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Keywords: PRISMA satellite imagery, spectral data acquisition, fieldwork, radiometric corrections, urban artificial areas classification

The Italian Spatial Agency (ASI) has launched in 2019 the new PRISMA mission (Hyperspectral Precursor of the Application Mission) which integrates the hyperspectral sensor with an additional sensor, capable to acquire not only panchromatic images, but also VNIR (Visible and Near-InfraRed) and SWIR (Short-Wave InfraRed) data [1]. A possible application of such data is the urban areas classification using spectral data from fieldwork acquisitions to train the algorithms and to validate the results.
Considering the novelty of this mission and the data collection carried out by PRISMA sensors, this research focused on the comparison between spectral data taken by a portable spectroradiometer and that obtained from PRISMA satellite reflectance imagery. The main purpose of this analysis is to classify the hyperspectral imagery in a way to evaluate the reliability of spectral data from the PRISMA mission for such a purpose.
The pilot area considered for the collection of hyperspectral data is mainly represented by the city of Prato and surroundings areas (Montemurlo, PT; Calenzano, FI; Campi Bisenzio, FI).
Materials chosen to be part of the samples list are common man-made objects used for roof covering and for paving public and private buildings or properties. The materials that were studied during the spectral data collection missions were solar cells, bitumen, asphalt (parking lots and highway), plastic (air-supported structures), metal roof covering, wood paving, clay roof tiles, clay paving and concrete (paving and roof tiles). The test site locations were defined considering various elements: areas with large covering, owners' availability, security conditions and ease of access, material status and quality, presence of different materials within the same site when possible.
During the data collection several spectral signatures man-made materials in different locations were sampled. The collection was acquired using a portable spectroradiometer, namely ASD FieldSpec® 3, and then post-processed by the software ViewSpec® Pro.
At each site, a white reference sample was measured in order to compute the reflectance by rationing it to the raw DN data collected from the man-made materials.
In order to compare this data from fieldwork with that from the PRISMA mission, Erdas® Imagine 2020, L3Harris Technologies ENVI®, Google® Earth Engine and Esri® ArcMap were used to process the satellite imagery in terms of radiometric and geometric corrections. The Empirical Line Correction method was used to calibrate the PRISMA imagery of reflectance while, at the meantime, a pure translation shift was applied to the panchromatic, VNIR and SWIR images in order to obtain a satisfactory georeferencing. Then, two pansharpened VNIR and SWIR images, characterized by 5 meters of spatial resolution, were produced by the fusion with the panchromatic image.
The available PRISMA image was classified, and the materials of the urban area were mapped allowing to differentiate the roofs and the paving characterised by asphalt, concrete, clay tiles, bitumen, plastic, metal, solar cells and wood. The accuracy of classification was alto assessed through ground truth activities and photointerpretation of the imagery available on Google® Earth Pro.

Reference

[1] https://www.asi.it/en/earth-science/prisma/