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Improving the Segmentation of Multispectral Images Investigating the Temporal Behavior of Boundary Pixels by LSU Analysis

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Abstract:

In the classification process one of the approaches widely used is based sole on the spectral properties specific for every single pixel (pixel-based classification). This process is often is preceded by segmentation which in turn might be greatly improved by one preliminary step including sub-pixel analysis and mixed-pixel decomposition for boundary pixels. A generally accepted meaning of the word segmentation in the image processing community is the decomposition of the image under study into its different and homogeneous regions of interest (RoI) where the presence of single class or dominated one is known. In this study we have been focused on the assumption that applying the linear spectral unmixing (LSU) method on the border pixels forming the polygon in the image one could achieve better segmentation than relying only on spectral or geometrical properties. In LSU the mixed pixels, especially those in the border areas, in the image are expressed as linear combinations of the respective spectra of basic land cover types presented in the image. Implementing the LSMA on the data the smoothness of segments was improved. Our study showed that this is important not only for big homogeneous areas, but smaller ones could also benefit from the method proposed. This is of particularly importance where relatively large number of small plots should be correctly identified using multispectral data with moderate to coarse resolution. The idea behind this research was inspired by the data that will be made freely available from next generation of satellites for Earth observation (eg. LDCM and Sentinel-2) compared with high resolution multispectral data delivered by commercially operated satellites. We are confident that the results from this research will provide larger communities with reliably classified multispectral data for environmental modelling and for disaster management response.

Keywords:
multispectral data, linear spectral unmixing, segmentation, temporal data, next generation EOS