e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:07/Issue:04/April-2025 Impact Factor- 8.187 www.irjmets.com

REMOTE SENSING AND GIS AND ITS APPLICATION

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ABSTRACT

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. It provides a vast scope to explore, identify, and analyse the natural resources of undeveloped regions. It documents the dynamic changes in physical processes and resulting landforms, usually by satellite images. A geographic information system (GIS) consists of integrated computer hardware and software that store, manage, analyze, edit, output, and visualize geographic data. Much of this often happens within a spatial database, however, this is not essential to meet the definition of a GIS. This paper provides a general overview of remote sensing and GIS and their applications.

Keywords: Remote Sensing, GIS, Application

I. INTRODUCTION

The term "remote sensing," first used in the United States in the 1950s by Ms. Evelyn Pruitt of the U.S. Office of Naval Research, is now commonly used to describe the science and art of identifying, observing, and measuring an object without coming into direct contact with it.

Remote sensing means acquiring information of things from a distance with sensors. (without touching the things) Sensors are like simple cameras except that they not only use visible light but also other bands of the electromagnetic spectrum such as infrared, microwaves and ultraviolet regions.

GIS (Geographic Information System), are computer-based tools used to store, visualize, analyze, and interpret geographic data. Geographic data (also called spatial, or geospatial data) identifies the geographic location of features.

This paper focuses on a particular research tool for geographic research known as remote sensing and GIS and applications of both in general and civil engineering filed.

II. METHODOLOGY

1. Remote Sensing

This principle underpins remote sensing, which detects and records the radiant energy for further study. Different objects and surfaces, like water, soil, or plants, return energy in different electromagnetic bands in different quantities.

There are two types of remote sensing instruments - passive and active. Passive instruments detect natural energy that is reflected or emitted from the observed scene. Passive instruments sense only radiation emitted by the object being viewed or reflected by the object from a source other than the instrument.

Remote Sensing Techniques

Active Sensors. LiDAR. Radar. InSAR. PSInSAR. SAR. SRT. SqueeSAR.

Passive Sensors. Aerial Photography. FLIR. Geodetic Survey. Hyperspectral Imaging. Long- Wave Infrared. Multispectral Imaging. Near Infrared Surveys. Oblique Aerial & Ground Visible Band & Thermographic Imaging. Radiometrics. SWIR.

- Components Of Remote Sensing.

1. Energy Source or Illumination.
2. Interaction with the Target.
3. Recording of Energy by the Sensor.

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4. Transmission, Reception, and Processing.
5. Interpretation and Analysis.

- General application of Remote sensing

1. Agriculture
2. Forestry
3. Geology
4. Hydrology data
5. Sea ice monitoring for avoid pollution and controlling
6. Land cover and Land
7. Mapping- planetary, digital elevation model topographic model
8. Oceans and Coastal Monitoring

Remote Sensing offer a wide area of applications in the domain of civil engineering covering the main fields of interest of a civil engineer as: regional planning and urban development, critical infrastructure protection, natural hazards and environmental issues, road alignment studies, land cover/land use studies.

Remote Sensing Merits and Demeits

- Merits –

a. It does not disturb the object while taking observation.
b. Systematic data collection.
c. Provide great scientific knowledge.
d. Foever technology.

- Demerits

a. Less human involvement.
b. Calibration issue – may provide inaccurate data.
c. Cost- have a high cost.
d. Requires skilled analyst.

2.Geographic Information System (GIS)

It was Dr. Roger F. Tomlinson who first coined the term geographic information system (GIS). He created the first computerized geographic information system in the 1960s while working for the Canadian government a geographic database still used today by municipalities across Canada for land planning.

Google Maps is probably the most widely used of the GIS platforms. Although it is not necessarily the best tool for complex data visualization, it is extremely robust and easy to use on mobile devices, and is better for the demonstration of routes and journey times.

A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map, such as streets, buildings, and vegetation.

Components of GIS:

A working GIS integrates five key components: hardware, software, data, people, and methods. Hardware is the computer on which a GIS operates. Today, GIS software runs on a wide range of hardware types, from centralized computer servers to desktop computers used in stand-alone or networked configurations.

GIS is a combination of hardware and software that enables: The collection of spatial data from different sources (remote sensing being one of them). It relates spatial/tabular data, performs spatial/tabular analysis, and designs the layout of a map.

Data: There are two main GIS types: vector data and raster data.

Softwares in GIS: GIS mapping software saves both labour time and budget. It allows employees to be more efficient when mapping out job sites due to the sheer volume of data they can access. GIS makes transporting and tracking goods significantly more efficient when applied in logistics scenarios.

Popular Desktop GIS Software. The two most used desktop GIS programs by far are ArcGIS and QGIS. Both offer similar functionality but there are some major differences in terms of how they are distributed and their surrounding ecosystems.

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A GIS software can handle both vector and raster data. Remote sensing data belong to the raster type and usually require special data manipulation procedures that a regular GIS does not offer. However, after a remote sensing analysis has been done, its results are usually combined within a GIS or into a database of an area for further analysis (possibly overlaying with other layers). In the last few years, more and more vector capabilities have been added to remote sensing software, and some remote sensing functions are inserted into GIS modules.

- GIS application

a. Local Government.
b. Real Estate and Marketing.
c. Public safety and defense.
d. Natural resource exploration/extraction.
e. Transportation.
f. The Geospatial Industry.
g. Health Management (Health Systems, Health Centers, Management Beds)
h. Public health and epidemiology.

- Demerits with GIS

a. Prohibitive cost- Smaller businesses and small government offices tend to think that they can't afford GIS.
b. Inconsistencies in data- Your decisions are only as good as the data you use to make them.
c. Lack of standardization.
d. Area limitation.

III. CONCLUSION

❖ Remote sensing has proven to be an important tool in geography.

❖ Multi-temporal satellite data help to delineate the various change of the earth surface.

❖ Remote sensing has progressively expended applications in various fields such as urban-regional planning, health planning, geomorphology, and resource planning. Because of its varied applications and ability to allow users to collect, interpret, and manipulate data over dangerous areas, remote sensing has become a useful tool for all.

❖ GIS has shown a very important role in various aspects of geotechnical engineering including preliminary site investigations, identification of potential project barriers (like mines etc), interpolation for obtaining data at inaccessible locations, data visualization, data processing. Finally remote sensing and GIS are the backbone of the survey and in today's era its need of civil engineering

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