Post-doctoral position

MATIS laboratory - French Mapping Agency (IGN) - France

Visual characteristics extraction and matching for scalable image based localization

Keywords

Computer vision, Feature extraction, Visual landmark, Image matching, Image retrieval, Image based localization, Scalability.

Context

This Postdoctoral position takes place within the scope of a large-scale European Project: Things2Do (call KET-ENIAC 2013-2). This project aims at building a design and development ecosystem to support the deployment of a new semiconductor technology: FDSOI. This technology allows to build computer chips with smaller transistor size and lower power consumption, enabling more powerful yet energy efficient wearable smart devices.

The French Mapping Agency (IGN) contributes to this project through two of its five research laboratory (MATIS and LOEMI labs) by developing a wearable demonstrator running on FDSOI, used for image-based localisation.

Wearable localisation system like smartphones usually make use of GPS or radio signal to find a position that may not be very accurate in urban environment because of noise or signal masking. This project aims at providing an accurate positioning solution using the picture stream from the wearable device camera (smart glasses) matched against a precisely geolocalized picture database, acquired using a mobile mapping vehicle called Stereopolis which is developed in the MATIS laboratory.

The images acquired by the wearable system can then be registered by first matching visual relevant features between both data sets, and second integrating these matches into a bundle adjustment process. The MATIS has already some experience and tools on bundle adjustment for robust registration and reconstruction of 3D visual landmarks (e.g. road markings and road signs) from multiple view imagery with sub decimetric absolute accuracy.

Subject

In this context, the post-doc will focus on the study of matching algorithms for very precise registration of an image as well as of an image sequence. The objective is to increase the accuracy already reached in the laboratory and in literature.
In particular, we will first focus on the extraction of very precise visual features. Visual landmarks such as road markings and signs have proved their robustness, especially facing classical interest points.

Other visual landmarks or more general visual features (points, lines, patches etc.) will be studied according to the precision of their localization and their repeatability. Then the main challenge will concern the geometric precision of the matching, especially facing the volume and redundancy of the manipulated data (input and reference) and their differences due to different periods of acquisition.
Pure 2D-to-2D strategies may be considered, as well as 2D-to-3D ones involving the 3D reconstruction associated with the reference dataset available at MATIS. Depending on the source of the images, an initial set of solutions (e.g. given by GPS) would be available or not. In that case, the scalability of the proposal will be mandatory to deal with large segments of data. The post-doctoral fellow will work with a team of researchers and engineers involved in the project, including an engineer working on the optimal coding of extraction and matching algorithms on FDSOI technology.

References

X. Qu, B. Soheilian, N. Paparoditis. Vehicle localization using mono-camera and geo-referenced traffic signs. IEEE Intelligent Vehicles Symposium (IV2015), Seoul, South Korea, 28 June - 1st July 2015.

L. Wei, B. Soheilian, V. Gouet-Brunet. Augmenting vehicle localization accuracy with cameras and 3D road infrastructure database. ECCV workshop on Computer Vision in Vehicle Technology 2014, Zurich, Switzerland, September 6-12, 2014.

N. Paparoditis, J.-P. Papelard, B. Cannelle, A. Devaux, B. Soheilian, N. David, E. Houzay. Stereopolis II: A multi-purpose and multi-sensor 3D mobile mapping system for street visualisation and 3D metrology. Revue Française de Photogrammétrie et de Télédétection 200: 69-79, October 2012.

MATIS laboratory

The MATIS laboratory of the IGN, which is the French national mapping agency, is one of the leading laboratories in photogrammetric computer vision, image analysis and remote sensing applied to geospatial imagery and ground based imagery (e.g., provided by mobile mapping systems). It is composed of 30 researchers, including 19 permanent researchers. The MATIS laboratory has been involved in 3D data collection for 3D city modelling for twenty years, and makes use of several distinct methods that have been developed during this period. For more information about the MATIS please visit our website.

Profile

The candidate should have a PhD degree in photogrammetry or computer vision, with knowledge and interest in pattern recognition at large scale.
-Good knowledge of programming language (C++) is mandatory.
-Prior knowledge and experience in the fields of pose estimation and/or scalability will be a plus.
-Good spoken and written English. Knowledge of French would be useful.

Organization

Location: MATIS laboratory of the IGN, Saint--Mandé, Paris, France.
Salary: around 2200 € per month (net income), according to experience. The position is a salaried employment with the right to social benefits and paid vacations.
Duration: 22 months, to start as soon as possible.

Application procedure

Send by email in a single pdf file to the contacts: a cover letter describing how your research experience is relevant to the position, recommendation letters or names of referees and a resume (including a summary of the thesis and full list of publications).

Contacts

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Deadline

June 18th, 2015