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Department of Computer Applications

BITS N BYTES

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Principal's Message

Remote sensing technologies guided by satellite imagery have emerged as an important new source of data for environmental applications over the past few years. Technological improvements in sensors and their platforms provided a major impetus for the use of hyper spectral applications in many fields such as geology, agriculture, water quality, forestry, urban, biodiversity, and so forth.

I am happy that our Department of Computer Applications is bringing up this new issue of Bits N Bytes focused on Remote Sensing. Through this electronic platform our students and teachers of Computer Applications can express their views and ideas in this emerging field that could benefit society at large.

I congratulate Asst. Prof Mildred Lemos and all who have contributed to Bits N Bytes.

I hope and wish Bits N Bytes will inspire and ignite many minds.

Assoc. Prof. Helic Barreto
Acting Principal

What is Remote Sensing ?

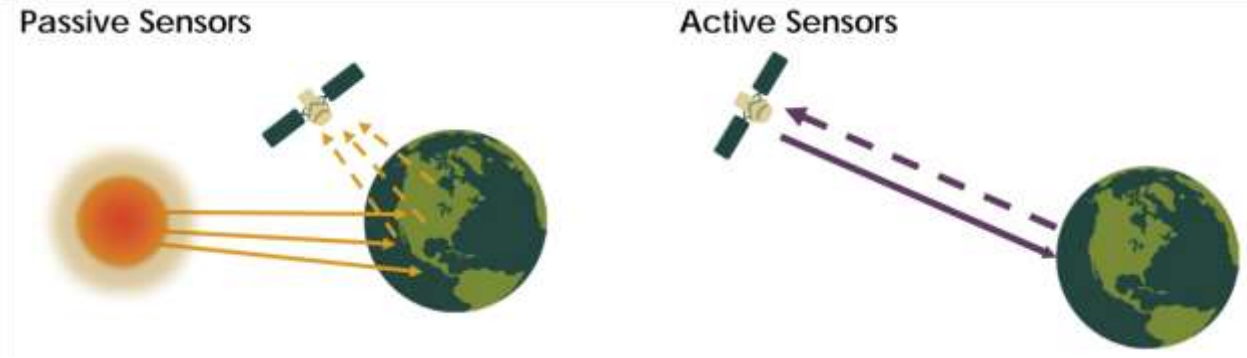
- **Asst. Prof. Mildred Lemos**

Remote means something which is not exactly in contact or physical contact, Sensing refers to getting a data value like temperature, pressure, photographs etc.

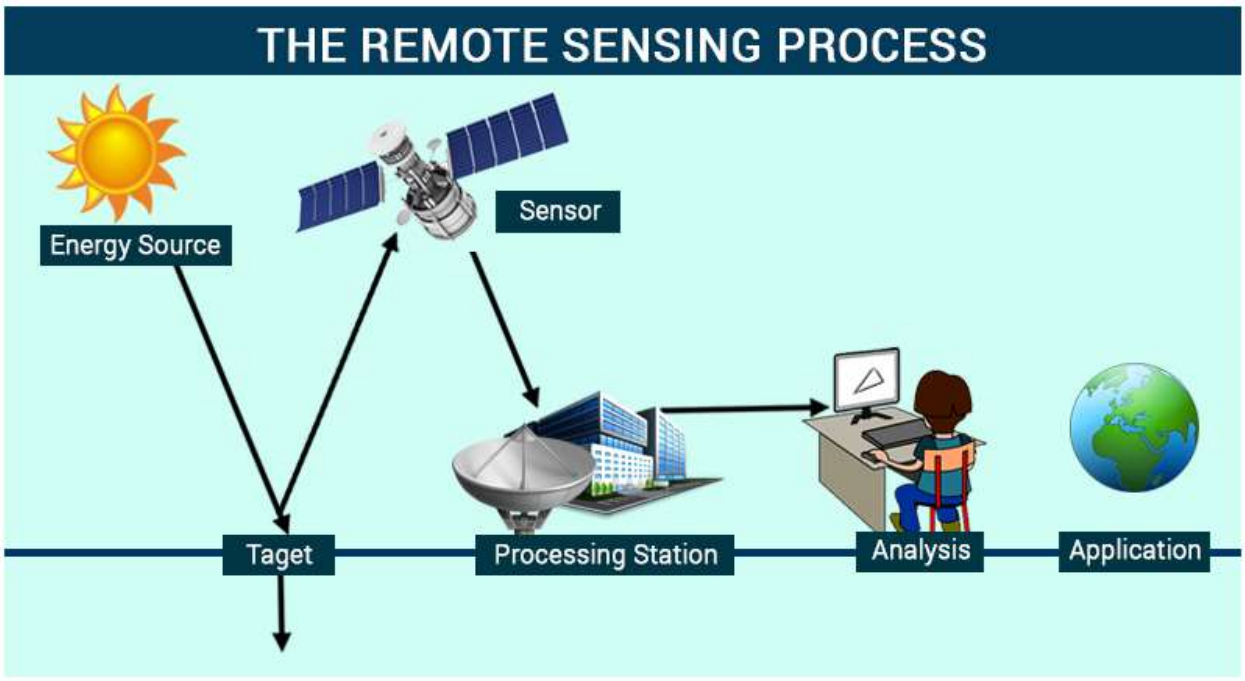
Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation from a distance. Special cameras are used to collect these remotely sensed images, which researchers then use to "sense" things about the Earth.

Today, there are nearly 6,000 satellites circling our tiny planet. About 60% of these are defunct satellites—space junk—and roughly 40% are operational.

Sensors, or instruments, onboard satellites and aircraft use the sun as a source of illumination or provide their own source of illumination, measuring the energy that is reflected back. Sensors that use natural energy from the sun are called passive sensors while those that provide their own source of energy are called active sensors.



The remote sensing technology makes it possible to collect data of dangerous or inaccessible areas and have replaced costly and slow data methods on the ground, ensuring that areas or objects are not disturbed.



The remote sensing process involves an interaction between incident radiation from an energy source and the targets of interest.

The first requirement is to have an energy source which illuminates or provides electromagnetic energy to the target of interest. Once the energy makes its way to the target through the atmosphere, it interacts with the target depending on the properties of both the target and the radiation.

A remote sensor then collects the energy that is emitted from the target, the energy recorded by the sensor is transmitted to a receiving and processing station where the data is processed into an image. The processed image is then interpreted to extract information about the target that was illuminated.

The information extracted from the imagery can then be used to better understand the target, reveal some new information about it, or assist in solving a particular problem.

The Remote Sensing technology is used in numerous fields like geography, hydrology, ecology, oceanography, glaciology, geology.

Some of the applications of remote sensing are :

- Analyzing the condition of rural roads
- Providing a base map for graphical reference and assisting planners and engineers
- Detecting land use and land cover
- Observing climate changes
- Identifying crop conditions
- Increasing precision in farming
- Determining the soil moisture content
- Tracking clouds to help predict the weather
- Tracking the growth of a city and changes in farmland , forests and coastlines over several years or decades.
- Discovery and mapping of the rugged topography of the ocean floor (e.g., huge mountain ranges, deep canyons, and the “magnetic striping” on the ocean floor).

Applications of Remote Sensing and GIS in Agriculture

- **Asst. Prof. Rajlakshmi Metri**

Agriculture is the backbone of the economic system of a given country. In addition to providing food, agriculture also provides employment opportunities to a very large percentage of the population.

It is estimated that the current world population of 7.8 billion is expected to reach 9.6 billion people by 2050. This growth in population indicates that the food production must increase to meet the global food demand. Therefore serious measures are required in the agriculture sector to ensure that our food system is ready to meet the challenges of the growing population.

Amidst the pressure to offer food security to the growing world population, the agriculture sector also faces numerous challenges like changes in climatic conditions, impact of global warming, changing rainfall patterns, soil degradation and water quality degradation. Such factors have a diverse impact on agriculture as the farmers will not be able to have a clear picture of what to expect in terms of climate, as well as what inputs are needed for optimum output in crop yield. This implies that farmers require effective prediction of various aspects such as crop yield and development, rainfall predictions, changes in soil quality

and atmospheric conditions.

As it is known that technology has benefited every sector, and so has also played a vital role in improving agriculture. The rapidly emerging technology of Remote

Sensing (RS) and Geographical Information System (GIS) provides reliable information of natural and man-made features, or processed and interpreted phenomenon, occurring over the earth's surface without making any physical contact.

Remote sensing along with the other advanced techniques such as global positioning systems (GPS) and geographical information systems (GIS) provides numerous applications in the field of agriculture GIS systems can map current and future fluctuations in precipitation, temperature, crop yield, soil moisture and many more. By mapping geographic and geologic features of current and potential farmland, scientists and farmers can work together to create more effective and efficient farming techniques to increase crop production.

Some of the major applications of Remote Sensing and GIS in agriculture :

Crop production forecasting: Forecasting the expected crop yield over a given area and determining how much of the crop will be harvested under specific conditions is possible using remote sensing. Researchers can be able to predict the quantity of crop that will be produced in a given farmland over a given period of time. This will enable planners and decision makers to plan for import in case of shortfall or to export in case of surplus.

Crop Damage Assessment: Crops do not grow evenly all over a field due to factors such as differences in soil nutrition, lack of moisture, pest infestation, weeds and other stresses. And therefore crop productivity may vary from one area of the field to the other. Remote sensing can aid in early detection of crops affected by such conditions such that appropriate measures can be implemented to improve the health of crop.

Soil moisture Estimation: Sufficient levels of soil moisture is an important condition for proper plant formation and has a direct impact on the crop yield. Crops will not grow and develop with inadequate soil moisture which will result in low crop yield. Soil moisture data are also required for reservoir management, early warning of droughts and irrigation scheduling. Remote sensing and GIS techniques provide reliable alternatives to traditional methods and can cover vast areas and provide information about the spatiotemporal variations of

Soil moisture content. This helps in determining the quantity of moisture in the soil and hence the type of crop that can be grown in that soil.

Precision farming: Precision farming is an emerging agricultural technology that utilizes ultra-modern technologies like Global Positioning Systems (GPS), Geographic Information Systems (GIS), and Variable Rate Technology (VRT), Optical satellite imagery and Satellite Imagery and Aerial Imagery. Such tools manages each crop input on a site-specific basis to reduce waste, increase profits, and maintain the quality of the environment while minimizing certain factors such as the amount of pesticides, fertilizers, land-use, and other costs.

Droughts & Floods Assessment & Monitoring: Droughts and floods are water-related natural disasters which affect a wide range of activities related to agriculture. The information derived from Remote Sensing and GIS technology provides tremendous potential for prediction and risk zone identification of a farm, monitoring and preparation of contingency plans that can be taken up and assessment of damage assessment and relief management in case of drought and flood.

The Remote Sensing and GIS technologies significantly contributes in all the major activities of the agricultural sector for visualization, monitoring and management and thereby helps maintaining the sustainability of the agricultural systems and improving the economic growth of the country. These technologies provides new insights into the dynamics of the natural environment - but at the end of the day, it is how these technologies can be used which decides its value.

Implementing these technologies in agriculture will help to maintain the sustainability of the agricultural systems and improves the economic growth of the country.