OUTLINE OF VISUAL INTERPRETATIONS OF DIFFERENT KIND OF IMAGES OBTAINED BY REMOTE SENSING TECHNOLOGY

Gașpar M. Alexandra, Silvia Zeicu, Emil Luca
University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca,
Calea Mănăștur 3-5, 400372, Cluj-Napoca, contact@usamvcluj.ro, andragaspar@yahoo.com

Abstract. Remote sensing is the science of measuring, analyzing and recording data about a phenomenon from a certain distance. The relationship between remote sensing and landscape is important due to the strong spatial extent of information collection that remote sensing makes possible. This paper aims to provide a comprehensive overview of the basics of remote sensing and some important sensors and remote sensing system, as well as the usage of different kind of images (aerial photographs, satellite images, radar and lidar) for studying landscape.

Keywords: remote sensing, landscape, multispectral image

REFERENCE REVIEW

A remote sensing system is collecting data about an object using instruments that are not in a direct contact with the studied object. In order to study large area of the Earth s surface, specific sensors are installed on platforms such as planes, helicopters or satellites. These remote sensing systems utilize visible, reflected infrared, thermal infrared, and microwave spectra, and include both passive and active sensors. A passive sensor system needs an external energy surce and it detects emitted and reflected energy wavelenghts from a phenomenon. On the other hand, an active sensor system provides its own energy source.

Most sensors record information by measuring the transmission of energy from the surface in electromagnetic (EM) spectrum.The variation in the energy emitted from Earth s surface, allows images of the same surface to be created. In certain sections of the electromagnetic spectrum. the energy waves pass easily through atmosphere, while other types do not.

While aerial photographs are black and white pictures and related to only one region of the EM spectrum, satellite images are captured using sensors which simultaniously record in different regions of the EM spectrum, in the same time.

1. Aerial photographs

As it sounds, aerial photography is the process of taking photographs from the air. It started as a proof of effectivness comparing to the time-consuming ground surveys along with limited sight of landscape elements taken on the ground. Shortly after, it was considered a key in military applications development. Once the World War II ended, natural processes and landscape studies were welcomed.

1.1 Classification of aerial photographs

Aerial photographs are taken in two basic forms:

1..1 *Oblique photographs* are taken when the axis of the photograph is purposely tilted between 3 and 90 degrees from the vertical. This type of image is primarly used in archaeologyfor a wider context and to give depth. Particular for them is the low elevation they are taken and also the few

numbers, therefor its application is limited and often taken just for a specific purpose. The best time frame to take oblique aerial photographs is considered to be winter season due to the clarity of the frosty conditions perfectly emphasise features.

1..2 *Vertical photographs* are a familiar form of aerial photographs. They are taken straight down over a landscape and the axis of the camera at the moment of exposure is truly vertical (+- 3 degrees from the camera axis).

Aerial photographs may also be classified by format, size, shape of the original negative within the camera.

1.2 Applications of aerial photographs

- ✓ urban studies
- ✓ Archeology in locating monumentsnot visible at ground level
- ✓ can be used as map substitute if a grid system id added
- ✓ climate changes
- ✓ visibility of phenomenon like caves or objects under an edge

2. Satellite multispectral images

Monochrome images of the same scene, taken with a different sensor. Each image is referred to as a *band.* Satellites usually take several images from frequency bands in the visual and non-visual range. *Landsat 5,* for example, produces 7 band images with the wavelength of the bands being between *450* and *1250 nm.*

2.1 Application

- ✓ Band 1 - (blue) used for soil, vegetation and coastal water mapping
- ✓ Band 2 - (green) used for depicting green reflectance of vegetation
- ✓ Band 3 -(red) used for differentiating vegetation based on chlorophyll absorption
- ✓ Band 4 - (near IR) used for vegetation and biomass surveys
- ✓ Band 5 - (short wave IR) used for sense vegetation moisture and snow/cloud reflectance differences
- ✓ Band 6 - (long wave IR) used for thermal mapping
- ✓ Band 7 - (short wave IR) used for determining vegetation moisture and depiction of minerals (based on hydroxyl ions) for geological mapping

3. Hyperspectral imagery

Vegetation extraction from hyperspectral imagery is increasingly studied recently. If compared with multispectral imagery, hyperspectral images includes hundreds of spectral bands not only a dozen of spectral bands. Moreover, the reflectance/absorption spectral signatures from individual species as well as more complex mixedpixel communities can be better differentiated from the much wider spectral bands of hyperspectral imagery (Varshney and Arora 2004). Therefor, hyperspectral sensors are well suited for vegetation studies.

3.1 Applications

- ✓ In military for targeting detection.
- ✓ In agriculture for location of stressed crops.
- ✓ In finding and rescuing operations.

4. RADAR imagery

Radar (Radio Detection and Ranging) is an active remote sensing system and was developed mainly for the armed forces. It measures the time between pulses and their reflected components to determine distance. Different pulse intervals, different wavelengths, different geometry and polarizations can be combined to roughness

characteristics of the earth surface. An important feature is that cloud covers can be penetrated without any effect on the imagery due to relatively long wavelengths used, which allows these systems to "see" through clouds, smoke, and some vegetation. Also, being an active system, it can be operated day or night.

4.1 Clasification of RADAR imagery

4.1.2 *SLAR* which stands for Side-Looking Airborne Radar. It was developed in 1950 and it works by measuring what gets scattered back once it sends one pulse at a time.

4.1.1 *SAR* (Synthetic Aperture Radar) was developed also by SLAR. It has the same work principle, the difference being in sending multiple pulses instead that one at a time.

4.2 Applications

- ✓ hydrology, including the retrieval of soil moisture and snow water content, glaciology
- ✓ mapping of vegetation
- ✓ mapping of forest and biomass
- ✓ mapping agricultural crops

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