
6. Documental evidence to support the country of residence, residence permit or other legally equivalent document, in cases where the applicant is a foreigner or non-resident in Portugal - valid until the beginning of the grant.
7. Other supporting documents relevant to the final assessment.

Failure to deliver the required documents within the 90-day period after the date of the notice of the conditional awarding of the grant implies its cancellation.

Application period: From 2021-12-02 to 2021-12-16

Submission of applications: the application will be formalised by submitting the form available in the *Work With Us* section of INESC TEC website.

7. BINDING LEGISLATION AND REGULATION

The hiring process shall comply with the current legislation regarding the Research Grant Holder Statute, approved by Law no. 40/2004 of August 18, in its current wording, as well as by the Regulations for Grants of INESC TEC and for [FCT Grants Regulation in force](#).

For more information, please check the Regulations for Grants of INESC TEC and relevant annexes at www.inesctec.pt/bolsas



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