



Dr. Pinliang Dong

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Biography

Dr. Dong teaches Intermediate GIS, Advanced GIS, Advanced GIS Programming, Introduction to Remote Sensing, and Special Problems. He advises graduate student research in GIS, remote sensing, and applications in geographic and environmental sciences. Recent graduate theses include selecting optimal residential locations using GIS, vegetation mapping using NASAs EO-1 hyperspectral image data, development of a GIS toolkit for wildlife tracking, and small-area population estimation using high resolution satellite images and LiDAR data.

Research Interest

- ② Spatial analysis and modeling
- ② GIS and remote sensing for environmental science, geosciences, public health, and population studies
- ② LiDAR data applications in built-up and forest environments
- ② Digital image analysis

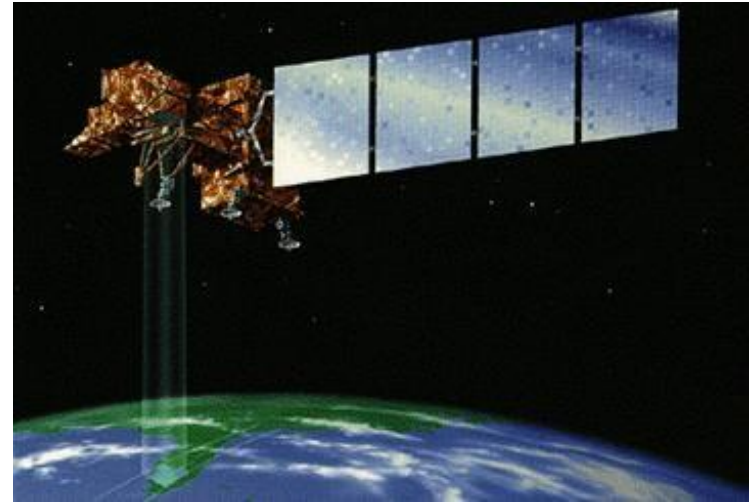
Remote Sensing

A satellite image of Earth showing the continent of Africa on the left and Europe on the right. The ocean is a deep blue, and the landmasses are shown in various shades of green, brown, and tan, indicating different vegetation and terrain types. The image is used as a background for the text.

REMOTE SENSING *is the process of sensing and measuring objects from a distance without physical contact with them*

Sensing

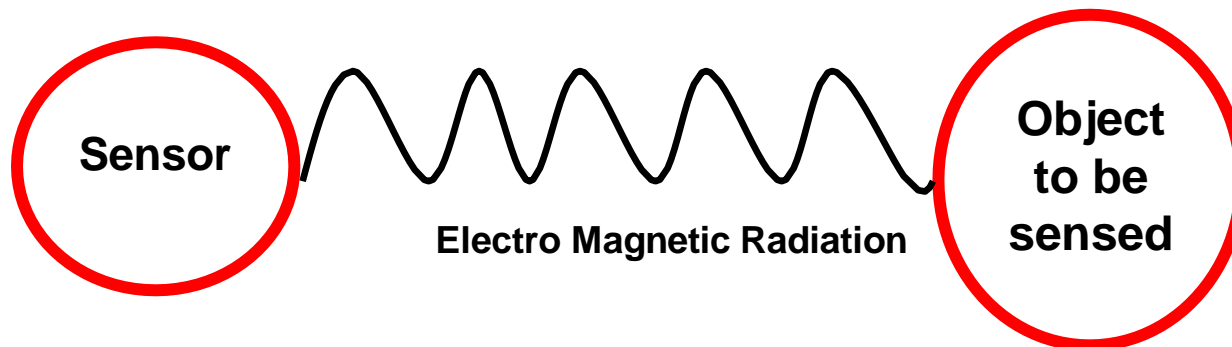
- **1.Scanning**
- **2.Characterizing**
- **3.Classification**
- **4.Identification/ Quantification**
- **5.Analysis**



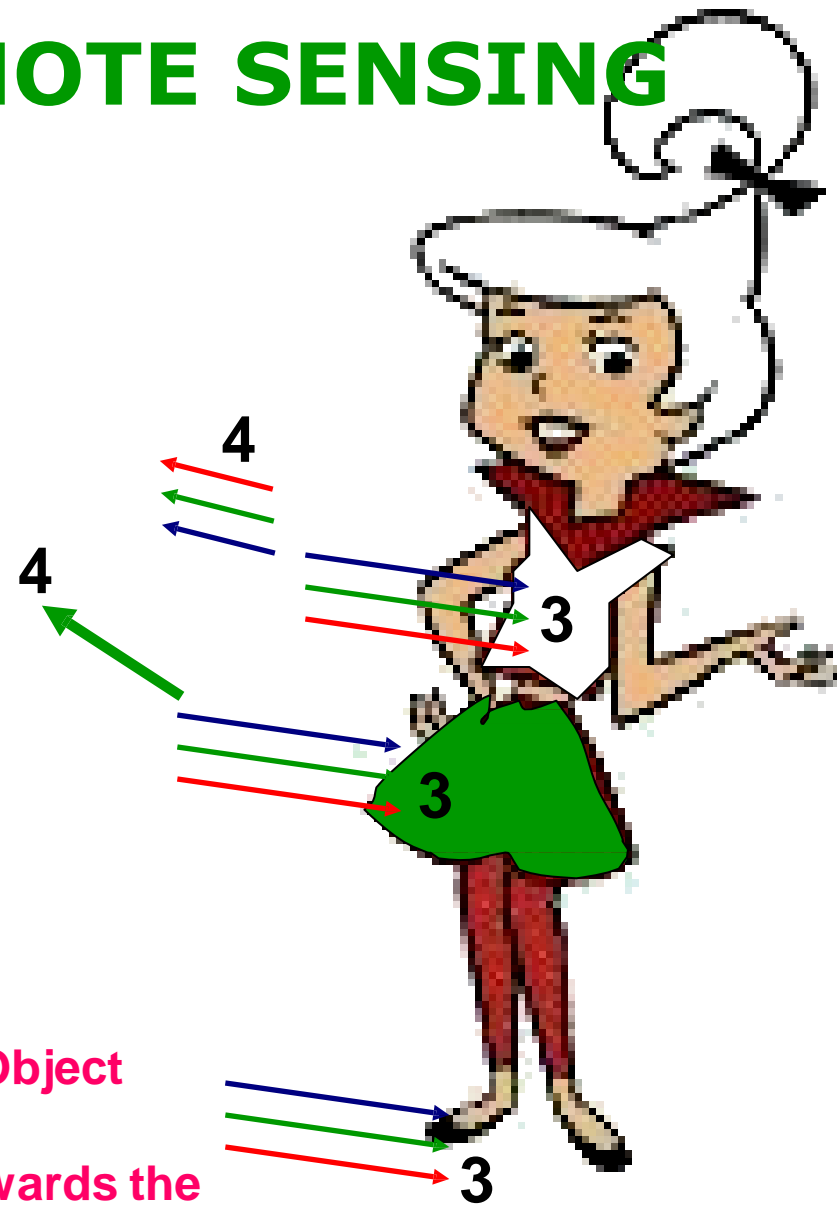
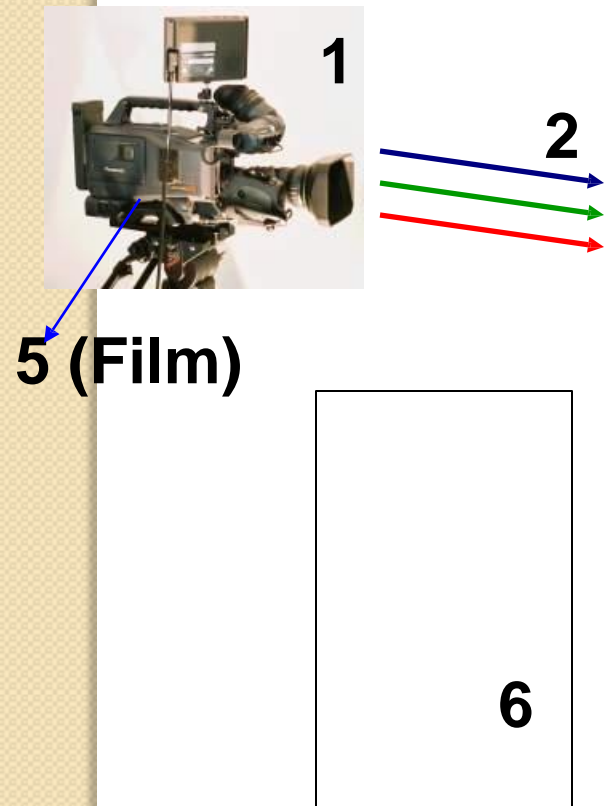
REMOTE SENSING

· "Remote sensing is the science of acquiring information about the Earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information."

Three Essential Things for Remote Sensing



SIX STAGES IN REMOTE SENSING



Stage-1. Source of energy

Stage-2. Transmission of EMR towards the Object

Stage-3. Interaction of EMR with the Object

Stage-4. Transmission of Interacted EMR towards the Sensor

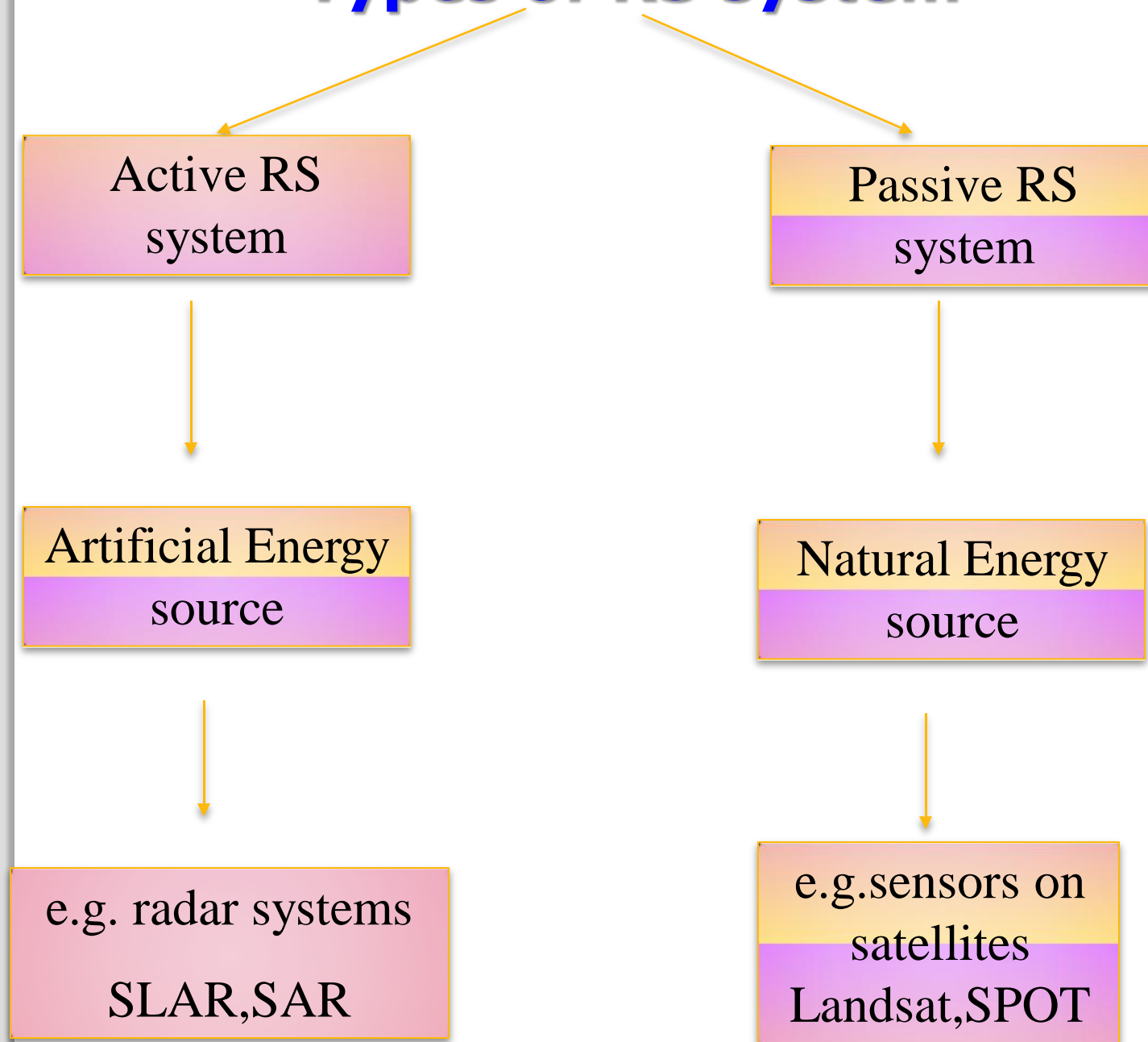
Stage-5. Recording of the Image by the Detector

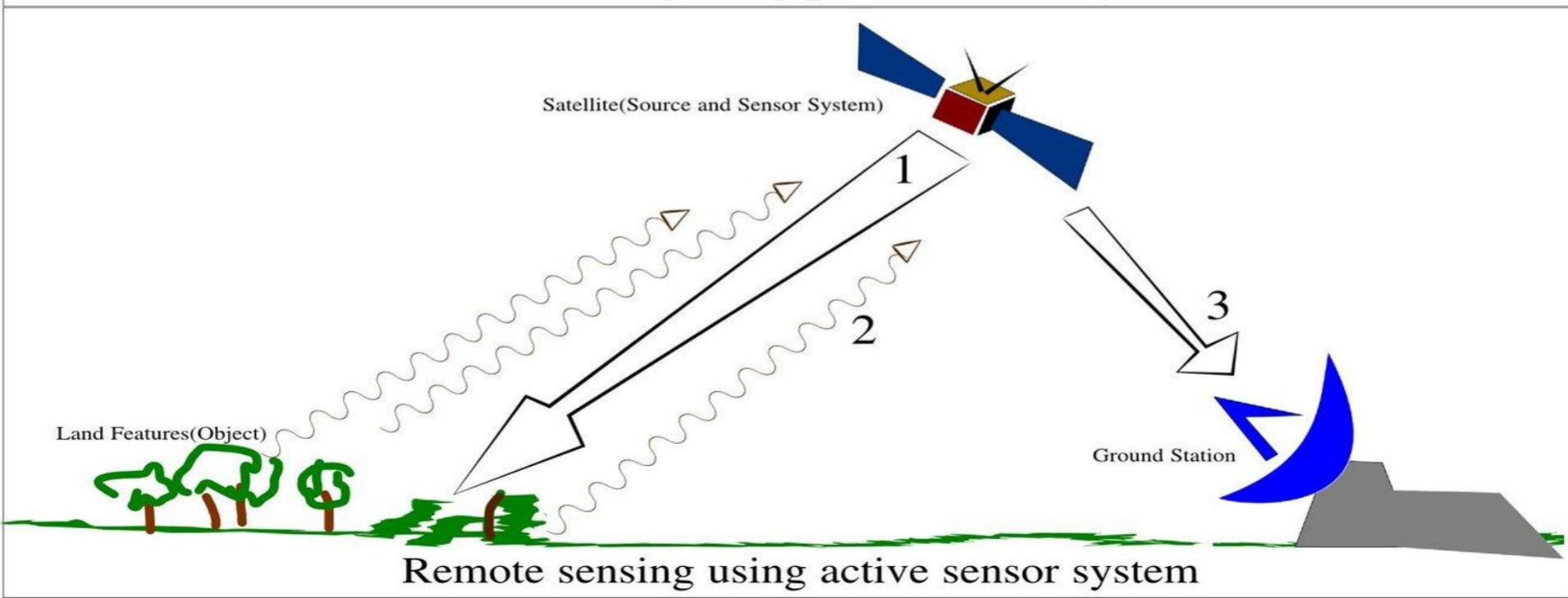
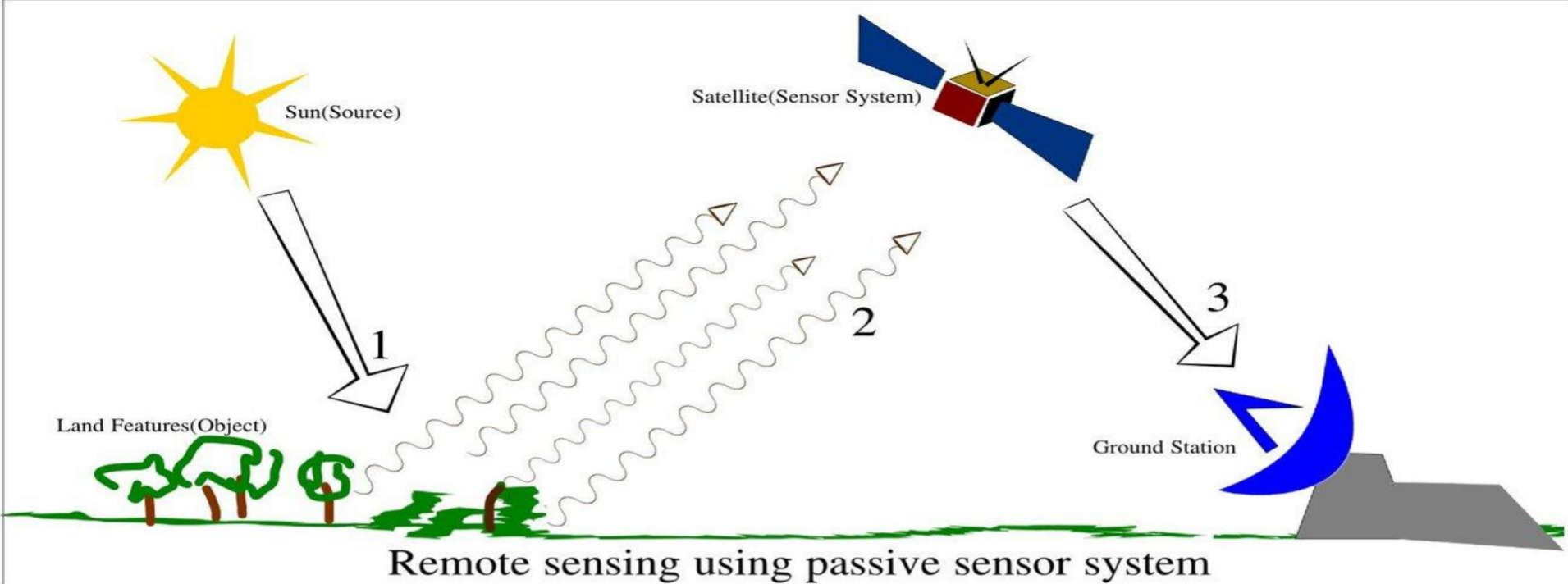
Stage-6. Analysis of the Imagery

Fundamental Principle

Most remote sensing instruments (sensors) are designed to measure photons. The fundamental principle underlying sensor operation centers on what happens in a critical component - the detector. This is the concept of the photoelectric effect. This, simply stated, says that there will be an emission of negative particles (electrons) when a negatively charged plate of some appropriate light-sensitive material is subjected to a beam of photons. The electrons can then be made to flow from the plate, collected, and counted as a signal. A key point: The magnitude of the electric current produced (number of photoelectrons per unit time) is directly proportional to the light intensity. Thus, changes in the electric current can be used to measure changes in the photons (numbers; intensity) that strike the plate (detector) during a given time interval.

Types of RS system





Sensor Detection

1. Passive Detection

- Sensors measure levels of energy that are naturally emitted, reflected, or transmitted by the target object.
- **Passive sensors** are those which detects naturally occurring energy. Most often, the source of radioactive energy is the sun.
- Detection of reflected solar energy, for example, can only proceed when the target is illuminated by the sun, thus limiting visible light sensors on satellites from being used during a nighttime pass.
- The Thematic Mapper, the primary sensor on the Landsat satellites, is a good example of a passive sensor.

2. Active detection

- ✦ Active Sensors provide their own energy source for illumination of the target by directing a burst of radiation at the target and use sensors to measure how the target interacts with the energy.
- ✦ Most often the sensor detects the reflection of the energy, measuring the angle of reflection or the amount of time it took for the energy to return.
- ✦ Active sensors provide the capability to obtain measurements anytime, regardless of the time of day or season.
- ✦ They can be used for examining energy types that are not sufficiently provided by the sun, such as microwaves, or to better control the way a target is illuminated. However, active systems require the generation of a fairly large amount of energy to adequately illuminate targets.
- ✦ *Doppler radar is an example of an active remote sensing technology.*

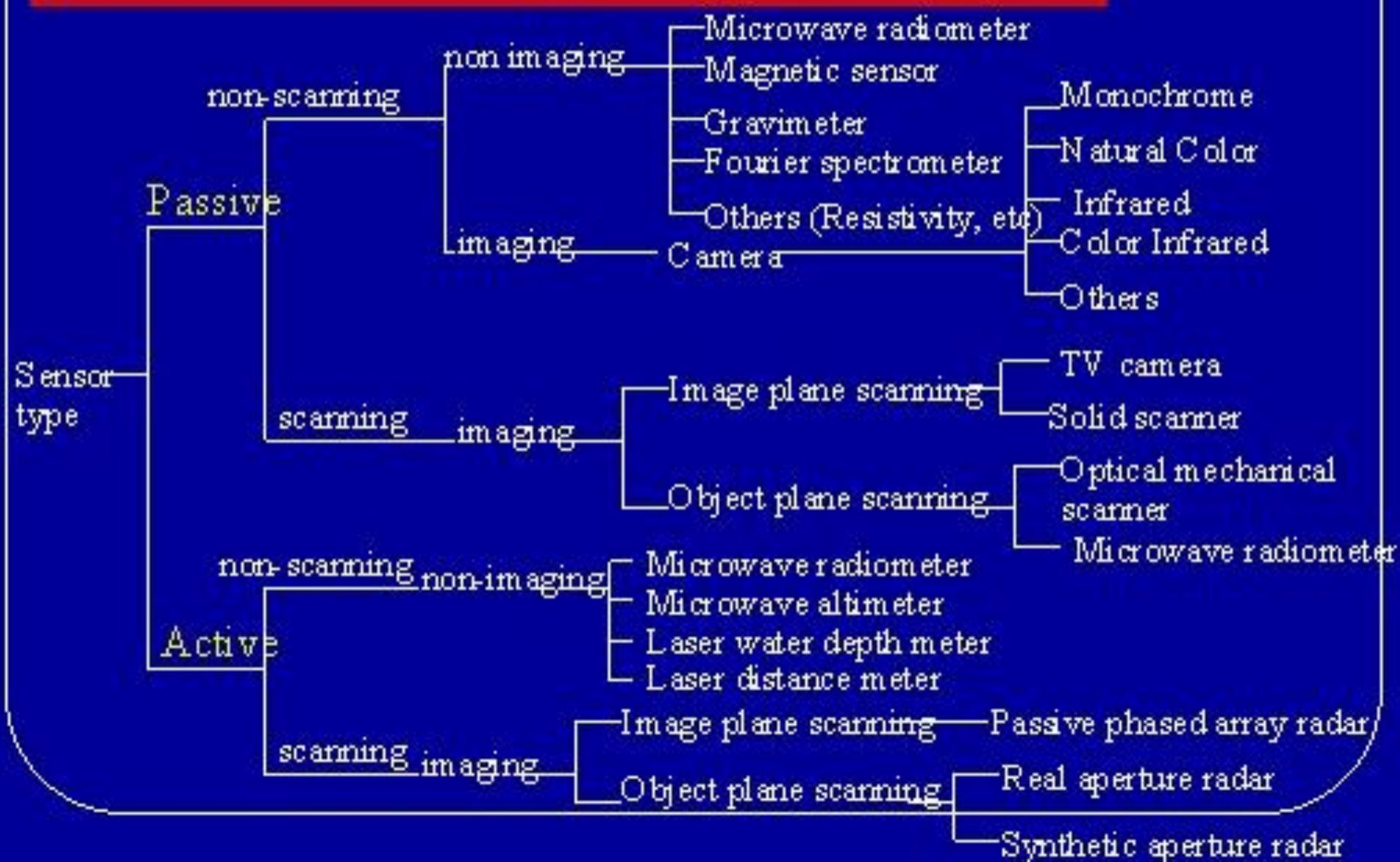
IMAGING SENSORS

- Sensors which provide output to create an image
- Eg : LISS I, LISS II, LISS III etc.

NON IMAGING SENSORS

- Sensors which provide numerical output with respect to the quantum of radiation
- Eg: Radiometer, Scatterometer etc.

There are many remote sensors



Applications of Remote Sensing

- Coastal water mapping, soil/vegetation discrimination, forest classification, man-made feature identification
- Vegetation discrimination and health monitoring, man-made feature identification
- Plant species identification, man-made feature identification
- Soil moisture monitoring, vegetation monitoring, water body discrimination
- Vegetation moisture content monitoring
- Surface temperature, vegetation stress monitoring, soil moisture monitoring, cloud differentiation, volcanic monitoring
- Mineral and rock discrimination, vegetation moisture content

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