



Departamento de  
Física



## Project description

**Project title:** Hyperspectral images data acquisition and processing

**Student:** Candidate from the Master degree in Optometry and Vision Sciences

**Supervisors:** Vasco Miguel Nina de Almeida / Assistant professor at the Dep of Physics, UBI

Francisco Miguel Pereira Brardo Ferreira / Assistant professor at the Dep of Physics, UBI

### Task description and expected results

Hyperspectral imaging has an advantage over alternative methods for combining spatial and spectral data in that it allows spectrally selective samples of reflected light to be recorded simultaneously over the scene. Therefore, on each pixel of the image we have the reflectance spectra of that particular location in the natural scene. The system is fast enough to avoid distorts estimates of the spectral reflectance due to temporal variations in the outdoor illuminant or the position of surfaces within the scenes and has a high spatial resolution comparable to that of the eye.

The imaging system used here was developed elsewhere [1]. The hyperspectral images were acquired with a progressive-scanning monochrome digital camera (Hamamatsu ORCA), with a cooler by Peltier, with a CCD array of 1024 x 1024 pixels and 10-bit output, an f/1.8 lens and a tunable birefringent filter (VariSpec, model VS-VIS2-10HC-35-SQ, Cambridge Research and Instrumentation, Inc., Boston, Mass.) mounted in front of the lens. A spectroradiometer (PR650 from PhotoResearch, US) will be used for colour and luminance calibration. This equipment is available at the Optical Center of the University of Beira Interior.

The data acquisition will be carried out in indoor and outdoor scenarios of Covilhã region looking to expand the existing hyperspectral images database to more specific occupational/recreational requirements e.g. golfers, surgeons, divers, night security workers. Correct planning for diversity and specificity of the sample will be crucial for the success of subsequent tasks.

The experiments will be carried out at the University of Beira Interior by the candidate. The design will be assisted by the supervisors.

It is expected that expanding the actual image database will give additional information about the spatial and chromatic complexity of everyday specific requirements.

**Bibliografic references**

[1] Nascimento, SMC, Ferreira, F & Foster, DH (2002). Statistics of spatial cone-excitation ratios in natural scenes. Journal of the Optical Society of America A-Optics Image Science and Vision, 19, 1484-1490

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1965492/>

**Student signature**

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**Supervisor's signatures**

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