Remote Sensing

The technique of obtaining information about objects through the analysis of data collected by special instruments that are not in physical contact with the objects of investigation.

Forms of Remote Sensing

- **Acoustic (Sound Waves)**
  - SONAR (SOUND NAVIGATION Ranging)
    - used to map the ocean floor.

- **Optical (Electromagnetic Waves)**
  - RADAR (RADIO Detection And Ranging)
    - used by meteorologists to sense precipitation
  - LIDAR (Light Detection And Ranging)
    - a laser system used by NASA Airborne Oceanographic LIDAR (AOL3) project to measure chlorophyll in the ocean
    - Color spectrometers in satellite sensors

Optical Remote Sensing

- **Close Range**
  - sensor is a few centimeters from object (e.g., an optical spectrometer)

- **Short Range**
  - sensor is within meters of the object (e.g., sensors carried on an Unmanned Air Vehicle (UAV))

- **Medium Range**
  - sensor is a few kilometers from object (e.g., sensors carried on board an aircraft)

- **Long Range**
  - sensor is hundreds of kilometers from object (e.g., Landsat satellite)
Color Basics

The colors that human beings perceive in an object are determined by the nature of the Red, Green, and Blue light reflected from the object.

Color image processing can be divided into two major areas: **full color** and **pseudo-color**.

**Full Color** images are acquired by sensors such as a satellite sensor or a color scanner.

**Pseudo Color** image processing involves assigning a shade of color to a particular monochrome intensity or range of intensities in an image.

Primary and Secondary Colors of Light and Pigment
Close Range Remote Sensing

Spectral Analysis of Plant Foliage

Optical Spectrometer

Reflectance Curves

Short Range Remote Sensing
UAV Research at Virginia Tech

Model airplane used to pinpoint plant stress

Article by Heather McElrath

UAV Images of Peanut Fields
Suffolk, VA

Visible

NIR

NDVI

Medium Range Remote Sensing

NOAA Twin Otter Aircraft used for remote sensing
http://aol.wff.nasa.gov/aolff_pub.html
VT Golf Course

Long Range Remote Sensing

Artist's rendering of Landsat 7 satellite on orbit
http://landsat.gsfc.nasa.gov/
Remote Sensing and Remote Sensing and Management of Plant Diseases

Soil-borne disease “Clubroot,” on cauliflower

Remote Sensing and Management of Vector Borne Disease:

Remote Sensing and Management of Grasshoppers

S. P. Schell & J. A. Lockwood
University of Wyoming, Laramie

Satellite image showing areas of infested wheatgrass. A 37 acre infestation with a very high grasshopper density (25-30/m²). Virtually all the forage in the center of the outbreak has been destroyed.

Southern California Counties

Mexico
San Diego
Imperial
San Bernadino
Los Angeles
Riverside
Salton Sea

Remote Sensing & Whitefly Management

Satellite image of Imperial Valley, CA

American-Mexico Border
Ground Survey and Sampling of Crops and SLW Populations

Classified TM Image: Imperial Valley, CA. (05-30-95)

Satellite Image: Montgomery County, VA