Workshops — Sunday, November 16

Workshop 1

Hyperspectral Imagery Processing and Feature Extraction: Maximizing Geospatial Information Retrieval

William Farrand, *Space Science Institute*
Stuart Blundell, *Visual Learning Systems, Inc.*
Sunday, November 16, 1:00 pm to 5:00 pm, CEU .4
Registration Fee: $165 Member, $265 Non-Member

INTERMEDIATE Workshop: Intended for users of remote sensing data including analysts who may have used multispectral data and GIS systems and are now interested in using hyperspectral data and feature extraction in their work. Also appropriate for managers who must make decisions about what kind of remote sensing data to purchase for their projects and/or what kind of image processing or feature extraction software they should purchase.

Imaging spectrometry, commonly referred to as hyperspectral remote sensing, provides high-resolution spectral information for environmental, natural resources, and urban characterization projects. Hyperspectral image processing approaches can also be applied to broadband multispectral imagery and results from these analyses can be used to enhance automated feature extraction techniques. In this workshop, we will provide students with an introduction to the phenomenology of imaging spectrometry, hyperspectral image processing techniques, and feature extraction approaches to demonstrate how to add value to the maintenance of geospatial databases. We will emphasize that the added value in imaging spectrometry is on the spectrometry, the ability to identify materials based on their reflectance signatures. We will briefly discuss the phenomenology of reflectance spectrometry and explain why some materials are more amenable to mapping than others. We will describe commercially available processing systems that are available for processing hyperspectral and multispectral data and discuss the processing techniques within those packages. Certain processing techniques are better suited to certain applications. We will explain why this is so.

Hyperspectral imagery provides users with discrete spectral, and consequently compositional, information about Earth surface materials. The ability to integrate other types of geologic, geochemical, biologic, or hydrologic data with information from hyperspectral data improves the interpretation and mapping process. The student will be introduced to the concepts of developing feature extraction models for assisted and automated feature extraction approaches using hyperspectral, lidar, DEMs and multispectral data within a GIS. We will provide real-world examples of how end products, derived from hyperspectral and multispectral data processing, including resultant mineral and vegetation species maps, can be extracted using the Feature Analyst software.

We will provide a package of materials to the students that will include hard copies of the material presented and an extensive list of references on the topics addressed.

Topics to be addressed

I. Define Imaging Spectrometry (Hyperspectral Remote Sensing)
II. The Phenomenology of Reflectance Spectrometry
III. Object Recognition and Feature Extraction using Spatial and Spectral Attributes
IV. Commercially Available Hyperspectral Imaging (Hsi) Software Packages
V. Processing Techniques for Applications of HSI and MSI (Demonstration)
VI. Feature Extraction Strategies using HSI, LIDAR and MSI Datasets
VII. Summary and Final Discussion

Workshop 2

Image Interpretation

Charles Olson, Professor Emeritus, *University of Michigan*
Sunday, November 16, 1:00 pm to 5:00 pm, CEU .4
Registration Fee: $165 Member, $265 Non-Member

INTRODUCTORY Workshop: Anyone desiring to extract information from remotely sensed data, especially in those situations when automated methods cannot get the job done with sufficient accuracy.

Human interpreters routinely map land cover with accuracy above 90 percent. In this workshop we will explore how they do it.

I. The Interpretation Process – Integrating Multiple Inputs
II. Elements of Image Interpretation
  A. Shape
  B. Size
  C. Tone (the only element successfully automated)
  D. Shadow
  E. Pattern
  F. Texture
  G. Site
  H. Association
  I. Resolution
III. Interpretation of "Unknown" Features

Workshops — Monday, November 17

Workshop 3

Advanced Classification

Ranga Raju Vatsavai, *Oak Ridge National Laboratory*
Sunday, November 16, 1:00 pm to 5:00 pm, CEU .4
Registration Fee: $165 Member, $265 Non-Member

ADVANCED Workshop: Though basic principles will be covered, we assume the attendees are familiar with basic classification schemes (e.g., techniques offered in commercial systems such as ERDAS Imagine or PCI Geomatica).

The primary objective of this workshop is to bring recent advances in classification technology to the remote sensing analyst. Through this workshop we would like to disseminate the basic principles behind these new classification and machine learning schemes, and give the participants a firsthand practical experience through open source research prototype systems.

Participants are encouraged to bring a lap-top computer for hands-on training of the software.

The following topic will be covered in depth along with hands on practice using open source machine learning tools.

I. Statistical Framework: Introduce basic concepts, such as, maximum likelihood parameter estimation, Bayesian classification framework, Gaussian Mixture Models, Expectation Maximization, Covariance structure and robust estimation techniques.
II. Semi-supervised Learning: Statistical classification algorithms, such as, MLC and MAP requires a large number of training samples for accurate estimation of model (e.g., Gaussian) parameters. Recently, semi-supervised learning techniques that utilize large unlabeled training samples in conjunction with small labeled training data are becoming popular in machine learning and data mining. Introduce basic semi-supervised learning framework for the classification of remote sensing imagery.
III. Sub-class Classification: Increased spectral resolution offers the remote sensing analyst the ability to carryout species level classsification, however it also requires additional training efforts. Introduce a new sub-class classification scheme that is capable of automatically identifying finer (sub-) classes from aggregate classes, thus reduces the need for large amounts of additional training data.
IV. Spatial Classification: Increasing spatial resolution invalidates the basic assumption that the training samples are independent and identically distributed. Introduce a spatial semisupervised learning scheme and also allude the participants to the basic differences with respect to the conventional per-pixel based classification schemes.
V. Multiple Classifier Systems: Introduce basic premise behind multiple classifier systems and discuss various classification fusion schemes.

Workshop registration fees are is NOT included in the full Conference registration fee. Workshops require separate registration and payment for each workshop. Please see the registration form on page 29. Availability is based on space.

ASPRS reserves the right to cancel any workshop if the minimum number of registrations is not received by October 17, 2008. Popular workshops sell out early, so register early to ensure your place in a selected workshop. Workshops are limited to a maximum of 40 attendees.

Workshop 4

Emerging Technologies in Photogrammetry and Remote Sensing

Mike Renslow, *Renslow Mapping Services*
Claire Kiedrowski, *KAPPA Mapping, Inc.*
Monday, November 17, 8:00 am to 5:00 pm, CEU .8
Registration Fee: $215 Member, $315 Non-Member

INTERMEDIATE Workshop: This workshop provides an overview of emerging technologies and their impact on photogrammetry and remote sensing methodologies. The advance towards full digital mapping from start to finish, and the capacity to capture very large amounts of data supported by rapid processing and software will alter the way maps and imagery are produced in the near future. At the same time, active sensors, hand-held data collection devices, and feature extraction are changing fundamental mapping procedures and the way data are supplied to GIS.

Participants will receive an overview of the systems, technologies, and impacts on mapping in the next two to three years, as well as, the institutional issues involved in implementation.

Workshop topics include:

I. Metric Digital Sensors (Large and Medium Format)
II. Direct Georeferencing (INS, GPS, IMU)
III. Impact of New Technologies on Photogrammetry ('Heavy' Stereo Coverage, Nearly No Ground Control, True Orthos, Institutional Issues, Software)
IV. Automatic Feature Extraction (Linear Features and Buildings)
V. Active Sensors (Lidar, Radar, Data Processing and Software, and Future Systems)
VI. Satellite-borne Sensors
VII. Mobile Mapping (Hand-held Technologies, Auto-GIS Update
VIII. Supporting Technologies (Communications, Standards, GPS, Computing Speeds, UAVs)
IX. Adoption of the NCEES Model Law for Licensure of Photogrammetrists

Continuing Education Units (CEUs)

ASPRS, in conjunction with the University of Maryland, College Park, is pleased to offer Pecora 17 workshop attendees the opportunity to earn Continuing Education Credits (CEUs). All attendees are eligible for CEUs if they attend any of the workshops, register on site for CEUs, and pay the processing fee of $25. For each workshop attended, one CEU for every 10 hours of eligible sessions attended is awarded to CEU registrants. (Full day workshops are eight (8) hours and receive 0.8 CEUs. Half day workshops are four (4) hours and receive 0.4 CEUs). Forms and payment are accepted on site only at the Conference Registration Desk.

CEU participants will receive a certificate of completion awarded by the University of Maryland, College Park, approximately one month after the conference. If certificate is not received within 60 days after the conference, contact ASPRS.

Please note: CEUs are awarded to workshop attendees only. Technical sessions, general sessions, poster sessions, or any other scheduled special event at this conference are not eligible for CEUs.

Workshops — Monday, November 17

Workshop 5

Grid-Based Map Analysis and GIS Modeling

Joseph K. Berry, *University of Denver and Berry & Associates*
Monday, November 17, 8:00 am to 5:00 pm, CEU .8
Registration Fee: $215 Member, $315 Non-Member

INTERMEDIATE Workshop: This workshop provides experience with the concepts, underlying theory, data considerations, procedures, and practical considerations in applying advanced grid-based map analysis techniques. It investigates spatial analysis and spatial data mining approaches using numerous hands-on examples of analytical techniques and applications from natural resources management, environmental assessment, precision agriculture and geo-business. Specific topics include the Nature of Grid-based Data (discrete spatial objects vs. continuous map surfaces), Spatial Analysis Operations (operators for assessing "geographical context" within and among map layers; Reclassify, Overlay, Distance and Neighbors), Spatial Statistics Operations (operators for assessing "numerical context" within and among map layers; Surface Modeling and Spatial Data Mining) and Future Directions (alternative data structures; GeoExploration vs. GeoScience). The workshop follows the organization of the instructor's chapter on "GIS Modeling and Analysis" in the forthcoming ASPRS *Manual of Geographic Information Systems*. Each participant receives a CD with lecture materials, related readings and software/exercises for hands-on experience as homework. Attendees should be comfortable with the basic concepts in GIS and math/stat procedures and have an interest in map analysis/modeling.

The first portion of the workshop focuses on the Nature of Grid-based Data and Spatial Analysis Operations (5 hours). Discussion first establishes the difference between analytical potential of maps composed of discrete spatial objects (points, lines, and polygons; mapping and geo-query) and those organized as continuous map surfaces (spatial analysis and statistics). Discussion of Spatial Analysis operators for assessing geographical context within and among map layers include underlying theory, data considerations and advanced applications for such grid-based techniques as shape/pattern indices, effective distance, optimal path/corridor connectivity, visual exposure, and roving windows.

The second portion of the workshop focuses on Spatial Statistics Operations and Future Directions (3 hours). Discussion of Spatial Statistics operators for assessing numerical context within and among map layers include underlying theory, data considerations and advanced applications for such grid-based techniques as density analysis, spatial interpolation, residual analysis of interpolation performance, map generalization, linking data space and geographic space, level slicing, map similarity, spatial clustering and predictive modeling. Discussion of Future Directions investigates alternative data structure implications, as well as the interaction and impact of GeoExploration and GeoScience paradigms guiding geotechnology.

Specific topics and hands-on examples include:

I. Maps as Data, Not Pictures (Ex#1– Grid-based Map Analysis Framework)
II. A Map-ematical Approach (Ex#2– Structuring a Simple GIS Model)
III. Analytical Operations for Reclassifying and Overlaying Maps (Ex#3–R&O Techniques)
IV. Analytical Operations for Measuring Distance and Connectivity (Ex#4– D&C Techniques)
V. Analytical Operations for Characterizing Neighborhoods (Ex#5– Neighborhood Techniques)
VI. Model Development and Execution (Ex#6– Suitability Modeling)
VII. Surface Modeling (Ex#7– Spatial Interpolation)
VIII. Establishing Spatial Patterns and Relationships (Ex#8– Spatial Data Mining)
IX. Future Directions in Geotechnology (GIS, GPS, RS, other)

Workshop 6

Preparing For ASPRS Certification

Robert Burtch, *Ferris State University*
Rakesh Malhotra, *North Carolina Central University*
Monday, November 17, 8:00 am to 5:00 pm, CEU .8
Registration Fee: $215 Member, $315 Non-Member

INTERMEDIATE Workshop: Assumes participants have subject knowledge and are serious about taking the Certification Exam.

The purpose of this workshop is to prepare individuals who are planning to sit for the ASPRS Certification exams as a Certified Photogrammetrist or Certified Mapping Scientist in either Remote Sensing or GIS. The workshop will begin by explaining the purpose and form of the exam. It will then identify key topical areas that an applicant should be aware of prior to taking the exam. Topics will start with a review of the basic concepts and sample questions to show how they will be tested in the exam. Finally, the workshop will try to identify resources in which exam takers should be aware and from which to study in their preparation for the examination.

I. Purpose of the Exam
  A. Role of the exam in the certification process
  B. Format of the exam
  C. Topical areas covered on each of the three different exams
II. Geodesy/Surveying
  A. Principles of State Plane Coordinates
  B. Surveying Technologies
  C. Resources for further study
III. Photogrammetry
  A. Important principles
  B. Review questions
  C. Resources for further study
IV. Remote Sensing
  A. Important principles
  B. Review questions
  C. Resources for further study
V. Geographic Information Systems
  A. Important principles
  B. Review questions
  C. Resources for further study
VI. Other topical areas of importance in preparation for the exam

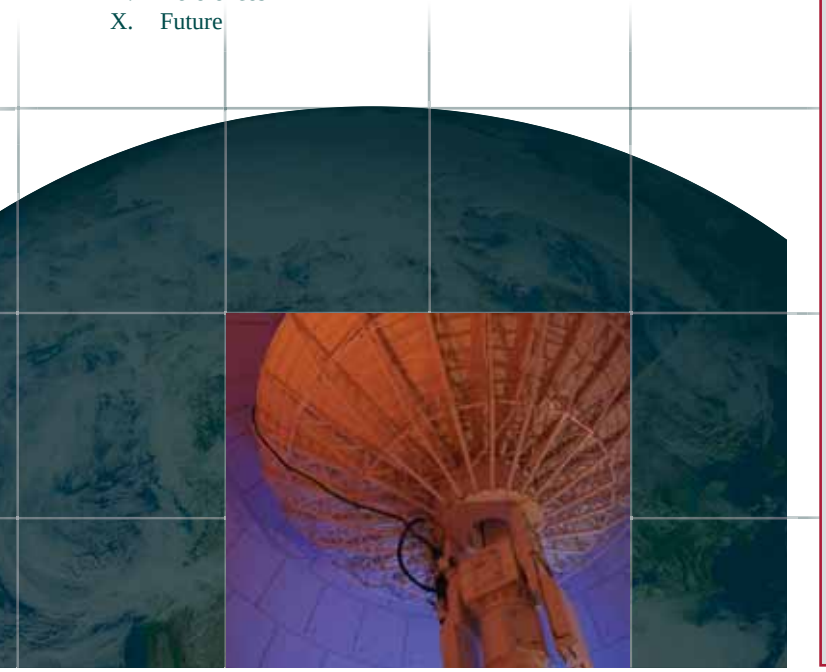
Workshop 7

Professional Airborne Digital Mapping Systems — An Overview
Dave Fuhr, *Airborne Data Systems*
Brian Huberty, *U.S. Fish & Wildlife Service*
Monday, November 17, 8:00 am to 5:00 pm, CEU .8
Registration Fee: $215 Member, $315 Non-Member

INTRODUCTORY Workshop

The primary objective of this tutorial is to review professional airborne digital mapping camera systems. We will discuss all advantages and disadvantages of these new, dynamic systems - technical, costs, feasibility, calibration and applications. Participants will leave with a better understanding of what it takes to map their projects by either contracting or acquiring airborne digital mapping camera systems.

I. Introduction
II. Geospatial Information - What and Where is the Information You Need?
  A. Physical resolution
  B. Spectral resolution
  C. Positional accuracy
III. History
IV. Mapping and Multi-spectral Airborne Cameras
V. Platforms UAV to U2
VI. Camera Basics
  A. Array sensors-CCD,CMOS
  B. Linear/pushbroom sensors
  C. Scanning mirror
  D. Lenses
  E. Filters/bandwidth
  F. Electronic shutters
VII. Camera Systems Design
  A. Processing and storage systems
  B. Aircraft power supply
  C. Navigation GPS/IMU
  D. Real-time data links
VIII. Applications
IX. References
X. Future



ASPRS Division, Committee and Board of Directors Meetings

Saturday, November 15

8:00 am to 5:00 pm
Executive Committee

Sunday, November 16

9:00 am to 10:00 am
Division Directors
Committee Chairs

10:00 am to 11:00 am
Electronic Communications Committee

10:00 am to 12 noon
Geographic Information Systems Division

11:00 am to 12 noon
Sustaining Members Council
Journal Policy and Publication Committees
Data Preservation and Archiving Committee

1:00 pm to 3:00 pm
Photogrammetric Applications Division Lidar Subcommittee
Convention Policy and Planning Committee
Professional Practices Division

3:00 pm to 5:00 pm
Education and Professional Development Committee
Primary Data Acquisition Division
Remote Sensing Applications Division
Student Advisory Council

5:00 pm to 6:00 pm
By-Laws Committee
Division Directors

Monday, November 17

8:00 am to 5:00 pm
Board of Directors