MA-460, Summer practice 2010

Valmiera Training Workshop

Quantitative research methods in human dimensions of environmental change within Eastern Europe

21 August

- Dr. Zanda Peneze, Faculty of Geography and Earth Science, University of Latvia
  Lecture: “Land use and landscape changes and factors influencing them in Latvia during the 20th – 21st centuries”

- Dr. Olga Krankina, Associate Professor & Sr. Researcher, Oregon State University, Dept of Forest Ecosystems and Society
  Lecture: “New approaches to land cover mapping, change monitoring, and human impact in the era of satellite observations”

22 August

- Dr. Garik Gutman, NASA Program Director, NASA – Landcover Landuse Change Program

  Lecture: “Optical Remote Sensing: Basics, Data Processing, Applications”

- Enrique (Tres) Montano, The University of Maryland

  Lecture on optical coarse resolution sensors AVHRR->MODIS->VIIRS; data availability, access, quality assessment, and applications

  Lecture: “Moderate Resolution Imaging Spectroradiometer (MODIS) satellite image data products”

- Dr. Mutlu Ozdogan, Assistant Professor, The University of Wisconsin, Center for Sustainability and the Global Environment

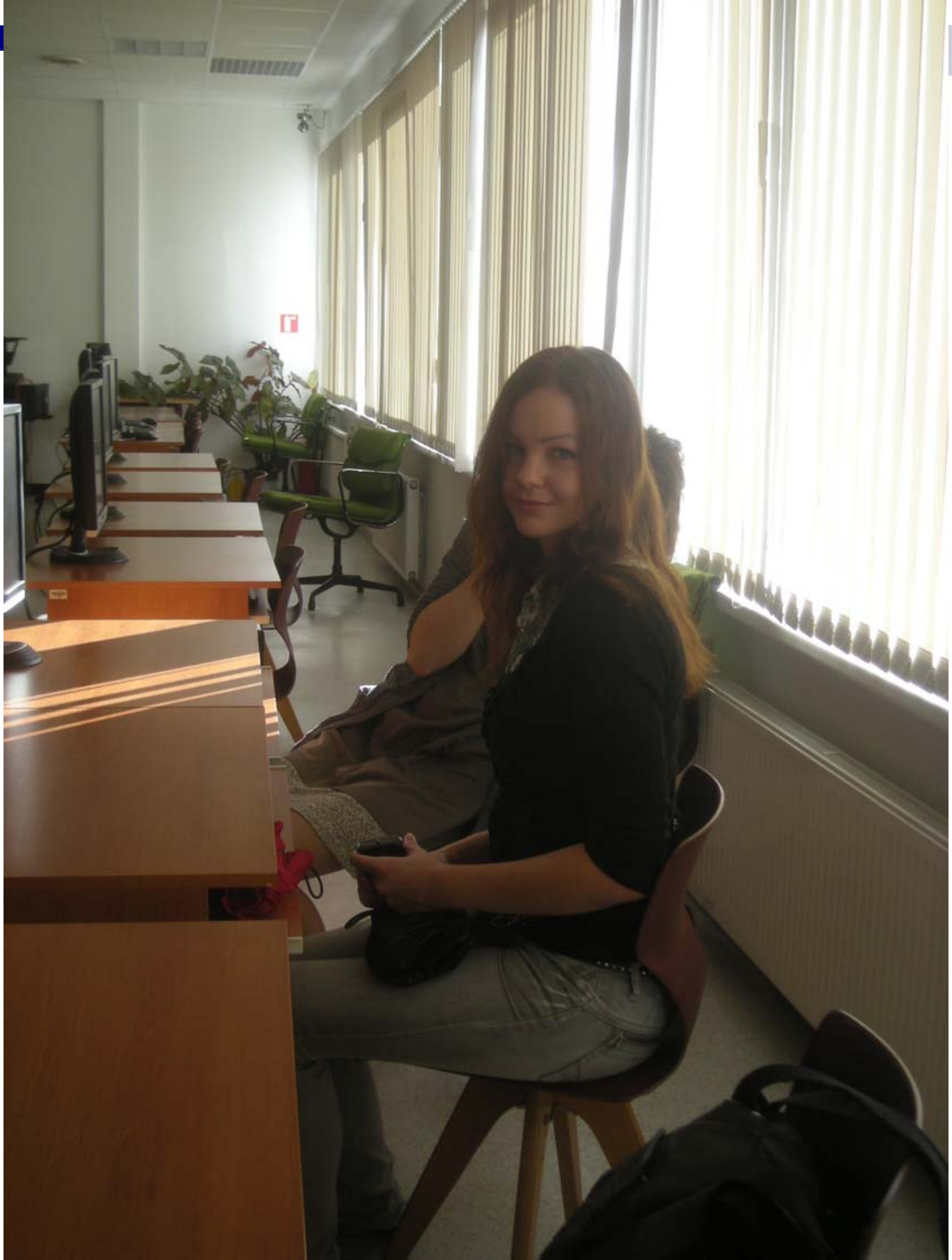
  Lecture: “Landsat satellite image pre-processing: radiometric and geometric image correction and normalization”

- Dr. Gregory N. Taff, Assistant Professor of geography, The University of Memphis

  Lecture: “Basics of supervised and unsupervised classification of remotely sensed images”

- Dr. Yuri Knyazikhin, Research Professor, Boston University and Brian Rheingans, Jet Propulsion Laboratory, California Institute of Technology

  Computer tutorial on Multi-angle Imaging SpectroRadiometer (MISR) satellite image data products



Computer Tutorial

- **Bidirectional Reflectance Factor (BRF)** – with the exception of the mirror-like surface of an absolutely calm body of water, all natural terrestrial surfaces and media reflect light diffusely. Clouds, aerosol layers, vegetation canopies, soils, snow fields – all scatter shortwave radiation into an angular reflectance pattern or Bidirectional Reflectance Factor (BRF) whose magnitude and angular shape is governed by the composition, density and geometric structure of the reflecting medium. Demonstration sensitivity of BRF to land cover type.

Task: Derive angular signatures of the following land covers during the greenest season: grasses, shrubs, broadleaf crops, broadleaf forests and needle forests.

Data: MISR Level 2 Land Surface Products: Directional-Hemispherical Reflectance (DHR), Bidirectional Reflectance Factor (BRF) covering 2 by 2 degree areas. The selected areas (we had about 6 different areas in the USA) represent five biomes: grasses, shrubs, broadleaf crops, broadleaf forests and needle forests.

Method: Average DHR and BRF over 2 by 2 degree areas.

Algorithm:

1. Order MISR Level 2 Land Surface DHR and BRF Products for selected areas representative of five biomes and corresponding to the greenest areas
2. Select cloud-free pixels
3. Average BRF and DHR over cloud-free pixels over 2 by 2 degree areas to obtain 5 signatures
4. Analyze differences in BRF

- **Angular signature in spectral space** – a vegetated surface scatters shortwave radiation into an angular reflectance pattern, whose magnitude and shape are governed by the composition, density, optical properties and geometric structure of the vegetation canopy and its underlying surface. The angular signatures at different spectral bands are not independent and their correlation conveys information about land cover type. The correlation, e.g., can be seen if one depicts variation in the BRF at red and near-infrared (NIR) wavelengths with the view angle. Points corresponding to different view angles form a curve – an angular signature in spectral space. The signature can be characterized by three metrics: its location in the spectral space, which is mainly determined by the biome type; the DHR at red and NIR wavelengths is used to specify the location; inclination (slope and intercept) of the signature, which is determined by leaf and soil optical properties, and the structure of the canopy; and the length of the signature, which describes spectral variation in the shape of the BRF.

Task: Derive angular signatures in spectral space of the following land covers during the greenest season: grasses, shrubs, broadleaf crops, broadleaf forests and needle forests.

Data: MISR Level 2 Land Surface Products: Directional-Hemispherical Reflectance (DHR), Bidirectional Reflectance Factor (BRF) covering 2 by 2 degree areas. The selected areas (we had about 6 different areas in the USA) represent five biomes: grasses, shrubs, broadleaf crops, broadleaf forests and needle forests.

Algorithm:

1. Derive angular signatures of the following land covers during the greenest season: grasses, shrubs, broadleaf crops, broadleaf forests and needle forests using algorithm described in the previous section.
2. Derive angular signatures in spectral space
3. Provide interpretation of the signatures

23 August

- Dr. Mutlu Ozdogan, Assistant Professor, The University of Wisconsin, Center for Sustainability and the Global Environment

  Lecture: “Hyperspectral remote sensing”

- Dr. Peter Romanov (NOAA/U. Maryland)

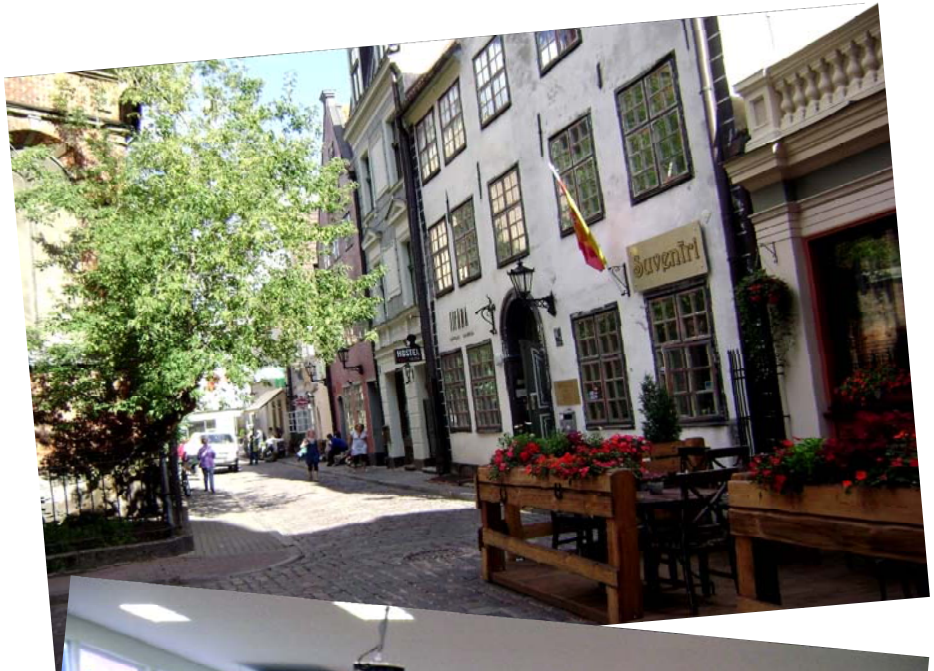
  Geostationary satellite data: processing and land surface applications

- Florian Schierhorn, PhD student, Leibniz Institute of Agricultural Development in Central and Eastern Europe (Advisor: Dr. Daniel Mueller)

  Spatial modeling of agricultural abandonment in FSU countries, using geoprocessing and numerical modeling

- Dr. Gregory N. Taff, Assistant Professor of geography, The University of Memphis

  Tutorial/Lecture on statistical and geospatial methodologies appropriate for relating aggregated social/economic data to pixel-level remote sensing data



Computer Tutorial

- **Goal**: The goal of this workshop exercise is to learn to analyze satellite-image-based landuse/landcover change data in conjunction with Census data to learn about how we influence the land. Gauja National Park is the study site for this exercise. We analyzed landcover change data from 2 Landsat TM satellite images from summer of 1985 and summer of 2002 together with data from the 2000 Latvian Census of the same area. In this exercise, we studied where growth of new forests occurred in Gauja National Park, and saw how it is related to the number of people of working age in those areas. Then a map displaying both variables of interest was created.

my_1st_map.pdf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В СССР


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