

An Overview Of Remote Sensing And its Applications

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Remote Sensing is an exciting and upcoming area of technology for scientists as well as for students seeking job opportunities. Remote sensing is the science of collecting data regarding an object or a phenomenon without any physical contact with the object and obtaining information from a distance, typically from aircraft or satellites. Remote sensors collect data by detecting the energy that is reflected from Earth. These sensors can be on satellites or mounted on aircraft.

Stages In Remote Sensing

Following are the basic processes that help in the collection of information about the properties of the objects and phenomena of the earth surface:

- (a) Source of Energy (sun/self-emission)
- (b) Transmission of energy from the source to the surface of the earth
- (c) Interaction of energy with the earth's surface
- (d) Propagation of reflected/emitted energy through atmosphere
- (e) Detection of the reflected/emitted energy by the sensor
- (f) Conversion of energy received into photographic/digital form of data
- (g) Extraction of the information contents from the data products
- (h) Conversion of information into Map/Tabular forms

Remote sensing technique has emerged as an effective tool for systematic survey, analysis, and better management of natural resources (land, soil, water, forests, mountains) along with the monitoring of desertification, flood, drought, and landform change. Some major fields where remote sensing is used are Forestry, Agriculture, Surface changes, Biodiversity and Weather forecasting etc. Here we are going to discuss the applications of remote sensing in Bio-Sciences.

Applications Of Remote Sensing In Bio-Sciences

1. Monitoring of Forests

Remote sensors are powerful tools for monitoring and conserving forested areas. On-site observation of forested areas is not possible because of wild animals and thick bushes, and therefore remote sensing technique provides an alternative method of monitoring these areas. The sensors are placed above the targeted area and are used to monitor activities in those areas.

2.ManagementOfNaturalResources

Natural resources are valuable, and thus they are prone to theft and misuse. Remote sensing technique is used to reverse these activities. The satellite sensor records all the ongoing activities within the site, which greatly helps to minimize cases related to misuse and theft.

3. Protecting Water Source And Course

The government and community put up various measures to protect the water bodies. However, these rules and measures may not be followed since there is no on-site observation, and this poses a great challenge in protecting water bodies and their course. Remote sensing technique, allows monitoring of water bodies so that government can take actions against these illegal activities.

4. Air And Water Quality

In Environmental Science, water and air are the most fundamental things, and thus their safety should be maintained. The remote sensing detects the cause of pollution and provides relevant information that can be used to maintain the quality of air and water.

5.EnvironmentalPreservation

Remote sensing technique is widely used to protect and preserve the environment by providing information that may be used in decision making to save the environment.

6.DetectingPhysicalCharacteristics

Sensors can detect the physical characteristics of an area by measuring its reflected and emitted radiation. This helps in documenting the history of a given area or region as the researchers can predict and sense things in that area.

7. Controlling Natural Disasters

Natural disasters are a great threat to the mankind as well as to the environment, and thus they need to be curbed and be controlled. The remote sensing technique is a powerful tool for controlling and handling fires, drought, desertification, etc. For example, during a forest fire outbreak, remote sensors such as satellite sensors are used to map a larger space, and thus allowing rangers to see the area affected by the fire.

8. Weather Prediction

Satellites sensors have proved to be effective in predicting weather conditions. Also, sensors can track erupting volcanoes, which may help relocate people around the volcanic mountain.

9.ManagementOfInfrastructure

Infrastructure such as roads is a component of the environment also, and thus there is a need to maintain them. It is not easy for traffic police to detect traffic problems in all areas; this introduces the remote sensing technique. Satellite sensors record and take images that may be used to analyze the roads and infrastructure.

10. Urban Planning

To avoid a congested environment, proper planning is needed. However, this can be achieved by knowing the present state of the area to be managed. An image of the total area covered by the urban is needed, and this is where the remote sensing technique chips in and takes images used in the planning process.

11. Researching Tool

During research in environmental science, methods that are capable of capturing maximum data are preferred. The remote sensing technique is more preferable as compared to other methods since it can cover a wide area at the same time.

12. Resource Exploration

During the exploration of natural resources, remote sensing is a helpful tool. It is used to locate quarrying sites and update existing geological maps. The technique is also used to identify new mining sites and in locating fuels deposits.

13. Land Mapping

In environmental science, land use mapping is necessary. The remote sensing technique is used to take an image on the earth's surface, and the images are further used to monitor changes in land use and update land and roads map. It equips planners and administrators with the relevant information needed in the development of the area.

14. Environmental Study

During the study of the environment and its surrounding, remote sensing is helpful in detecting the cause of deforestation, volcanoes, pollutions, desertification, landslides, and other natural hazards. Important information is deduced from this study and may later be used to prevent the occurrence of another natural hazard.

15. Habitat Conservation

Some vegetation in the environment needs to be protected from animals and also humans. Remote sensing technique may be helpful in recording all the activities taking place around the protected area and hence maintaining their safety.

16. Source Of Information

Remote sensing technology may be a vital source of information to any study related to the environment. Recorded images and videos by sensors may be used in environmental analysis as they contain information of the wide area.

17. Applications In Marine Ecosystems

Sea Surface Temperature

Most industries use seawater as cooling water. When the water used as a coolant returns to the natural environment at a higher temperature, temperature changes reduce oxygen and affect the marine ecosystem. Remote sensing assessment helps in this area.

Viewing Ocean Floor

Sensors can be used to take images of the Deep Ocean without needing to travel underwater. This application of remote sensors has greatly led to increased study, discovery, and mapping of the ocean floor's topography, thus easing Oceanography (study of the ocean).

Coral Reef

Coral reefs are formed by living coral polyps and calcareous algae that grow at sea levels between 77 and 86 degrees Fahrenheit with normal salinity. Coral reefs act as feeding, reproductive, breeding, and aquatic habitats for many oceanic organisms, so the density and distribution of corals alter the populations of fish and other organisms. The advantages of remote sensing systems in this area are the ability to survey the area on a large scale, continuous monitoring and the ability to check the system ecosystem in remote areas without direct contact with it.

Mangrove Forest

Mangrove forests are tropical and subtropical ecosystems that grow on the margins of two different environments, sea and land. These forests play an essential role in ecology and are considered as carbon reserves. Due to their location in the tropics, they are prone to hiding under clouds, so a reliable monitoring tool is essential to measure deforestation. Radar remote sensing has been shown to be useful in distinguishing mangrove cover from other ground cover due to its long wavelengths that can penetrate the cloud.

Ocean Colour

The colour of the ocean is a unique property for water. Mapping and understanding ocean colour changes can help monitor water quality and identify natural and human contaminants (oil slicks and algae blooms) that are dangerous to aquaculture and even to humans. Remote sensing optical data can detect targets such as suspended sediments, algal blooms, chlorophyll-A, and oil slicks at various scales

Career Opportunities In Remote Sensing

Remote sensing specialists may be hired as geographers, cartographers, physical scientists, computer scientists, GIS analysts, remote sensing scientists, surveyors, photogrammetrists (who create maps from air and satellite photos), image analysts, or other professionals.

The Indian Institute Of Remote Sensing (IIRS) is a constituent unit of Indian Space Research Organisation (ISRO), Department of Space, Govt. of India. IIRS offers various courses, trainings and capacity building programs in Remote Sensing & GIS, geospatial technology and its

applications etc. The training, education and capacity building programmes of the Institute are designed to meet the requirements of fresh graduates, researchers, academia, professionals at working levels and decision makers. For detailed information, the website <https://www.iirs.gov.in/> may be consulted.

Suggested Readings

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