# HICO Data User's Proposal

HICO use in natural resources and coastal water chlorophyll-a monitoring

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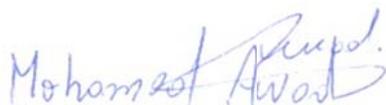
Date: 26/9/2013

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Abstract

Mapping forests in Lebanon is an important task in the process of natural resources management. This means that the more accurate the maps the better the decision making concerning natural resources management. Currently, all mapping methods depend on using multi-spectral satellite images which cannot provide a clear separation between different forest species. In this research, the deployment of hyperspectral images such as the Hyperspectral imager for the Coastal Ocean (HICO) in the mapping process can help in accurate identification of different forest species. The combination of the hyperspectral medium (HICO) and/or high resolution multi-spectral images can help in achieving the objectives. In addition the research will include an investigation of the available commercial segmentation/classification methods in order to identify the strengths and weaknesses. At the end of this project there will be maps of Lebanese some pilot areas showing fruit pine forests distribution and some of the problems facing these forests. In addition, the HICO images will be used to map Chlorophyll-a in the Lebanese coastal area in order to monitor the quality of water and the fishing resources.

Keywords: Hyperspectral ; Multispectral ; Segmentation ; Forest; ANN, Chlorophyll-a.

1. Statement of work/project description

Inability to identify the problems which may face natural resource in Lebanon may cause fast deterioration of these resources and loss in the economy and the environment. Many research projects about mapping natural resources and their status in Lebanon are based on the multi-spectral satellite images or aerial photographs which are not sufficient to provide enough information regarding any related issue. Images produced from hyperspectral sensors contain much more information than images from multispectral sensors and have a greater potential to detect differences in these resources.

The hyperspectral images can be used to obtain information about the spatial distribution of natural resources and will help in better managing them and in turn in reducing their losses.

The remote sensing methods which are used to map forests and chlorophyll-a in Lebanon are based on the analysis of multi-spectral satellite images. In this research the hyperspectral

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images of HICO will be used to create pinus pinea (stone pine) forest maps of pilot. A spectrometer will be available soon in the Center which will help in obtaining target spectral signatures.

The images will be used to identify the stone pine forests and to map Chlorophyll-a accurately. The correct identification of the pine forests and chlorophyll-a will help to identify problems and to reduce the losses to an important economic source which represents the traditional domestic forests in the mountains of Lebanon and to the fishery business in the coastal area. The advantage of implementing this project is to initiate the first step and attempt toward using hyperspectral images to manage natural resources as one of many sources of Geoinformation in Lebanon. In addition, it will increase the awareness of the problems that may face these important natural resources which give Lebanon his richness and natural beauty.

2. Biographical Sketch

The National Center for Remote Sensing (NCRS) is a research Center which comprises different disciplines. The Center was established in 1997 as part of the main organization the National Council for Scientific research. The Principal Investigator (PI) is a senior researcher who has been working in   NCRS since its establishment. The main activities of the PI is using up to date technologies in remote sensing, GIS and other geospatial technologies to conduct research in environment, geosciences, and the development of new image processing methods. The following are some of the published papers in refereed journals [1-10] and conferences [11-15].

The Center has state of the art hardware and software such as 2 plotters (A0) several scanners A4/A3 and one scanner A0, several printers A4/A3 with color capabilities. Moreover, the Center has more than 40 computers (PC, workstations, servers, and laptops), many different GPSs, spectroradiometer acquired recently. Finally, we have a high speed Internet and we are installing a new Modis images acquisition station.

Several important software packages are available in the Center and are yearly maintained such as ARCGIS 10.2, ERDAS Imagine 2013, MATLAB R2010, ENVI, ER Mapper, QGIS, VISAT Beam and our own developed software.

We are currently doing many researches and they can be viewed on the following WEB page

http://www.cnrs.edu.lb/index.php?option=com_content&view=article&id=62

3. Outputs and activities

The outcome of this project will be a benefit to many sectors in Lebanon one of them the agriculture sector, municipalities, tourisms, and researchers.
The following are the anticipated results of the project:

-Creating several new and accurate maps.

-Increasing the accuracy of the decision maker in the coastal area and forests management.

- Modified or creating techniques for the segmentation or fusion of hyperspectral images.

-Publishing papers in Journals or conferences.

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