Physics Colloquium

Michigan Technological University
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Room 139 Fisher Hall

ENVIRONMENTAL APPLICATIONS OF HYPERSPECTRAL IMAGING DATA

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Abstract: Hyperspectral imaging (HSI) spectrometers acquire images in an array of contiguous spectral bands (100s) such that for each pixel in the image a complete set of radiance spectra is measured. The two spatial image dimensions (elements and lines) combined with a third spectral dimension, produce the hyperspectral image "cube." Typical measurements from hyperspectral sensors contain information not only about the spectral characteristics of the surface but of the intervening atmosphere as well. Conventional HSI processing starts with atmospheric compensation so that retrieval of surface characteristics can be accurately achieved. Compensation algorithms are used to remove the effects of water vapor, aerosols and other gaseous constituents in the atmosphere. This is a key advantage to HSI applications over those from multispectral sensors in that surface features can be more accurately defined. Meanwhile, the characterization of water vapor, aerosols and other atmospheric phenomenology derived in the compensation process can lead to additional environmental applications and products such as: integrated column water vapor, aerosol properties, delineation of manmade vs. natural clouds and plumes, better depiction of clouds, and coastal water characterization. Though each application/product may only ingest a few spectral bands, the ultimate strength of HSI exploitation lies in the simultaneous and adaptive retrievals of atmospheric and surface features.

Biography: Dr. Michael Griffin is a staff member in the Sensor Technology and System Applications group at the Massachusetts Institute of Technology's Lincoln Laboratory, a research arm of the university. His research interests include applications of hyperspectral technology to meteorological and environmental applications and the study of high clouds and the utility of using current cloud databases for cloud-free-line-of-sight predictions. Recent efforts involved the design and employment of a cloud-cover detection algorithm for the Hyperion hyperspectral sensor to run onboard the Earth Observing 1 (EO-1) space-based platform. Dr, Griffin came to Lincoln Laboratory in 1997 to work on data analysis, algorithm development, and assessment of hyperspectral sensors. Prior to joining Lincoln Laboratory he was an atmospheric physicist at the Air Force Research Laboratory, where he was involved in the development of cloud algorithms from multispectral imagery and worked on the retrieval of humidity, precipitation, and surface properties from microwave sensor measurements. Dr. Griffin received his undergraduate degree in physics and mathematics from California State University, Chico, and his graduate education in meteorology from the University of Utah.