# Data Acquisition and Interpretation

- **Electromagnetic radiation interacts with the earth surface (target) to produce energy signals**
- **Characteristics or information about targets are then extracted from signals**
- **Next step involves procedures by which signals are detected, recorded and interpreted**

# Detection of Electromagnetic Energy

Detection of electromagnetic energy can be performed either photographically or electronically

- Process of photography uses chemical reactions on the surface of a light-sensitive film to detect energy variations within a scene
  - Relatively simple and inexpensive and provide high degree of spatial detail

# Detection of Electromagnetic Energy

- Electronic sensors generate electric signal that corresponds to energy variations in the original scene, e.g., video camera
  - Broader spectral range of sensitivity
  - Ability to electronically store and transmit data
  - Requires recording device such as magnetic tape, CD-ROM

**In remote sensing**

- **Image refers to pictorial representation, regardless of the wavelength used in the remote sensing device**
- **Photograph is used for images that were detected and recorded on a film**

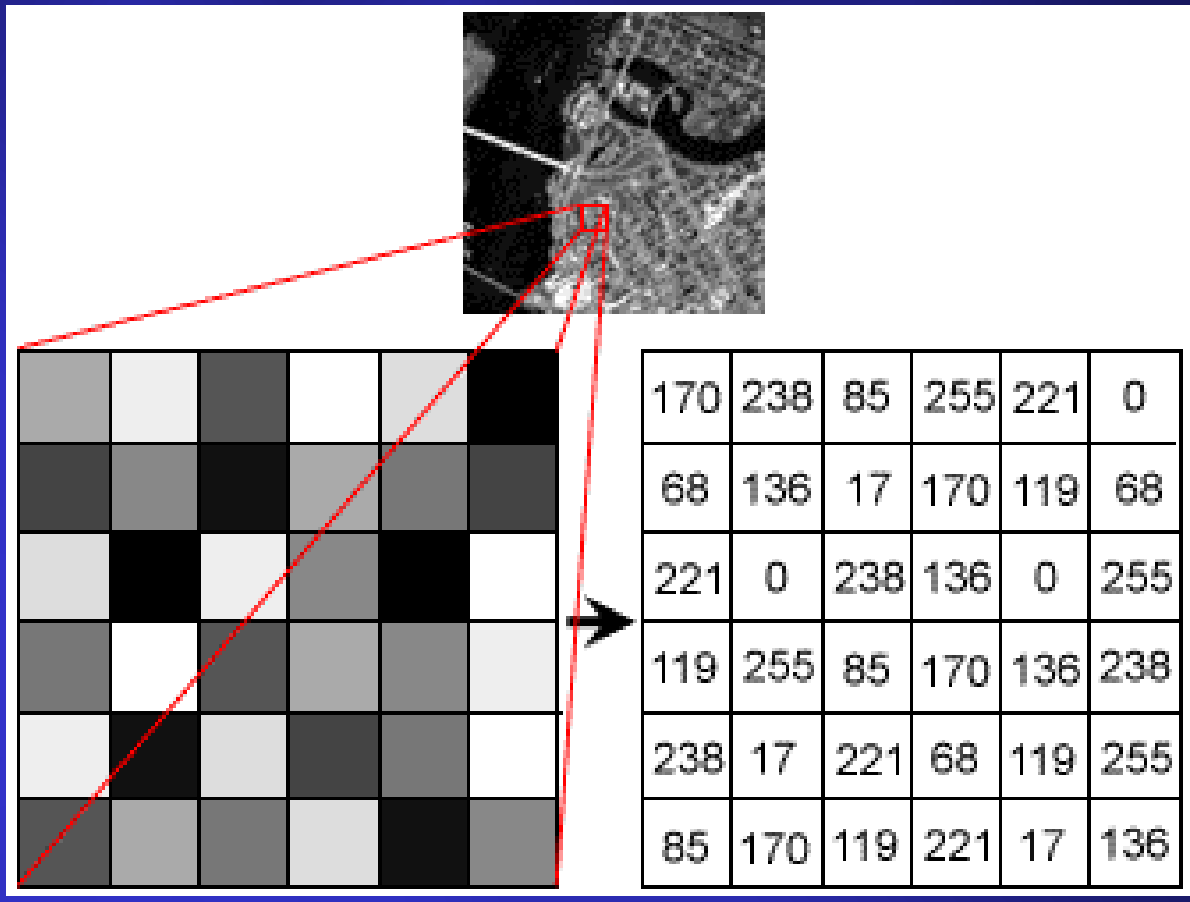
**All photographs are images but not all images are photographs**

# Display of Photograph

- A photograph could be displayed in either analog or digital format
- Analog refers to a hardcopy format
- A photograph displayed in digital format by subdividing the image into small equal-sized 2-dimensional array
  - Also referred to as Picture elements or Pixels
  - Brightness of each area represented by numeric values or digital numbers

# Digital Image of a scanned photograph

- Computer display each digital value as different brightness levels
- Sensors that record electromagnetic energy, electronically record the energy as an array of numbers in digital format from the start



| | | | | | |
|---|---|---|---|---|---|
| 170 | 238 | 85 | 255 | 221 | 0 |
| 68 | 136 | 17 | 170 | 119 | 68 |
| 221 | 0 | 238 | 136 | 0 | 255 |
| 119 | 255 | 85 | 170 | 136 | 238 |
| 238 | 17 | 221 | 68 | 119 | 255 |
| 85 | 170 | 119 | 221 | 17 | 136 |

- For 8-bit image brightness level vary from 0-255. Computer can recognize 256 gray levels
  - 0 represents black
  - 255 represents white
- Human eye can recognize not more than 16-gray levels
- Information for a particular wavelength is stored in a channel or band

# How do we make color images?

- **Channels of information can be digitally combined and displayed in the three primary colors (blue, green, red) to form color images**
- **Depending on the relative brightness or digital value, the primary colors combine in different proportions to represent different colors**

# Interpretation of images

- Visual interpretation of pictorial image data has been a principal technique for remote sensing analysis
- Visual interpretation makes use of the human mind to quantitative evaluate spatial patterns
  - Labor intensive
  - Requires experience
- Digital interpretation
  - Computer assisted analysis
  - Artificial intelligence

# Fine and Coarse Resolution

- In a coarse resolution image only large features are visible
- In a fine resolution image small objects can be detected

# Landsat TM image of Muscat area

# Landsat TM image of Muscat area