Post-doctoral position

Photogrammetric processing of archival aerial campaigns

IGN – LaSTIG

Project ANR HIATUS "Historical Image Analysis for Territory evolUtion Stories"

Context

One mission of IGN, the French national mapping agency, consists in preserving aerial images acquired over the French territory. Thus, IGN has a collection of aerial photogrammetric surveys captured since the middle of the XXth century. This collection has been massively digitized during the last years.

These archival aerial images from photogrammetric surveys are a unique yet still unused to monitor and analyse environmental changes and anthropic phenomena over long periods. Indeed, such data exhibit outstanding characteristics: they constitute long time series (more than 100 years) with a high temporal resolution (at least one acquisition per 4 years), while providing a very high spatial resolution. Besides, because of their mapping finality, such data sets are multi-view ones, making it possible to calculate 3D information (heights).

ANR HIATUS project aims at automatically processing these archival images to retrieve the evolution of land cover. More specifically, this project aims both at (i) improving the automatic georeferencing / pose estimation of archival surveys in order to retrieve their geometry and derive ortho-images and digital surface models, and (ii) developing method to analyze such data taking into account their associated specificities and uncertainties (e.g. varying qualities and resolutions depending on acquisitions, training ground truth data available only at most recent dates).

Subject

Over the recent years, a great deal of work has been devoted to digitizing archival aerial surveys. The aim is now to retrieve camera calibrations, positions and orientations to be able to generate surface models and orthophotos, both necessary for automated land cover classification.

The work of this post-doctoral position is thus defined in the context of georeferencing these historical images. A first operational workflow based on MicMac [Rupnik et al., 2018] has already been developed [Giordano et al., 2018]. More precisely, to meet the specificity of the data, a prototype of automated ground control points extraction using recent geo-referenced images has been put in place. However, this existing solution needs further development concerning several aspects:

- Use different kinds of ground control landmarks in the processing chain. Possible approaches can be considered: (i) the use of linear structures detected in images [Cléry et al., 2014], (ii) the registration of 3D patches extracted out of archival and recent digital
surface models and (iii) the use of recent deep learning methods to detect and match points between historical images and recent georeferenced ones.

- Improve single-epoch extraction of tie-points between historical images, to increase the constraint of the bundle block adjustment.
- Optimize the bundle block adjustment strategies. For instance, adjustment of image blocks acquired at different times could be considered. [Feurer et al., 2018]


**Team**

The LaSTIG lab. of IGN, 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. In particular, it has developed MicMac, an open source photogrammetric software.

**Profile**

- The candidate must have a PhD degree in photogrammetry, image processing or computer vision.
- Good spoken and written English. Knowledge of French would be useful.
- Good knowledge of programming languages C++/Python.

**General information**

**Duration**: 18 months.

**Start**: first months of 2020, as soon as possible.

**Location**: Laboratoire en Sciences et Technologies de l'Information Géographique (LaSTIG) at IGN (Saint-Mandé, France).

Application procedure:

- a detailed resume including a list of publications and a description of the projects in which you were involved;
- a cover letter describing how your research experience is relevant to the position;
- a summary of the Phd thesis;
- recommendation letters.

→ Send all required documents by email in a single pdf file.

**Contact**

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