Types of remote sensing;

1.Active

2.Passive

Some devices:-

**Many important decisions ground on the data from RADARSAT, TerraSAR-X, SRTM, EOSDA, ERS, Sentinel, LANDSAT, among others**

**There exist two main types of remote sensing classified according to the source of signal they use to explore the object, active vs. passive. Active remote sensing instruments operate with their own source of emission or light, while passive ones rely on the reflected one. Radiation also differs by wavelengths that fall into short (visible, NIR, MIR) and long (microwave).**

**Active Remote Sensing:-**

**Each active sensor in remote sensing directs its signal to the object and then checks the response – the received quantity. The majority of devices employ microwaves since they are relatively immune to weather conditions. Active remote sensing techniques differ by what they transmit (light or waves) and what they determine (e.g., distance, height, atmospheric conditions, etc.).**

**Radar is a sensor assisting in ranging with radio signals. Its specific feature is the antenna emitting impulses. When the energy flow in radar active remote sensing meets an obstacle, it scatters back to the sensor to some degree. Based on its amount and traveling time, it is possible to estimate how far the target is.**

***Lidar* determines distance with light. Lidar active remote sensing implies transmitting light impulses and checking the quantity retrieved. The target location and distance are understood by multiplying the time by the speed of light.**

**Laser altimeter measures elevation with LIDAR.**

**Ranging instruments estimate the range either with one or two identical devices on different platforms sending signals to each other.**

**Sounder studies weather conditions vertically by emitting impulses, in case it falls to the active category.**

**Scatterometer is a specific device to measure bounced (backscattered) radiation.**

**Passive remote sensing: -**

**Passive sensors in remote sensing do not streamline energy of their own to the researched object or surface, unlike active ones. Passive remote sensing depends on natural energy (sunrays) bounced by the target. For this reason, it can be applied only with proper sunlight, otherwise there will be nothing to reflect.**

**Passive remote sensing employs multispectral or hyperspectral sensors that measure the acquired quantity with multiple band combinations. These combinations differ by the number of channels (two wavelengths and more). The scope of bands includes spectra within and beyond human vision (visible, IR, NIR, TIR, microwave).**

**Instrument names clearly identify what they measure:**

**Spectrometer distinguishes and analyzes spectral bands.**

**Radiometer determines the power of radiation emitted by the object in particular band ranges (visible, IR, microwave).**

**Spectroradiometer finds out the power of radiation in several band ranges.**

**Hyperspectral radiometer operates with the most accurate type of passive sensor that is used in remote sensing. Due to extremely high resolution, it differentiates hundreds of ultimately narrow spectral bands within visible, NIR and MIR regions.**

**Imaging radiometer scans the object or a surface to reproduce the image.**

**Sounder senses the atmospheric conditions vertically.**

**Accelerometer detects changes in speed per unit of time (e.g., linear or rotational).**

**Microwave Remote Sensing**

The classification of microwave sensing includes active and passive types and bases on the principle of either transmitting and receiving signals or receiving only. The differentiation lies in the wavelength. In this particular case, it varies from 1cm to 1m. Unlike shorter wavelengths, they break through almost any atmospheric conditions but heavy rains. Their insusceptibility to aerosols enables monitoring almost in any weather and at any time.

Passive M.R.S. - The method provides data for many branches like meteorology, hydrology, agriculture, ecology, oceanography. In particular, it enables scientists to check soil moisture, atmospheric water and ozone concentrations; to distinguish oil spills and address water pollution.

Active M.R.S. - The most typical example of such devices is radar (operating with microwaves). The basic two types of remote sensing in this category are : Imaging (two-dimensional, e.g., radars);

Non-Imaging (linear, e.g., altimeters or scatterometers).

**Data Processing Software**:

ENVI, ERDAS IMAGINE, and ArcGIS are popular tools for analyzing remote sensing data.

Open-source software like QGIS or GRASS GIS are also widely used for data processing and visualization.

PCI Geomatica (Catalyst), Trimble eCognition, Whitebox GAT, SAGA GISPolSARPro, ILWIS,

Orfeo Toolbox, Global Mapper, Feature Manipulation Engine, gvSIG

**Sensor Key Parameters**:

Spatial Resolution: Refers to the level of detail, or how small a feature the sensor can detect. Determined by the shape, size and texture of the target.

Spectral Resolution: The ability to distinguish between different wavelengths or bands of the electromagnetic spectrum. Changes as a function of wavelength.

Temporal Resolution: How often a sensor revisits the same location, critical for monitoring changes over time. Diurnal or/and seasonal changes in reflectance.

Radiometric/Polarisation Resolution: Refers to the sensor's ability to detect subtle differences in energy levels (brightness). Caused by the degree of polarisation.