

GPS AND ITS APPLICATIONS

UNIT III

BASIC MODE OF GPS SURVEYING: DGPS TRANSFER AND PROCESSING-SOURCES OF ERROR-DILUTION OF PRECISION(DOP)-ERROR CORRECTION-LOCATION OF GPS RECEIVER

Real-time **DGPS** occurs when the base station calculates and broadcasts corrections for each satellite as it receives the **data**. The correction is received by the roving receiver via a radio signal if the source is land based or via a satellite signal if it is satellite based and applied to the position it is calculating.

Post processing

Post-processing is used in Differential GPS to obtain precise positions of unknown points by relating them to known points such as survey markers.

The GPS measurements are usually stored in computer memory in the GPS receivers, and are subsequently transferred to a computer running the GPS post-processing software. The software computes baselines using simultaneous measurement data from two or more GPS receivers.

The baselines represent a three-dimensional line drawn between the two points occupied by each pair of GPS antennas. The post-processed measurements allow more precise positioning, because most GPS errors affect each receiver nearly equally, and therefore can be cancelled out in the calculations.

Differential GPS measurements can also be computed in real time by some GPS receivers if they receive a correction signal using a separate radio receiver, for example in Real Time Kinematic (RTK) surveying or navigation.

The improvement of GPS positioning doesn't require simultaneous measurements of two or more receivers in any case, but can also be done by special use of a *single* device. In the 1990s when even handheld receivers were quite expensive, some methods of **quasi-differential** GPS were developed, using the receiver by quick turns of positions or loops of 3-10 survey points.

Relative and Differential GPS Data Transfer and Error Analysis

The effect of geometry of the satellites on position error is called geometric **dilution of precision (GDOP)** and it is roughly interpreted as ratio of position error to the range error. Imagine that a square pyramid is formed by lines joining four satellites with the receiver at the tip of the pyramid.

A common method of **error correction** is called differential **correction**. Recall the basic concept behind the requirement of three satellites for accurately determining 2-dimensional positions.

Differential **correction** is similar in that it uses the known distances between two or more receivers to enhance **GPS** readings.

A number of **GPS** satellites are deployed on six orbits around the earth at the altitude of approximately 20,000 km (four **GPS** satellites per one orbit), and move around the earth at 12-hour-intervals.