INTRODUCTION

Remote sensing is broadly defined as science and art of collecting information about objects, area or phenomena from distance without being in physical contact with them. In the present context, the definition of remote sensing is restricted to mean the process of acquiring information about any object without physically contacting it in any way regardless of whether the observer is immediately adjacent to the object or millions of miles away. Human eye is perhaps the most familiar example of a remote sensing system. In fact, sight, smell and hearing are all rudimentary forms of remote sensing. However, the term remote sensing is restricted to methods that employ electromagnetic energy (such as light, heat, microwave) as means of detecting and measuring target characteristics. Air craft and satellites are the common *platforms* used for remote sensing. Collection of data is usually carried out by highly sophisticated *sensors* (i.e. camera, multispectral scanner, radar etc.). The information carrier, or communication link is the electromagnetic energy. Remote sensing data basically consists of wave length intensity information by collecting the electromagnetic radiation leaving the object at specific wavelength and measuring its intensity. Photo interpretation can at best be considered as the *primitive form* of remote sensing. Most of the modern remote sensing methods make use of the reflected infrared bands, thermal infrared bands and microwave portion of the electromagnetic spectrum.

Classification of remote sensing

Remote sensing is broadly classified into two categories

(*i*) Passive remote sensing and (*ii*) Active remote sensing

Passive remote sensing : It uses sun as a source of EM energy and records the energy that is naturally radiated and/or reflected from the objects.

Active remove sensing : It uses its own source of EM energy, which is directed towards the object and return energy is measured.

HISTORICAL SKETCH OF REMOTE SENSING

Remote sensing became possible with the invention of camera in the nineteenth century. Astronomy was one of the first fields of science to exploit this technique. Although, it was during the first World War that free flying aircrafts were used in a remote sensing role, but the use of remote sensing for environmental assessment really became established after the second World War. It not only proved the value of aerial photography in land

reconnaissance and mapping. but had also driven technological advances in air borne camera design. film characteristics and photogrammetic analysis.

However, upto early 1960's air borne missions were one of the expensive surveys, providing data for relatively small area at a single instant of time. Moreover, all the photographs were black and white. Colour photography came into existence after the invention of infrared films in 1950. From about 1960, remote sensing underwent a major development when it extended to space and sensors began to be placed in space. From 1970's started the new era of remote sensing. The first designated earth resources satellite was launched in July 1972, originally named as ERTS-1 which is now referred as Landstat-1. It was designed to acquire data from earth surface as systematic, repetitive and multi-spectral basic. The first Radar remote sensing satellite, SEASAT, was launched in 1978.

Prior to mid 1980's, the majority of satellites had been deployed by USA and USSR. France launched first of SPOT series in 1985 and in 1988, first Indian Remote Sensing Satellite (IRS-1A) was put into orbit. Satellites launched by Japan include JERS (Japanese Earth Resources Satellite) and MOS (Marine Observation Satellite). Radar satellites have been launched in 1991 and 1995 by European Consortium (ERS) and by Canada in 1995 (RADARSAT).

IDEALIZED REMOTE SENSING SYSTEM

An idealised remote sensing system consists of the following stages :

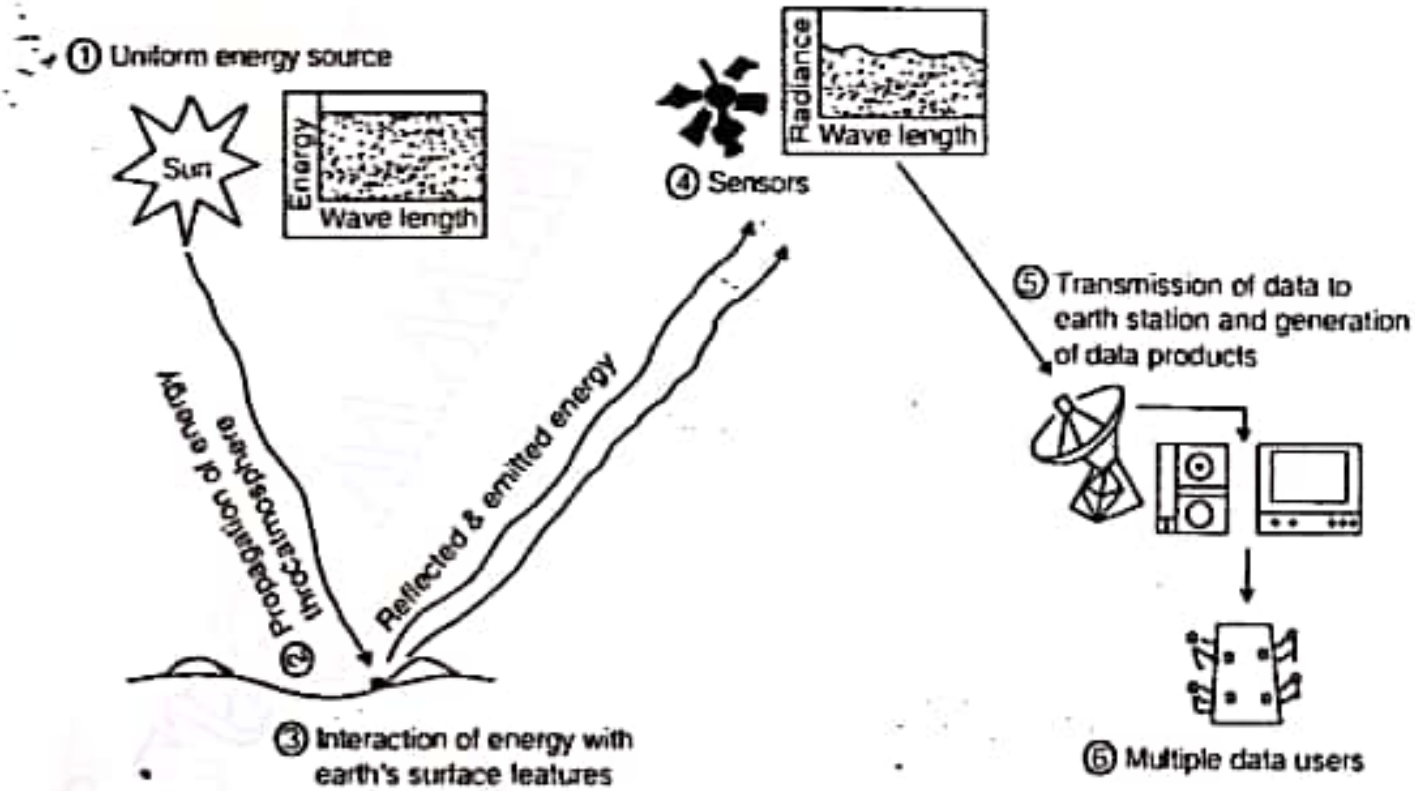
1. Energy source
2. Propagation of energy through atmosphere
3. Energy interaction with earth's surface features.
4. Airborne/space borne sensors receiving the reflected and emitted energy
5. Transmission of data to earth station and generation of data produce.
6. Multiple-data users

1. The energy source : The uniform energy source provides energy over all wave lengths. The passive RS system relies on sun as the strongest source of EM energy and measures energy that is either reflected and or emitted from the earth's surface features. However, active RS systems use their own source of EM energy.

2. Propagation of energy from the atmosphere : The EM energy, from the source pass through the atmosphere on its way to earth's surface. Also, after reflection from the earth's surface, it again pass through the atmosphere on its way to sensor. The atmosphere modifies the wave length and spectral distribution of energy to some extent, and this modification varies particularly with the wave length.

3. Interaction of energy with surface features of the earth : The interaction of EM energy, with earth's surface features generates reflected and/or emitted *signals* (spectral response patterns or signatures). The spectral response patterns play a central role in detection, identification and analysis of earth's surface material.

4. Air borne/space borne sensors : Sensors are electromagnetic instruments designed to receive and record retransmitted energy. They are mounted on satellites, aeroplanes or even balloons. The sensors are highly sensitive to wave lengths, yielding data on the absolute brightness from the object as a function of wavelength.



IDEALISED REMOTE SENSING SYSTEM

5. Transmission of data to earth station and data product generation : The data from the sensing system is transmitted to the ground based earth station along with the telemetry data. The real-time (instantaneous) data handling system consists of high density data tapes for recording and visual devices (such as television) for quick look displays. The *data products* are mainly classified into two categories :

(*i*) Pictorial or Photographic product (analogue)

and (*ii*) Digital product

6. Multiple data users : The multiple data users are those who have knowledge of great depth, both of their respective disciplines as well as of remote sensing data and analysis techniques. The same set of *data* becomes various forms of *information* for different users with the understanding of their field and interpretation skills.