Post-doctoral position

Complementarity of superspectral imagery and multi-angular acquisition for mapping fine urban land cover

IGN – LaSTIG – MATIS team

Project ERA4CS URCLIM "Urban CLIMate services"
http://www.jpi-climate.eu/nl/25223460-URCLIM.html

Context

Because of their high concentration in population, goods and infrastructures, urban areas are particularly vulnerable to climate change. Indeed, heat waves are enhanced by the urban heat island effect, while floods due to intense precipitations are exacerbated by ground imperviousness. To adapt cities to climate change, city actors and especially urban planners need tools to estimate the impact of city evolutions on climate. Thus, te ERA4CS **URCLIM** projects aims at proposing such urban climate services, out of data describing cities and climate.
Therefore, the first task of URCLIM project consists in developing a method to create high resolution maps of urban parameters, such maps being a mandatory input data to feed climate simulation tools. In particular, knowledge about present urban materials would be a useful input data for these simulation tools. But, at present, such information does not exist in current geographic databases, and be obtained at a large scale only from remote sensing data.

Subject

Very high spatial resolution multispectral imagery is generally limited to 4 spectral bands (blue, green, red and near-infrared) and doesn't enable a good mapping of urban materials because of its low spectral resolution. Some spectrally richer, hyperspectral and superspectral, sensors exist, and are an interesting alternative [Herold 2003],[Le Bris 2016].
However, usual multispectral cameras generally enable multistereoscopic acquisitions (i.e. a same point will be acquired under different angles in the acquired set of images), unlike many airborne hyperspectral sensors. This makes possible to derive knowledge about the directional reflective behaviour of materials [Martinoty 2005].

The post-doc will investigate how to exploit jointly spectrally rich (hyperspectral or superspectral) imagery and multistereoscopic very high spatial resolution multispectral images, in order to evaluate the complementarity of both sources to extract fine urban land cover (i.e. material map).

Proposed work will thus consist in :
- providing tools to calculate BRDF models out of multistereoscopic images, evaluating whether rigorous radiometric corrections are mandatory, or whether coarser corrections are sufficient.
- investigating how to use such information in a classification process (supervised/non supervised)
- identifying how to merge such information with information from spectrally richer imagery, but which could be monoscopic and at lower spatial resolution (as in the case of an hyperspectral acquisition)

Martinoty, G. (2005). Reconnaissance de matériaux sur des images aériennes en multirecouvrement, par identification de fonctions de réflectance bidirectionnelles. Mémoire de Thèse, Université Paris 7 - Denis Diderot.

Herold, M., Gardner, M. E., et Roberts, D. A. (2003). Spectral resolution requirements for mapping urban areas. *IEEE*

Transactions on Geoscience and remote sensing, *41*(9), p. 1907-1919.

Le Bris, A., Chehata, N., Briottet, X. et Paparoditis, N. (2016). Spectral band selection for urban material classification using hyperspectral libraries. *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences*, Volume 3(7), p. 33-40.

Team

The MATIS team of 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 is involved in research in remote sensing analysis (aerial/satellite optical images or 3D lidar point cloud) to extract land cover and detect changes in urban and rural areas.

Profile

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

General informations

Duration : 18 months.
Start : **January 2018.**
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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