

Hyperspectral image analysis for monitoring the water hyacinth in the Nile River

12 Month Post-Doctoral Position

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1 Context: MapInvPlnt Project

The MapInvPlnt Project is funded by European Union through the joint transnational EU research call of ERANETMED on water resources management. With the objective of taking a step forward in the control and management of aquatic weeds in the Nile River and surrounding coastal lakes, our goal is to develop an efficient method and software prototype to map and monitor the aquatic weeds. This software will allow us to identify aquatic weeds locations, change of dense and spreading rate. Availability of such information will have a great impact on identifying efficient methods to control, manage and eradicate aquatic weeds such as water hyacinth in the Nile River. Invasions of aquatic weeds have caused significant problems in many lakes and river systems worldwide. Aquatic weeds usually grow naturally and abundantly into freshwater, and flood plain habitats. It seriously decreases biodiversity, threaten natural environment, alter nutrient cycles, and worsen water quality. In Egypt, more than 80% of the canals and the drains are heavily infested aquatic weeds. Effective management of aquatic weeds requires appropriate control methods that include chemical, mechanical and biological techniques. Detection and mapping of the extent of rapidly spreading invasive populations are critical for identifying the weeds control priorities, including eradication efforts. The main objective of this project is to develop an efficient software prototype, using remote sensing techniques, to map and monitor the change of dense aquatic weeds in river and lake systems. More precisely, we will develop efficient analysis methods for low cost multispectral satellite images, such as ASTER images, for the detection of water hyacinth in the Nile River in Delta of Egypt, chosen as a case study.

2 Objectives

The objectives of the post-doctoral position consists of developing new algorithms that would help in producing two kinds of maps of the water hyacinth. The first kind is done using band selection, then image fusion and finally image segmentation. The second kind is done by band selection and parallel multi kernel learning for unmixing. The area of study is part of the Nile Delta that covers a large portion of the Nile River (Rosetta Branch and Burullus lake, one of the largest inland coastal lakes).

Three main tasks will be considered:

- Hyperspectral band selection
- Hyperspectral image fusion
- Hyperspectral image segmentation
- Hyperspectral unmixing

According to his/her preferences, the applicant will focus on one or some of these distinct tasks. The implementation will be done using MATLAB or any other preferred scientific computing software/language (ENVI/IDL, Python, C/C++). Obtained results will be disseminate in the scientific community by publications in journals or by communications in conference and national workshops.

Some fully supported short-term visits at Universidade de Lisboa (Portugal) and at City of Scientific Research and Technological Applications (Alexandria, Egypt) will be considered to collaborate with other project members.

3 Requirements

Candidates should hold a Ph.D in one these fields: signal/image processing, machine learning, applied mathematics. Experiences in Earth science, remote sensing and, ideally multi-band and/or multi-modality imaging, will be highly appreciated. A good level in English is required.

Candidates should demonstrate their abilities to develop models and algorithms models, implement the processing chain, supervise master students and disseminate the results of the project through journal papers and communications.

4 Applications

The candidate should send (in English) an extended CV (including background, experiences, list of publications and scientific responsibilities), a motivation letter and reference contacts to

nicolas.dobigeon@enseeiht.fr

Review of applications begins on March, 2016, and will be closed when the position is filled.

5 Additional information

Supervision: Nicolas Dobigeon

Location: University of Toulouse, IRIT/INP-ENSEEIH, France

Expected starting date: September, 2016

Duration: 12 months

Salary (net): 2200 euros/month.