Survey IV

GPS (Global positioning System).

Is a satellite-based navigation system.

satellites : An object launched specifically to orbit to transmit the position information.

Ground station : Used to control the satellites and update the information.

Receiver : collects incoming signals from the satellites and compute its location anywhere in the world.

Orbit : path an object in space follows as it circles the earth.

The Global Positioning System consists of 24 satellites. that circle the globe once every 12 hours to provide worldwide position, time and velocity information.

The three components of GPS are the space segment, user segment and control segment.

Uses of GPS.

→ Location - Determining a position

→ Navigation - Getting from one location to another.

→ Tracking - Monitoring object or personal movement.

→ Mapping - Creating maps of the world

→ Timing - Making it possible to take precise time measurements,

Fundamentals of GPS positioning

Global positioning System consists of 24 satellites that circle the globe once every 12 hours to provide worldwide position, time and velocity information. GPS makes it possible to precisely identify location on the earth by measuring distance from the satellites

Three segments

Space segment : the constellation of satellites.

Control segment : monitor systems that control and adjust satellites.

User segment : Users with receivers.

Space segment.

- System consists of 24 satellites.
- Solar powered, backup batteries, rocket boosters.
- The key part is the hydrogen atomic clock for accurate time.

Control segment.

- Main functions :- Track the satellites for orbit and clock determination, Upload the navigation message and time synchronization (satellite time and earth time.

● User segment.

- Military needs a secure system and a high ~~accuracy~~ accuracy.
- Civilians need unrestricted access and a reasonable accuracy.

GPS positioning is based on the range distance between the receiver and satellites.

Range distance = Speed of signal (light) × travel time,

The satellite broadcast signals with time information

GPS receivers use four or more satellites to solve for the receivers location and time.

GPS is satellite based radio navigation and positioning system built and run by the US department of defence.

Advantages of GPS.

→ It is worldwide, all weather system and ~~continuously~~ continuously available 24 hours a day.

→ GPS is designed to achieve relative high positioning accuracies from a few metre down to millimetre level.

→ It is a positioning system with no user charges and uses relatively low cost hardware and softwares.

→ Signal availability is guaranteed to users any-where on the globe.

→ Capability of determining velocity and time.

→ Able to provide service to unlimited number of users.

Photogrammetry can be defined as the science of obtaining measurements and producing maps by means of photography.

- Photogrammetric technique are required to determine relationship of features and aerial photo-graphs.
- Photo → light

  Gramma → drawn or written

  Metron → to measure

Principles of photogrammetry

→ Camera must may be held or mounted and photo-graphs may be taken by a photographer, triggered remotely or triggered automatically.

Platforms for use aerial photography.

- Fixed beam aircrafts.
- Helicopters, balloons, rockets, kites, Parachutes

The use of photography for accurate measurements is called Photogrammetry

The fundamental principle used in photogrammetry is triangulation.

Photogrammetry is a technique of measuring two dimensional or three dimensional objects from photograph or imageries stored electronically.

Applications

1. Civil engineering and construction.
   - site planning and design, including road and bridge design.
   - monitoring construction progress and ensure quality control.
   - Volume calculation of earth work and stock pile management.

2. Architecture and Heritage preservation.
   - Documentation and preservation of historical building and cultural heritage site.
   - Creating 3D models of architectural structures and interiors for design and restoration.

3. Environmental Monitoring.
   - Assessing land coverage changes, deforestation and land degradation.

. Monitoring shoreline erosion, coastal changes and wet land habitats.

Drone surveying.

Is an aerial survey conducted using drones and special cameras to capture aerial data with downward facing sensors.

Drone surveying can be 90% faster than manual surveying method, It helps in creating highly accurate maps and survey points.

Features

→ During drone survey, the ground is photographed several times from different angles and each captured image is tagged with certain coordinates.

→ The collected datas are processed using drone mapping software to create construction assets like 3D models, 2D maps, digital elevation models from which highly accurate measurements and volumetric calculations are taken.

→ Drone captures highly precise data quickly, without the need for surveying staff to walk over dangerous terrain or height to collect the information.

- **Applications of drone surveying.**

  → Land surveying
  → Precise measurements.
  → Land management and development.
  → Volumetric measurements.
  → Slope monitoring.
  → Urban planning.

Remote sensing

> Is a science of acquiring information about the earth surface without actually being in physical contact with the surface.

The characteristics of objects of interest can be ~~index~~ indentified, measured or analyzed without direct ~~conta~~ contact.

> This is done by sensing and recording reflected or emitted energy and processing. ~~ana~~ analyzing and applying that information.

> Remote sensing includes aerial photography and satellite imagery.

Applications

○ For site study GIS efficiently includes and analyses numerous types of information and images. It displays precise results that civil engineers can use to quickly communicate and connect with clients.

via simple map. Civil engineers also employ remote sensing techniques to forecaste future necessities.

o Archaeological investigation.
many historic structures are now buried beneath the ground and remain unknown. Remote sensors can recognize buried structures.

o Terrain mapping and analysis
Terrain mapping and analysis are quite important civil engineers can use terrain maping to build better highways, it also aid them in avoiding unsafe places and identifying the ideal terrains. Road and rail building can be difficult task without the use of remote sensing methods.

o Land use.
Larger area can be mapped in short time using remote sensing. Forest, agricultural, residential and industrial areas can be measured and monitored on a regular basis, it is easy to locate places where various crops are grown.

" Human eye the most familiar example of a remote sensing system"

Sight, smell, hearing.

● The information carries or communication link is electromagnetic energy.

Remote sensing data basically consists of wavelength intensity information by collecting the electromagnetic radiation leaving the object at specific wavelength and measuring its intensity.

Most of the modern remote sensing methods makes use of the infrared bands and microwave postion of the electromagnetic spectrum.
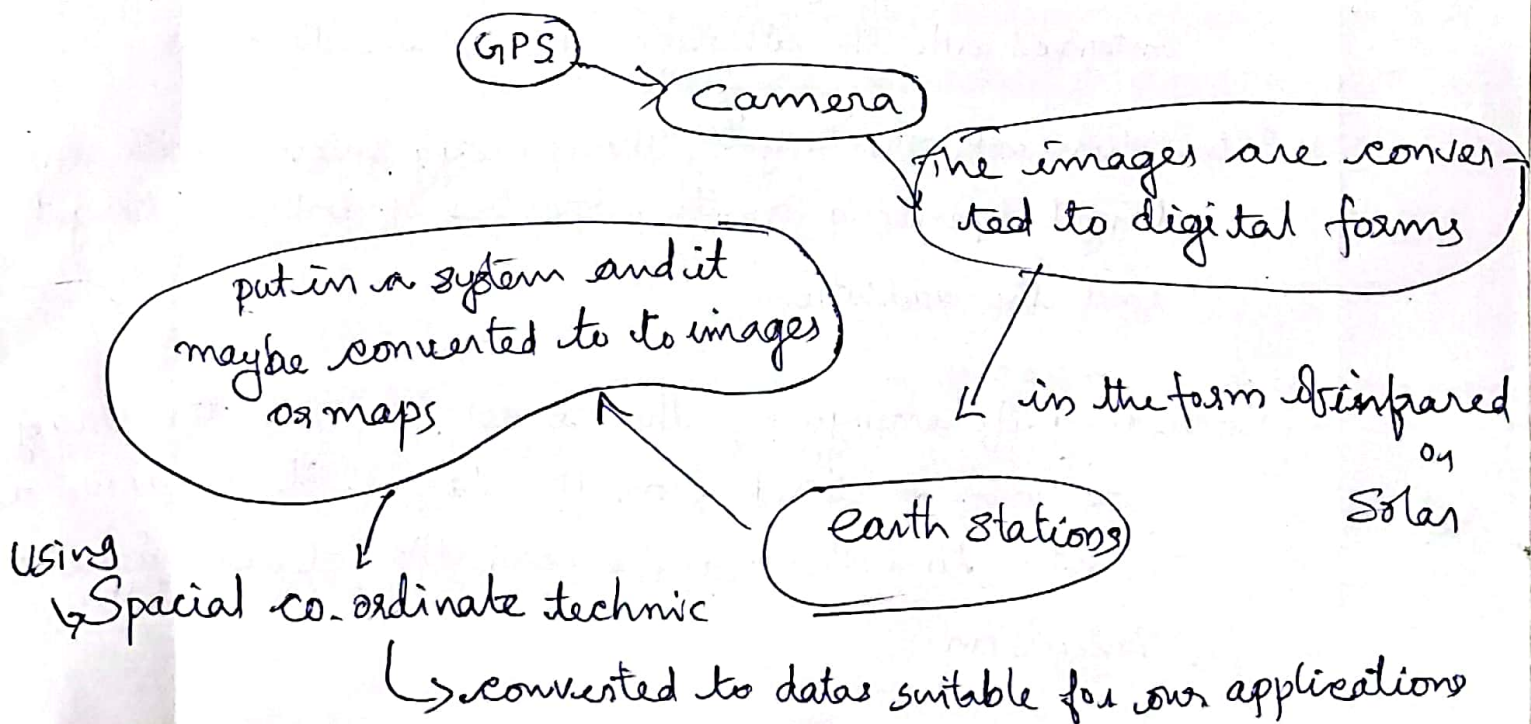
Elements in Remote sensing

1. Energy source or illumination; which illuminates or provides electromagnetic energy to the target of interest

2. Radiation and the atmosphere :- the energy travels from its source to the target, it will come in contact with the interact with the atmosphere it passes through.

3. Interaction with the target : The energy interact with the target depending on the properties of both the target and the radiation.

4. Recording of energy by the sensor : After the energy has been scattered from the target, it require a sensor to collect and record the electromagnetic radiation

Transmission, reception and processing : The energy record by the sensor has to be transmitted in an electronic form to receiving and processing station where the data are processed into an image (hard copy and or digital)

Interpretation and analysis : The processed image is interpreted, visually and or digitally or electronically to extract information about the target, which was illuminated.

Application : The final element of remote sensing process is achieved by extracting the required informations from the imagery about the target to better understand it.

GIS (Geographical Information System)

GPS → Camera

The images are converted to digital forms

put in a system and it maybe converted to to images or maps

in the form of infrared or Solar

earth stations

using

↳ Spacial co-ordinate technic

↳ converted to datas suitable for our applications

- Geographic information system (GIS) is a system designed to capture, stores, manipulates, analysis, manage and present all types of geographical data.

> It is an organized collection of computer hardwares software, geographic data and personal.

Key components of GIS.

→ Hardware
→ Software
→ Data
→ People
→ Procedures / methods

GIS Applications in Civil Engineering.

1. Structural: GIS allows civil engineers to include a variety of material data and area historical data into their layout. One of the most extensively utilized GIS application is structural analysis Engineers can use dynamic overlays and 3D models to check the problems.

2. Environmental: GIS can assist organizations in need of environmental information on land, water supplies and other natural elements. It can also help with natural disaster forecasts.

3. Transportation: Using GIS techniques traffic flow trends can be displayed and alongside

demographic transition on the same map

4. wal wastewater / stormwater : GIS technique can be used to combine data from hydraulic and hydrologic modeling to give a full examination of water utility systems. Another application is to use terrain analysis and floods data to plan drainage improvements.

5. Site analysis : GIS quickly analyses and combines a wide range of pictures and data.

6 Surveying :- Using GIS technologies, surveyors may quickly examine environmentally sensitive areas, forestry, government control, road networks Previously established boundaries, zoning permit status and other important data. The information are preserved and easily accessible for future projects that utilise the area.

what is GIS.

Computer based tools used to store, visualize analyze and interpret geographic data. Geographic data identifies the geographic location of features.

Data entry into GIS

- It is the operation of encoding data for inclusion into GIS database

- It is the first step in using GIS. the success of any GIS project depend on quality of data entered into the system.

Choise of any data input method depend largely on the application, available budget and the type of data being inputted.

There are two methods

1. Direct entry.
2. Indirectly.

Global navigation satellite system (GNSS)

Is a space-based radio positioning system that consists of constallations of satellites.

satellites in space transmit informations to GNSS receivers on earth. This information is used to determine position.

GNSS is used in various fields to provide accurate, permanently available position and time information.

Survey

marine Aviation

Urban development infrastructure.

Road, Automotive,

GNSS receiver consists of

(1) Antenna
(2) Receiver