SURVEYING INSTRUMENTS: GPS, DGPS & TOTAL STATION

Principles, Applications, and Comparison

Presented by: GRED Institute

INTRODUCTION

Modern surveying instruments are essential for accuracy.

Used in geoinformatics, civil engineering, land management.

WHAT IS GPS? (GLOBAL POSITIONING SYSTEM)

Satellite-based navigation system.

Provides location, velocity, and time data.

Operates globally, 24/7.

HOW GPS WORKS

Uses triangulation from at least 4 satellites.

Components: Space, Control, User segments.

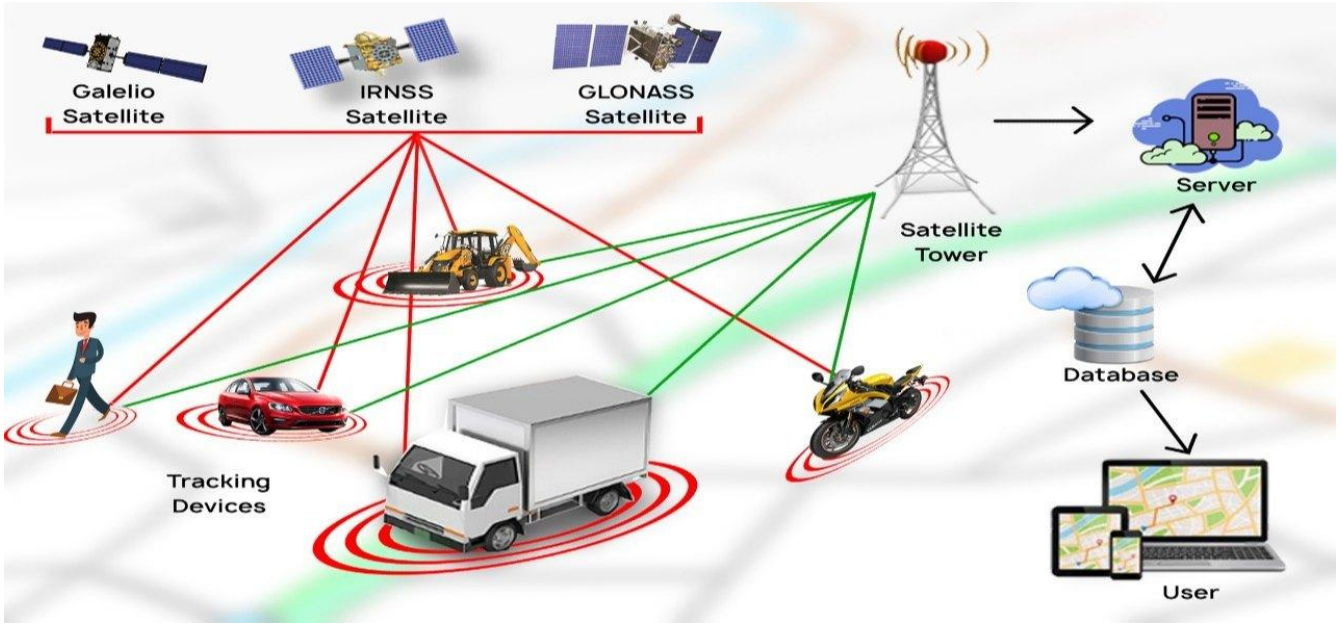
Determines exact position via satellite signals.

APPLICATIONS OF GPS

Navigation (vehicles, aviation, marine).

Surveying and mapping.

Disaster management, precision agriculture.



LIMITATIONS OF GPS

Signal blockage in urban or forested areas.

Atmospheric disturbances affect accuracy.

General accuracy: 5–10 meters.

WHAT IS DGPS? (DIFFERENTIAL GPS)

Enhanced GPS using reference station.

Corrects satellite errors.

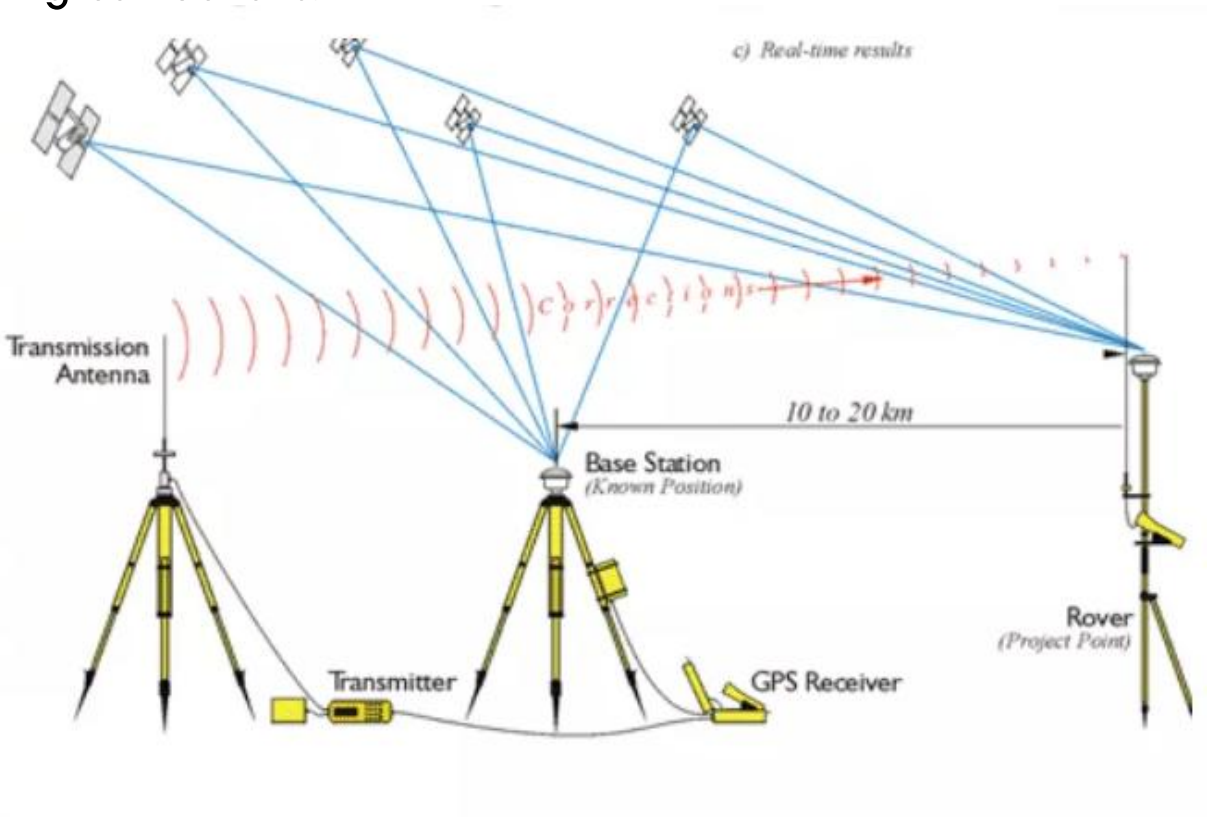
Improves accuracy to 10 cm – 1 meter.

HOW DGPS WORKS

Reference station compares known position with GPS data.

Sends correction data to rover.

Rover adjusts position using corrections.



APPLICATIONS OF DGPS

Hydrographic & land surveys.

Aviation and marine navigation.

Construction, mining, GIS data collection.

WHAT IS TOTAL STATION?

Combines EDM, Theodolite, and data recorder.

Measures angles, distances, coordinates.

High accuracy and precision.

WORKING OF TOTAL STATION

Manual or robotic operation.

Uses laser or infrared beam.

Stores and processes data digitally.

APPLICATIONS OF TOTAL STATION

Topographic surveys.

Construction layout & alignment.

Mining and excavation monitoring.

COMPARISON TABLE: GPS VS DGPS VS TOTAL STATION

Accuracy: GPS (5–10 m), DGPS (0.1–1 m), Total Station (2–5 mm).

Satellite needed: GPS & DGPS only.

Data: GPS/DGPS (coordinates), Total Station (angles, distance).

Used in: Mapping, precision survey, civil engineering.

ADVANTAGES & LIMITATIONS

GPS/DGPS: Fast, easy, large coverage, but less accurate.

Total Station: High accuracy, versatile, needs line of sight.

CONCLUSION

Each instrument serves unique surveying needs.

Selection depends on accuracy, budget, and environment.

THANK YOU!

Questions?

Contact: www.gredinstitute.com