IMIBIC CALL FOR EXPRESSIONS OF INTEREST:
POST-DOCTORAL RESEARCHERS: Applications of Artificial Vision

Reference: PostdocMSCA2017GC19

Description of IMIBIC

The biomedical research institute, IMIBIC, located in Cordoba, southern Spain, is a partnership between the University of Cordoba and the Reina Sofia University Hospital. IMIBIC offers a multidisciplinary environment focused on results-oriented research and based on precision medicine and excellence in science. IMIBIC is accredited with the Excellence distinction from the Carlos III Spanish National Institute of Health.

The Institute is structured in research groups that cooperate in the implementation of its various scientific programmes. Our major goal is to promote biomedical innovation as a powerful engine for economic and social development. To this end, the Institute offers an active environment in which to conduct high-level scientific research. Regular seminars and research events offer the opportunity to meet with national and international speakers covering a diverse range of topics in biomedicine.

The IMIBIC building is located within the University Health Sciences Campus, nearby the Reina Sofia University Hospital. It hosts a wide variety of core facilities for researchers, including the Biomedical Research Support Units that host brand new equipment and laboratories to support the technical needs of the IMIBIC community, as well as a Clinical Research Unit to support clinical trial research.

In 2015, IMIBIC managed to continue increasing its scientific output, with 359 papers and the total impact factor was 1303.75 points. Furthermore, 21 property registries were fostered at the heart of the Institute, and a total of 5 EU and international projects (private and public: FP7, H2020, IMI) were active in 2015.

Aim of the call

The Maimonides Biomedical Research Institute of Cordoba (IMIBIC) is seeking to develop proposals with **experienced researchers** for submission under the **Horizon 2020 Marie Skłodowska-Curie Actions.**
http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/msca-if-2017.html

IMPORTANT: Applicants should check their CV against the eligibility and mobility conditions of Marie Skłodowska-Curie Actions.

Brief description of the Research Group: Applications of Artificial Vision

Our research focuses on fundamental problems in artificial vision on which all the technology we develop in our applied research lines is supported. The main topics of our interest and areas in which be publish are: Unsupervised segmentation of scenes, Tracking, Unsupervised recognition of objects in a scene, Volumetric Reconstruction, Augmented Reality, and Virtual Reality.

We also do practical research related to 2D and 3D Vision Systems Design for specific applications in biomedical or industrial environments. The latest activities of the Group were centred on unsupervised evaluation of human mobility, automatic calculation of the geometry of irregular

objects for an optimal waste storage, fall risk prediction in the elderly and the development of automated X-ray analysis systems supporting the diagnosis of any type disease.

Project description:

Camera pose estimation is a common problem in many applications requiring a precise localization, such as augmented-reality, three-dimensional reconstruction, robotics, education, and medicine, among others. The goal is to determine the camera three-dimensional position and orientation with respect to a known reference system.

An approach to solve that problem consists in using natural features such as keypoints, color or 3D information. Natural landmarks have the advantage of not requiring any modification of the environment, but also imposes some limitations. In indoors environments, it is not strange to find low textured regions (like corridors or large white walls) or with regular patterns, in which systems based on natural landmarks cannot be employed. Additionally, localization using natural landmarks is only possible from locations relatively close to these employed for mapping, i.e., invariance to rotation, scale and translation is limited.

Another approach to tackle the problem consists in using artificial landmarks, which are easily distinguishable elements that can be robustly detected using low computational resources, and provide high accuracy. They contain enough information for camera pose estimation using a single marker (squared markers), and also have the advantage of being detected from a wider range of locations than natural landmarks, thus requiring less views for localization and mapping. For all these reasons, artificial landmarks are a very popular option in controlled environments such as industrial and research ones.

It can be observed by analysing the related literature, that there is a dichotomy in the proposed approaches for camera pose estimation. The related works either use natural or artificial landmarks, but few of them have focused on fusing both sources of information. Our starting hypothesis is that a system using both types of landmarks can provide a more robust and flexible framework for camera pose estimation, overcoming the drawbacks of each type with the strengths of the other. Our proposal is to develop techniques able to use both artificial and natural landmarks simultaneously, dynamically assigning a degree of confidence to each one depending on the situation.

Although the techniques to be developed in this work have a wide range of applications, this project will also make contributions on two particular areas: three-dimensional reconstruction and augmented reality.

Profile

Skills/Qualifications:
-PhD in Computer Sciences or Similar

Specific Requirements:
-Expertise in C++ programming
-Expertise in OpenCv
-Knowledge of Fundamental of Camera Model (pinhole, calibration, etc.)
-Knowledge of 3D reconstruction

Required Research Experience:
-Knowledge of volumetric reconstruction
-Experience with depth sensors
-Experience in structure from motion

Required Languages:
-Excellent level of spoken and written English.

Eligibility criteria:
The candidate must fulfil the eligibility and mobility conditions of Marie Skłodowska-Curie Actions.

Selection Process:

The process consists of an analysis, evaluation and ranking of all CVs received. Following the evaluation, the highest ranked applicants will be called for a personal interview in order to evaluate more precisely the skills of the candidate.

Additional comments:

How to Apply: Applicants should send their CV to the following address: personal@imibic.org stating clearly in the subject of the email the reference "**PostdocMSCA2017GC19**". Deadline for sending your CV: 10th April, 2017.

Warning: Application emails that do not include reference will not be considered.

For more information about the Marie Skłodowska-Curie actions, see:
http://ec.europa.eu/research/mariecurieactions/