→ Advantages of GPS

* It is extremely easy to navigate.
* The GPS signal is available anywhere in the globe
* It provide user with location based information
* This will be helpful in various application such as mapping, location, performance analysis, etc.
* There is no charge to utilize the GPS service.
* The GPS system get calibrated by its own and hence it is easy to be used by anyone.

→ Terms

1. Determination of position → Location
2. Navigation → Getting from one location to another
3. Tracking → Monitory object or personal movement
4. Mapping → Creating mapping of the world
5. Timing → Bringing precise timing to the world

Total station

- A total station is a combination of electronic theodolite, an electronic distance metre (EDM) and a small micro processor.
- It is a type of digital theodolite and that integrate the angle measuring with electronic distance measurement.
- The combination make it possible to determine the coordinates of a by a reflector by aligning the instrument cross hair on the reflector and simultaneously measuring vertical and horizontal angles and slope distance.
- A microprocessor in the instrument take care of recording, reading and necessary computations.
- The data is easily transferred to a computer where it can be used do generate map.

→ working principle of ~~talking~~ total station

The basic principle of total station is that the distance blw any two point can be known once the velocity and the time taken by the light travel are known.

Distance = velocity x time

The relation is already programmed in the ~~memory~~ memory of total station along with the correction factor that are used to calculate the required horizontal distance and is finally displayed on the LCD screen of the instrument.

→ objective or uses of total station

* To determine the angles blw the points
* To determine the horizontal distance blw the points
* To determine the elevation of various points
* To determine all 3 coordinates of various points.

→ Components of total station

* A tripod is used to hold the total station.
* An electronic note book used to record calculate and even manipulate the field of data
* Prism and prism pole which can measure length upto 2 km and upto 6.27 km can be measure with tripple prism
* Battery
* optical plummet eyepiece
* operation panel

→ Field procedure of survey using total station

- setting up the tripod
- mounting to total station on the tripod
- centering
- Levelling
- verifying the levelling electronically
- Adjusting the image and focusing the cross hair
- Taking the instrument.

→ Traverse with total station

- Steps involved in measuring the area of a plot using single stationed total station.

* Fix the total station over a station and level it.
* Press the power button to switch on the instrument
* select mode B → S function → file management → create enter a name → accept
* Then press escape to go to the starting page.
* Then set zero by double clicking on ~~zero~~ 0 set (F3)
* Then go to S function → measure → rectangular coordinate → station → press enter.
* Here enter the point number or name instrument height and, prism code.
* Then trucss accept (F3)
* Keep the reflecting prism on the first point and turn the total station to the prism focuse it and bisect it exactly use in horizontal and vertical clamps.

* Then select MEA and display panel will show the point specification.
* Now select edit and reorder the point number or name point code and enter the prism height that we have set.
* Then press MEA or save (F_3). So that the measurement to the first point will automatically be saved and the display panel will show the second point.
* Then turn the total station to the second point and do the same procedure.
* Repeat the step to the rest of the station and close traverse.
* Now go to S function → view or edit → graphical view.

closed traverse

* It will show the graphical view of the traverse.
* select S function → calculation → 2D surface → all → accept

area calculation

* This will give the area of the closed traverse.

→ Data gathering and data processing

* when target is sighted horizontal and vertical angles as well as sloping distances are measured and by processing apropriate keys they are recorded along with point number
* Height of instrument and target can be keyed in after measuring them with tape → then processor compute various information about the point and display on screen
* This instrument is provided with a in built micro processor the micro processor average multiple observation.
with the help of slope distance vertical and horizontal angle measured when high of axis instrument and target are suppeired the micro processor compute the horizontal distance X, Y, Z coordinate.
* The processor is capable of applying temperature and pressure correction to the measurement and if the pressure of temperature.
* The end of the day the information stred is downloaded to the computer.

* It can be used for further processing
* They are software like a valiate ~~vatiait~~ & auto plating contour at any specified interval and for plotting cross sectional along any specified time.

Sources of errors in total station

1) Circle ~~ecc~~ eccentricity
2) Horizontal collimation error in total station
3) High of standard error in total station

Control of errors in a total station

1. Instrumental error

* ~~some of~~ some instrumental errors are eliminated by observing on two faces of the total station and avg
* Instrumental errors are measured are corrected using electronic calibration ~~process~~ procedures that are carried out at any time and can be ~~applyed~~ applied to the instrumental on site.

2. Tilting axis error

* This axial errors occur when the tilting axis of the

total station is not ⊥r to its vertical axis

* This has no effect on side in is taken when the telescope is horizontal circle readings when the telescope is tilted.

* This errors is eliminated by two face measurements the tilting axis errors in measurement calibration procedure in applied for these two all all in circle reading

3. Horizontal collimation or line of sight errors

* This axial error is closed when the line of sight when ⊥r to the tilting axis

* It affect all horizontal circle reading it increases with steep siting but this eliminated by observing two faces.

Electronic theodolite

* It consist of a telescope that is moulded on a base as well as an electronic read out screen that is used to display horizontal and vertical axis

* This are convenient the digital read out takes the place of traditional graduated circle and this created more

accurate readings.

* It is a precision ~~inf~~ instrument for measuring angles in the horizontal and vertical placed.

→ components of part of electronic theodalite

* The parts of digital theodality are mostly similar to a non-digital theodalite accept for the presence of LCD screen

1- handle

2- ~~he~~ horizontal clamb

3- objective lense

4- horizontal tangent screw

5- operating key

6- Tabular bubble tube

7- circular " "

8- Tripod

9- Black plate

(2) Steps involved in traversing in a total station

- centre the theodolite over station A
- After all temporary adjustment go to survey and select ~~top~~
- Take all the necessary measurements shift the instrument to B. go to survey menu. select station B from the list and enter the ~~hei~~ height of instrument press enter and accept.
- Now select A from the list and place the prism on A. Take a sight on station A and we can see the massage of total station display as orientation sector concluded. This orientation is orientation by two station method.
- Now go to surveying and select measure Topo then continue the surveying up to next traverse station. Repeat the same procedure for remaining traverse station to complete the open or closed traverse.

Temporary adjustment of a total station

- Fix the total station on the tripod at a convenient place or at a station point.
- switch on the total station by pressing power button on the keyboard
- screen on the instrument shows electronic bubble and laser plummet.

- Centering over the ground station

The optical plummet is available with a laser point to the exact location over which the instrument is set up.

- Accurate levelling by foot screws & electronic bubble

The legs of the tripod are suitably adjusted to bring the bubble to the centre. The levelling can be done exactly in the same way as that of an ordinary theodolite. By keeping the telescope parallel to any two foot screws and rotating them either inward or outward and subsequently keeping the telescope in ⊥ position and turning the third foot screw. Electronic bubble can be seen on the display panel.

- Focusing & target sighting

A white paper can be held before the object glass and focusing is done using focusing screw until the cross hairs are clear.

→ Geographic Information system (GIS)

* It is a computer based system design to accept a large volume of special data derived from a variety of source and to store retrieve analysis manipulate and display this data according to the specification.
* Hardware, software, people, data, and methods are five key components.

→ Application & uses of GIS in Civil Engineering

1. water resources of planning
2. Land use planning
3. Geodetic ~~planning~~ mapping
4. Environmental application
5. Surveying
6. Cadastral mapping
7. Natural resources mapping
8. Mineral exploration
9. Route selection of highway
10. ~~the the~~ urban and regional planning

Terrestrial photogrammetry

* It is the branch of photogrammetry where in the photograph are taken from a fixed position on or near the ground
* In this photogrammetry photos are taken with the camera supported on the ground. That is used by a photo theodolite - which is a combination of a theodolite

Areal photogrammetry

* It is a branch of photogrammetry where the photographs are taken by a camera mounded on a aircraft flying over the area
* It is the best method for mapping procedure for big project and most ~~use~~ useful for military intelligent
* Areal photogrammetry defers from normal photogrammetry that is a photo taken from the air with the camera axis pointing downwards at the line of exposure.
* An areal camera mounted on air craft usually

→ classification of GIS

* management of natural disaster
* mapping
* Telecom and network services
* Accident analysis and hotspot analysis
* urban planning
* Transportation planning.

→ photogrammetry

* photogrammetry or photogrammetry surveying is the science and ~~part~~ art of obtaining accurate ~~mea~~ measurement by use of photograph for various purposes.
* ~~Photo~~ It can be used for topographic map classificatio of soil interpolation of geology acquisition of military intelligence and the preparation of composite picture ~~preparation~~ of ground

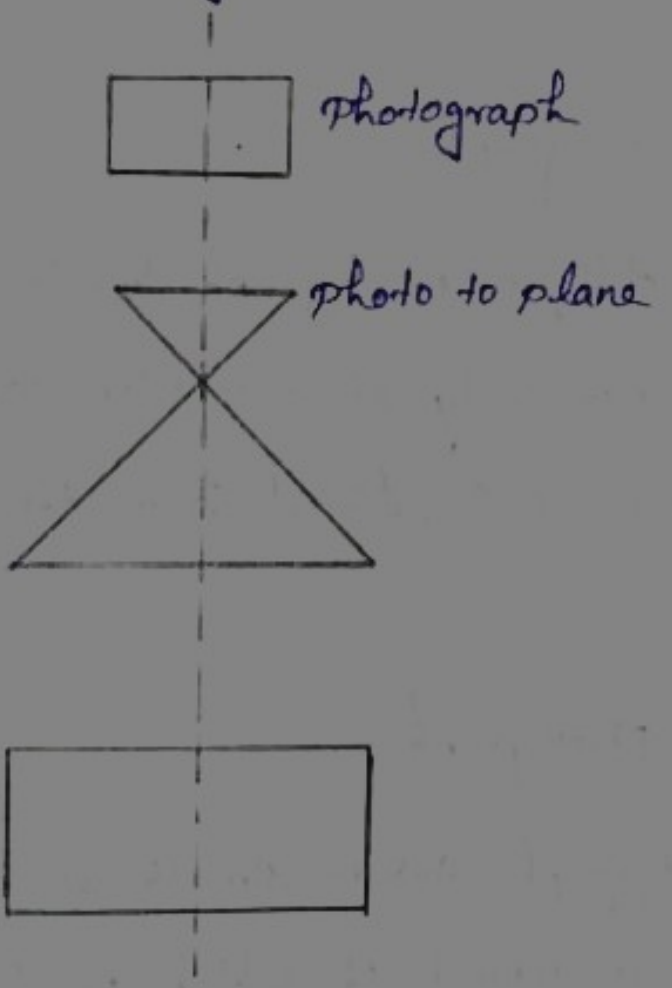
There are 2 types of photogrammetry
Terrestrial and areal photogrammetry

takes the areal photography.

→ Types of areal photograph

1) vertical photograph

A photograph taken with the optical axis of the camera pointing vertically downward is called vertical photograph



2) oblique photograph

* A photograph taken with the optical axis of the camera pointing inclined.
* This types of photograph covers more area of the ground

but the quality of the image is poor. These are further devided into 2 categories.

i) Low oblique photograph
ii) High " "

A high oblique photograph is one that include the horizon

- convergent photograph

It is a low oblique photograph in this 2 cameras are exposed simultaneously at successive camera station. with the camera axis fitted from the vertical at a fixed angle.

- Trimetrogon photograph

These are photograph taken simultaneously at 3 cameras held in a single mount of which one is held vertically and the others aligned oblically at an angle of 60° from the vertical axis.

→ Global Navigation Satellite System (GNSS)

* It is the standard generic term for satellite navigation systems.
* That provide autonomous geospatial positioning with global coverage.
* This term includes GPS, GLONASS, Galileo, Beidou and other regional systems.
* GNS is a term used world wide
* The advantage to having access to multiple satellite is accuracy, redentency and availability at all ~~times~~ times.
* Though satellite system dawn often fail, if one fail GNS recievver can pickup signal from other system.
Also if line of sight is obstructed having access to multiple satellite is also a benefit.

Application

i) organising ~~sight~~ site
ii) Keeping track of equipment

iii) surveying
iv) Levelly
v) Excavating
vi) Drilling
vii) Pile driving

Drawn surveying

* It refers to the use of drawn or unmanned areal vehicle (UAV) to capture areal data with downward facing sensors such as multispectral cameras, LIDAR, etc.
* The map can also be used to extract information such as highly accurate distances or volumetric measurement.
* Drawn surveying can be 90% faster than manual surveying method. ~~It helps~~
* It helps in creating highly accurate maps and survey point.

Applications

i) Land surveying
ii) Precise measurement
iii) Land management and development
iv) volumetric measurement
v) slope monitoring
vi) urban planning

Excellent A+.