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**Title**: Anomaly detection on hyperspectral images on graphs
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**Full description** -

The problematic is the detection of elements in a hyperspectral scene. The increasing quantity of multispectral data and the redundancy suggest that size reduction is possible. For a number of years, it is about changing the model of data acquisition rather than trying to find algorithms that can handle large amounts of data generated by a conventional acquisition. This is the purpose of the compressed sensing introduced by Candès, Tao and Donoho. This acquisition generates less data but their exploitation requires solving a complex minimization. First applied to grayscale images, it is generalized to multispectral data.

The extension of the detection of compressed signatures is based on a formal transformation called *spectralization*. We have highlighted the problems with this approach, including the reconstruction measurements, and we have stressed the need to choose appropriate measurements to enable an efficient reconstruction. In this work, we will focus on the detection of areas of interest in a multispectral image. The signature detection algorithm introduced by Guo-Osher uses L1 minimization is rather used for problems of sparcity.

Conventional tools of signal processing (frequency filtering, convolution, Fourier transform, regularization method, a model of energy minimization, etc.) have been extended to graph data structure by using spectral graph theory. It is based on the calculation of the graph Laplacian operator and its spectral analysis. The flexibility of graph approaches can consider information by changing properties of the weighted graph. We can suggest calculating the weight of pairs of pixels using different distances between spectral signatures of a hyperspectral image or to consider the similarity between two spectral signatures according to the graph structure.

The Guo-Osher minimization generates the signature detection in a multispectral image using a L1 minimization. After modelling measurements of a multispectral image, we study the adaptation of the minimization for a graph structure. We will propose a minimization that enables to detect the graph of an object into a multispectral image within the spectral graph theory. We will then compare the results of the new minimization by graphs with the original minimization.

This first work is to propose an algorithm for detecting the graph of a pattern or anomaly in a hyperspectral image in studying the similarity of signatures, defining the graph structure representations on a hyperspectral data and using models of energy minimization.

This second work is to extend the previous approach on data from a compressed sensing. The objective will be to detect the anomaly without an image reconstruction.

**Keywords:** Hyperspectral imaging, compressed sensing, graph, anomaly detection

**Funding**: DGA Direction générale de l'armement - Armaments Procurement Agency

**Conditions of access**:

- Citizen of the European Union or Switzerland;
- Not having started their professional career;
- In preparation of a Master degree in the year of submission of the application;
- Or hold a Master or equivalent allowing them to enroll in thesis;

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