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Dr. Bormin Huang

Space Science Engineering Center
University of Wincosin-Madison
USA

Biography

Dr. Bormin Huang has been serving as a Chair of SPIE Conference on Satellite Data Compression, Communications, and Processing since 2005, and a Chair of SPIE Europe Conference on High-Performance Computing in Remote Sensing since 2011. He is an Associate Editor of the Journal of Applied Remote Sensing (JARS), and serves, or has served, as the Guest Editor of JARS Special Section on "Satellite Data Compression", the Guest Editor of JARS Special Section on "High-Performance Computing in Applied Remote Sensing", and a Guest Editor of Special Issue on "Advances in Compression of Optical Image Data from Space" for the Journal of Electrical and Computer Engineering. He received his MSE in aerospace engineering from the University of Michigan, Ann Arbor, and his PhD in the area of satellite remote sensing from the University of Wisconsin-Madison. He is currently a research scientist and principal investigator at the Space Science and Engineering Center, the University of Wisconsin-Madison, where he advises and supports both national and international MS and PhD students and visiting scientists. He has authored and coauthored over 100 scientific and technical publications, including the Springer book "Satellite Data Compression". He has broad interest and experience in remote sensing science and technology, including satellite data compression, high-performance computing in remote sensing, remote sensing image processing, and remote sensing forward modeling and inverse problems.

Research Interest

- Satellite data compression
- High-performance computing in remote sensing
- Remote sensing image processing
- Remote sensing forward modeling
- Inverse problems

Remote Sensing

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

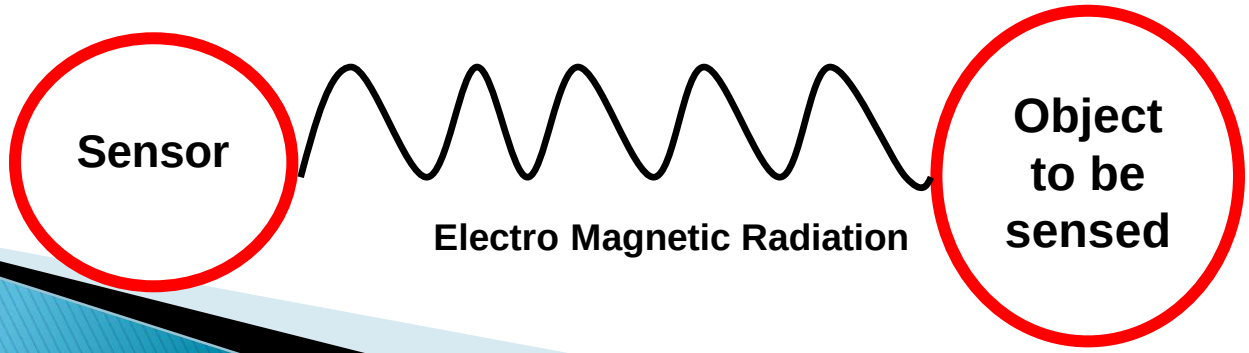
Sensing

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."

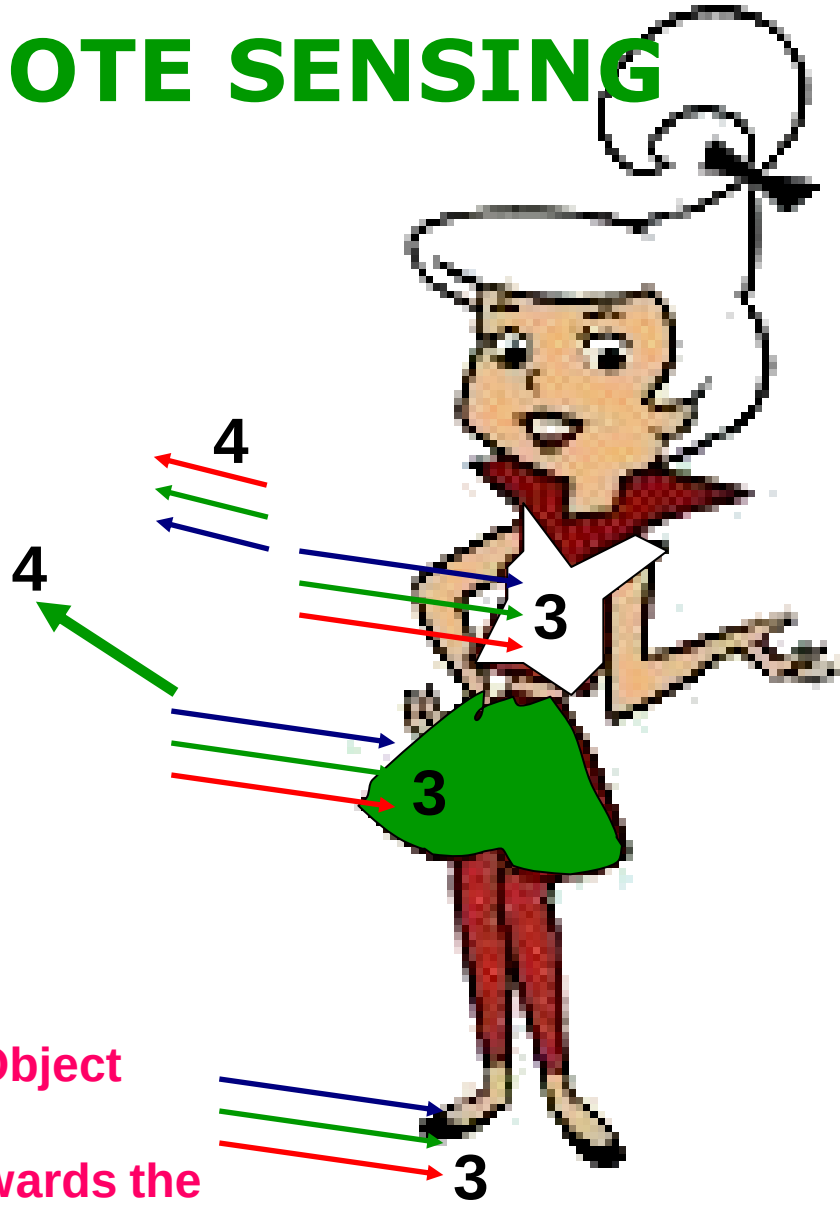
Three Essential Things for Remote Sensing



SIX STAGES IN REMOTE SENSING

2

5 (Film)

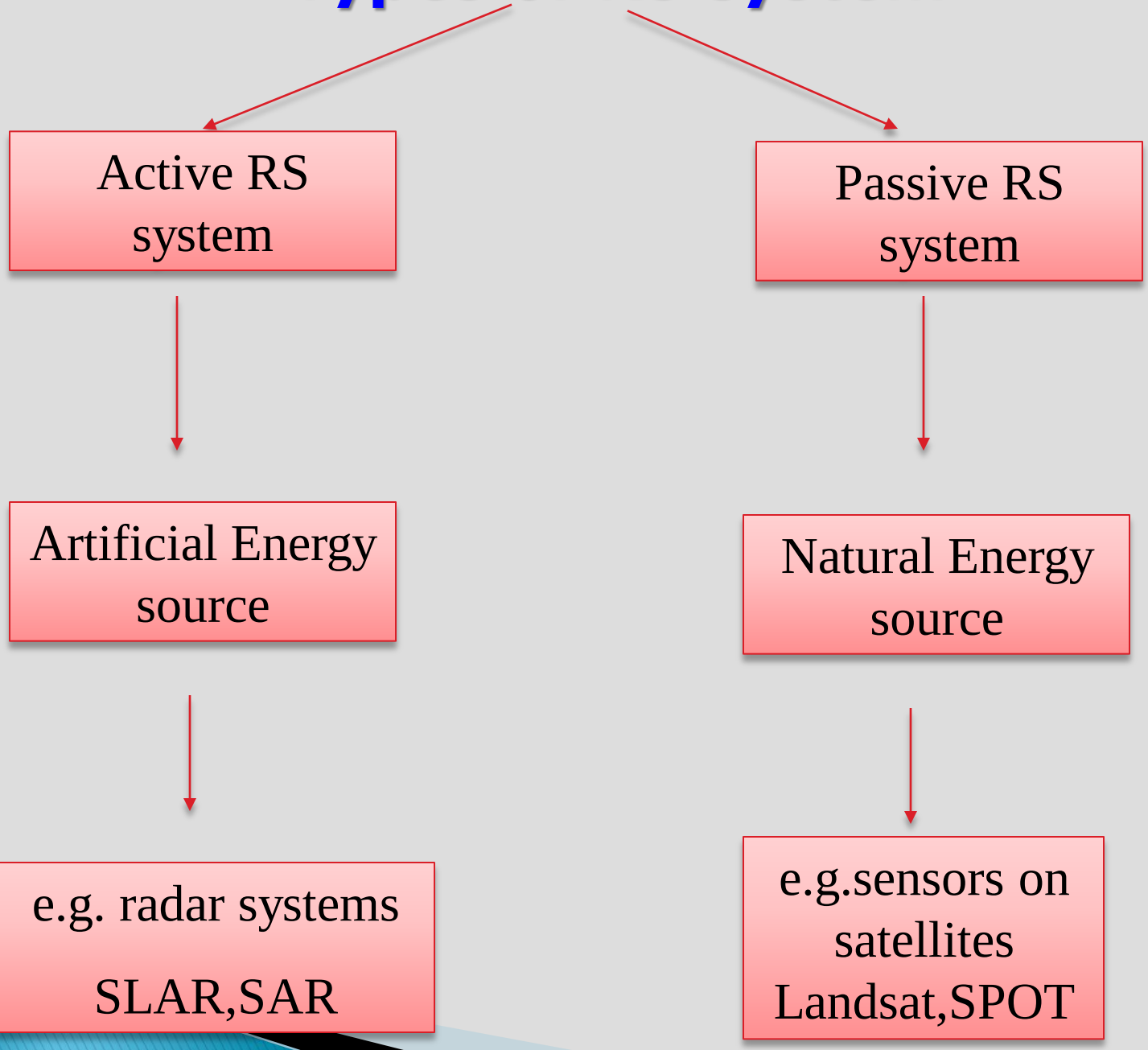


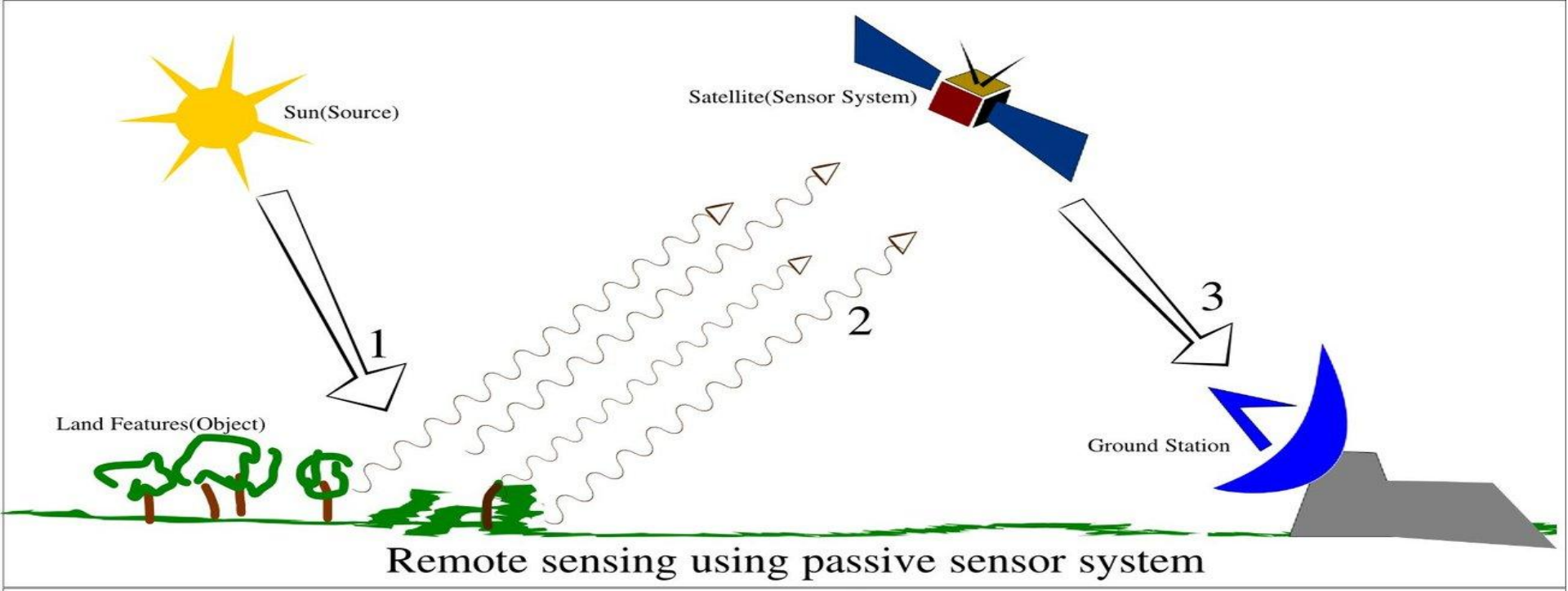
Stage-1. Source of energy
Stage-2. Transmission of EMR towards the Object
Stage-3. Interaction of EMR with the Object
Stage-4. Transmission of Interacted EMR towards the Sensor
Stage-5. Recording of the Image by the Detector
Stage-6. Analysis of the Imagery

Fundamental Principle

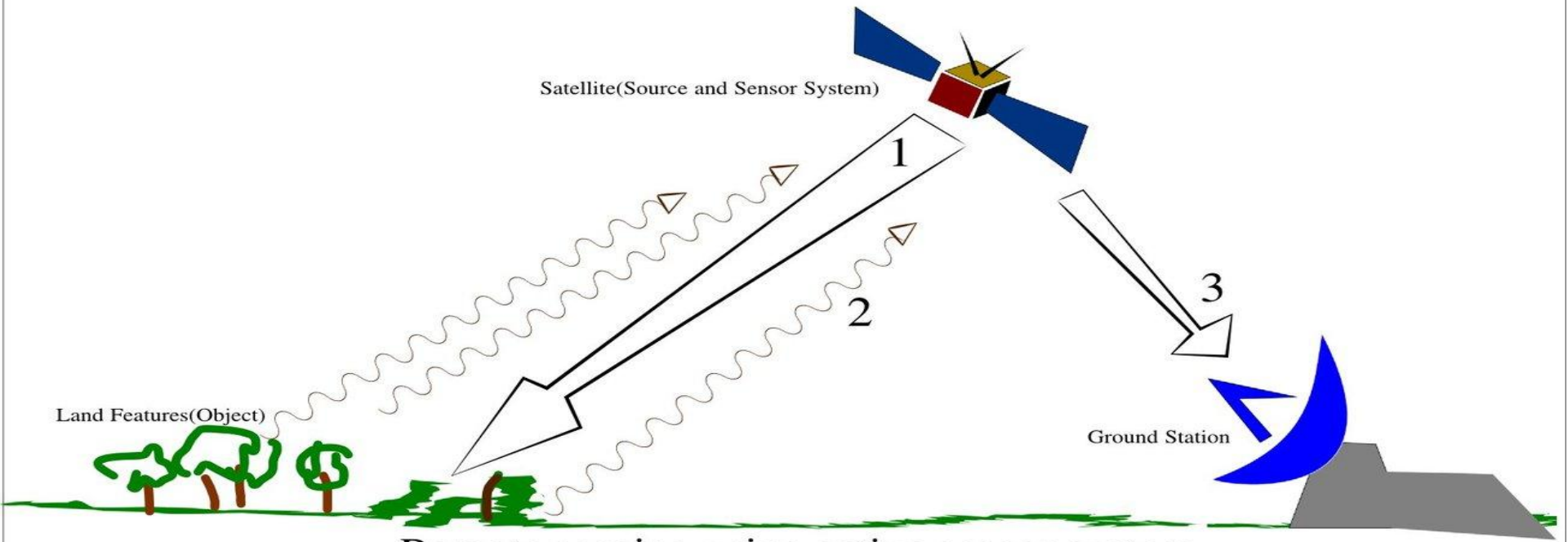
Most remote sensing instruments (sensors) are designed to measure photons. The fundamental principle underlying sensor operation centers on what happens in a critical component - the detector. This is the concept of the photoelectric effect This, simply stated, says that there will be an emission of 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





Remote sensing using passive sensor system



Remote sensing using active sensor system

Sensor Detection

1. Passive Detection

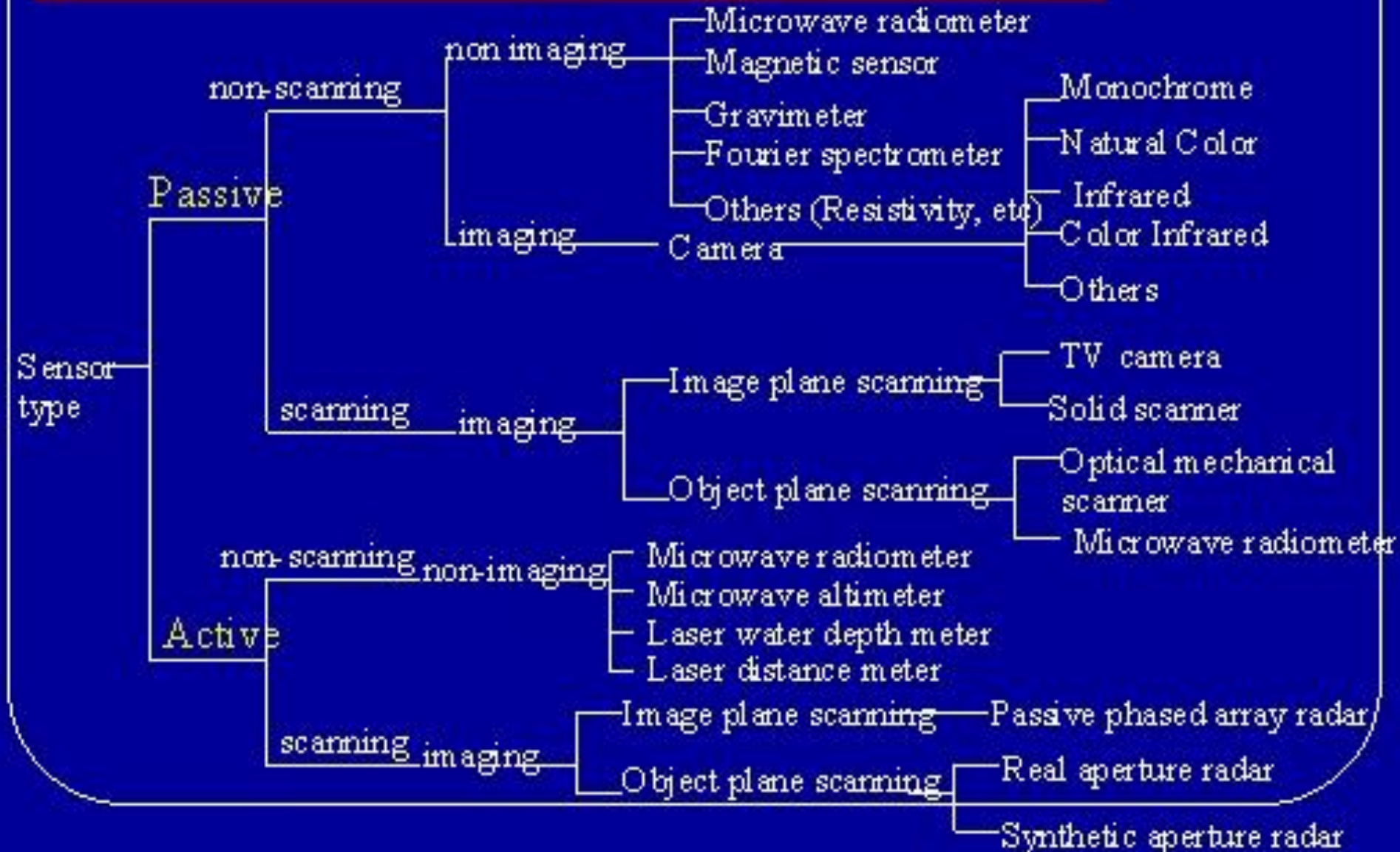
- Sensors measure levels of energy that are naturally emitted, reflected, or transmitted by the target object.
- **Passive sensors** are those which detects naturally occurring energy. Most often, the source of radioactive energy is the sun.
- Detection of reflected solar energy, for example, can only 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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Geophysics & Remote Sensing Related Journals

- *ISPRS Journal of Photogrammetry and Remote Sensing*
- *IEEE Transactions on Geoscience and Remote Sensing*
- *Applied Earth Observation and Geoinformation*
- *Photogrammetric Engineering and Remote Sensing*

Geophysics & Remote Sensing
Related Conferences

- ✓ *International Conference on Earth Science & Climate Change*
- ✓ *Asian Conference on Remote Sensing*
- ✓ *International Conference on Remote Sensing in Archaeology*
- ✓ *International Conference on Remote Sensing*
- ✓ *IEEE Conference on Aerospace and Remote Sensing Technology*

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