The Rochester area chapters of the IEEE Geoscience and Remote Sensing Society and the Signal Processing Society jointly present a technical seminar

Physics-based Target Detection: Analysis and Validation on an Airborne Hyperspectral Data Set

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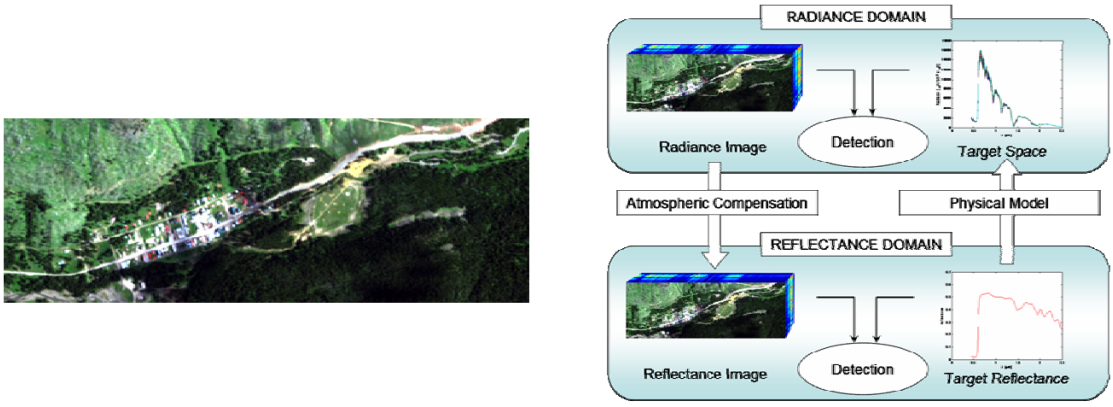
Thursday, October 9, 2008
Pizza and soda provided at 5:30 pm
Meeting and Presentation at 6 pm

Carlson Learning Center (Room 1275)
Chester F. Carlson Center for Imaging Science (Building 76)
Rochester Institute of Technology

Abstract

Target detection algorithms for hyperspectral images have been widely investigated and have proven valuable in many remote sensing applications. Typically, these algorithms are applied to an atmospherically-compensated reflectance image, since the target of interest is often specified by its spectral reflectance. Recently, physics-based approaches have been developed that allow these algorithms to be applied directly in the radiance domain. These approaches use a "target-space" which is defined by the generation of a range of possible sensor-reaching radiances for a given target spectral reflectance under a variety of illumination and atmospheric conditions. Physics-based target detection can be more efficient since it does not require the image be atmospherically compensated. However, whereas the generation of target spaces has been widely investigated, there has been relatively little work on the performance evaluation of different algorithms in the radiance domain compared to their typical application in the reflectance domain.

This presentation will report on an extensive analysis of physics-based target detection that has been carried out on a hyperspectral data set acquired by the airborne 126-band HyMap sensor over a complex rural scenario in Montana. A description will be provided of how the target-space was generated from analysis of the available information regarding the scene, sensor, data acquisition and atmospheric conditions. Next, the validation of the target-space obtained will be considered. Finally, the detection performance in both domains will be discussed with a focus on the strengths and weaknesses shown by the various geometrical and statistical detection algorithms considered.



(a) ***(b)***

(a) True Color representation of the hyperspectral image analyzed; (b) Comparison of target detection schemes..

Biography

Stefania Matteoli is a Remote Sensing Ph.D. student at the Department of Information Engineering, University of Pisa, Italy. She is currently a visiting scholar in the Chester F. Carlson Center for Imaging Science at the Rochester Institute of Technology (RIT). She received her B.S. and M.S. in Telecommunications Engineering from University of Pisa, Italy. Her main research interests include signal processing for multi/hyperspectral images exploitation and anomaly and target detection in remotely sensed images. Her current research at RIT focuses on target detection in the radiance domain by the employment of physics-based models.