History & Scope of Remote Sensing

FOUNDATIONS
Lecture Overview

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  • Power of imagery

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  • What is remote sensing?
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• History of Remote Sensing
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  • Balloons and early aircraft
  • World War II boom
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  • Color infrared film
  • Civil applications
  • Satellite remote sensing
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  • Global remote sensing
  • Geospatial data
  • Public remote sensing

• Overview of Remote Sensing Process
Introduction

LEARNING TO LOOK
The power of visual information
Everyday visual information

- Pictures concisely convey information about positions, sizes, and interrelationships between objects.
- These objects, in turn can convey deep levels of meaning.
- Humans possess a high level of proficiency in deriving information from images... even those scenes that are visually complex.
Definition

WHAT IS REMOTE SENSING?
Gathering of information from a distance.

- Remote implies that the observer is situated far from the subject.
- Sensing is employing the faculties of hearing, sight, smell, touch, taste, and equilibrium.
- So remote sensing is using instruments to gather information about a subject without physically touching it.

Definition: What is remote sensing
Observation of the Earth’s land and water surfaces

- Standard definition for class:
  - Remote sensing is the practice of deriving information about the Earth’s land and water surfaces by analyzing images acquired from an overhead perspective using electromagnetic radiation.
Remote sensing visual information

- Remotely sensed images have an overhead perspective and can use radiation outside the visible portion of the EM spectrum.
- Therefore, we need to employ our acquired knowledge from our fields of study (forestry, wetlands, urban design, biology, wildlife, range management) to interpret these images effectively.
History of Remote Sensing

ORIGINS AND DEVELOPMENT
Photography & Balloons: mid 19th century
Photography & Flight: World War I
Development of Photogrammetry: 1919 – 1939

Photogrammetry has been defined by the American Society for Photogrammetry and Remote Sensing (ASPRS) as:

The art, science, and technology of obtaining reliable information about physical objects and the environment through processes of recording, measuring and interpreting photographic images and patterns of recorded radiant electromagnetic energy and other phenomena.
Use of Electromagnetic Spectrum: World War II
Rapid technological advances: Cold-war years

Landsat 1 was the first satellite designed for Earth observation. First systematic repetitive observation of large areas of the Earth’s surface in several EM regions. Advantages:

1. First time large data sets were routinely available for scientific analysis
2. Imagery was in digital format which set the stage for digital software tools and analysis packages
3. Early satellites provided role models for other countries to develop their own programs
Global Remote Sensing: 1990’s - present

Terra-1 was launched by NASA in 1999 as the first satellite specifically designed to acquire global coverage of the earth and to monitor changes in the nature and extent of earth’s ecosystems.
Public Remote Sensing: 1990’s to present
Development of Geospatial Data: 1990’s - present

- Remote Sensing
- Global Positioning Systems (GPS)
- Geographic Information Systems (GIS)
Overview of the Remote Sensing Process

FLOW OF INFORMATION & ANALYSIS
Advanced remote sensing requires a consolidation of physics and mathematics as well as competences in the fields of media and methods apart from visual interpretation of satellite images.
Remote Sensing Process

- Physical Objects: objects (forests, urban areas, hydrology) that applications scientists wish to examine

- Sensor Data: data formed when an instrument (camera, radar) views the physical objects by recording EM radiation emitted or reflected by the landscape

- Extracted Information: consists of the transformation of the sensor data designed to reveal specific kinds of information

- Applications: the analyzed remote sensing data can be combined with other geospatial data to address a specific practical problem

Overview of RS Process: Workflow
Basic to Advanced Remote Sensing

- Basic remote sensing is utilized by professionals to analyze actual field condition and to increase their knowledge in their specific discipline.

- Advanced remote sensing requires a consolidation of physics and mathematics as well as competences in the fields of media and methods apart from visual interpretation of satellite images.