Postdoctoral position

MATIS laboratory – French Mapping Agency (IGN), France

Camera Localization with large scale semantic object signatures

Keywords

CBIR, computer vision, feature extraction, visual landmarks, 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, designed for image-based localization.

Wearable localization 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 exploiting the image stream from a wearable device camera (smart glasses) matched against a precisely geolocalized large scale image database, acquired using a mobile mapping vehicle called Stereopolis and developed in the MATIS laboratory [3].

The images acquired by the wearable system can be registered by first matching visual relevant features between both data sets using a CBIR approach, and second by integrating these matches into a bundle adjustment process. The MATIS already has some experience and tools on the matching of visual landmarks (e.g. road markings and road signs) and on bundle adjustment for robust registration and reconstruction of 3D visual landmarks from multiple view imagery with sub-decimeter absolute accuracy [1] [2].

Subject

This postdoc position will focus on the CBIR part of the process. He (she) will follow previous research works aiming to create a geo localization system based on semantic analysis of an image and comparison with a geolocalized object dataset.

Starting from a preliminary approach based on the indexing of the signatures of already detected semantic objects (visual landmarks or others) within a large scale geolocalized object dataset, this postdoc will focus on:

- the study and improvement of the descriptors which produce visual object signatures dedicated to image localization,
- the study and structuring of the signatures to perform fast retrieval in a large dataset through the distributed computing infrastructure available in the project,
- the management of several experiments to evaluate the proposal in realistic conditions, e.g. evaluating the impact of signature degradation (partial signature, false detections…), evaluating the relative importance of landmark categories used for pose estimation, assessment of the impact of landmark density per square kilometer in the dataset, etc.

The system will be used on a mobile and wearable image based localization system associated with a distributed computing infrastructure (“cloud”), but may also be used directly on the mobile device with a smaller dataset. With the support of a team of researchers involved in the project, this postdoc will be assisted by an engineer whose missions concern the development of visual landmark detection tools and the interaction with the distributed computing infrastructure.

References

[1] 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.

[2] 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.

[3] 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 (French national mapping agency - Ministry of Ecology, Sustainable Development and Energy), 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 modeling 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 CBIR, computer vision or photogrammetry, with experiences and interest in image management at large scale.
Good knowledge of programming language (C++) is mandatory.
Prior knowledge and experience in the fields of pose estimation 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 (metro Saint-Mande, line 1).
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: 21 months, to start at the end of March 2016.

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 and how you could contribute to the suject,
- recommendation letters or names of 2 referees,
- a resume (including a summary of the thesis and a full list of publications).

Contacts

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Deadline

February 19th, 2016