GPS SURVEYING TECHNIQUES

The position of stationary or moving object can be determined through GPS. When the position of a stationary or moving object is determined with respect to a well-defined coordinate (x, y, z) by using a single GPS receiver and by making observations to four or more satellites, it is called point positioning or absolute positioning (Fig. 9.10). However, if the coordinates of an unknown point are determined with respect to a known point it is called **relative positioning.**

In other words, relative positioning aims at determination of the vector between the two points, by observations to four or more satellites by two receivers placed at the two points simultaneously (Fig. 9.11). In case the object to be positioned is stationary, it is termed as static positioning, while if the object is moving, it is called kinematic positioning. GPS surveying implies the precise measurement of the vector between two GPS instruments. The GPS surveys may be classed as static surveys the traditional static surveying; dynamic surveys the rapid-static surveying, pseudo-static surveying, and kinematic surveying.

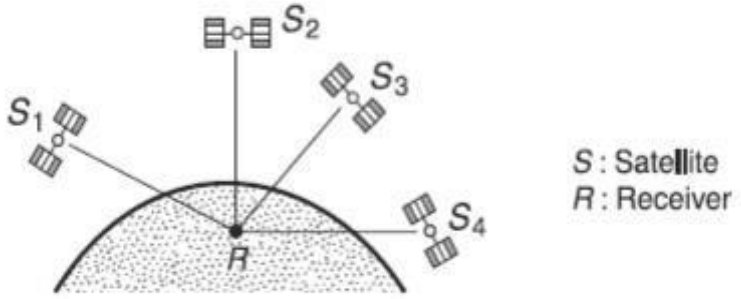

Fig. 9.10 *Point positioning*

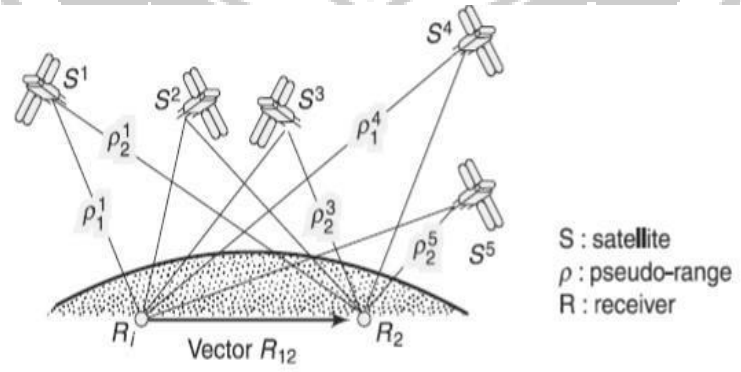

Fig. 9.11 *Relative positioning*

USES AND APPLICATIONS OF GPS

GPS is a complex system that can be used in many ways. For basic point positioning using geodetic receivers with a computer and post-processing software accuracy at the centimetre level is achievable. Although the accuracy is important, some surveyors feel that the main advantage of GPS is that it can be used in any

weather conditions day or night. This enables GPS surveying to be carried out over extended periods at any time of the year without restrictions such as rain, fog and poor visibility. Another advantage when surveying with GPS is that intervisibility between stations or points surveyed is not necessary.

This allows control stations to be placed conveniently. Further, with differential GPS accuracy of 100 m for navigation purposes, 1 m for mapping and a few millimetres for geodetic positioning is possible. However, the high cost of GPS surveying has restricted the realisation of the full potential of GPS till date. Added to this, there are difficulties in defining heights above datums such as mean sea level and with real time data processing and control. Despite these drawbacks, GPS has been very successfully used in surveying and other fields.

GPS is a tool that will provide the word a new "international standard" for defining locations and distances and it would allow nations to monitor and use natural resources more efficiently than ever before. The general overall uses of GPS are numerous. GPS itself, or in combination with Geographic Information System (GIS), or other spatially related data bases has emerged as a new, dynamic, spatially related information utility. This utility can process both spatial data and relational data, as well as it is capable of the real-time processing required for navigation and routing. The initial conception of GPS was military positioning, weapons aiming and navigation system. It was to replace TRANSIT and other navigation systems and to provide worldwide weather-independent guidance for military use. But because of its potential GPS will soon be part of the overall utility of technology. Some of the uses and applications global, regional and local are as follows.

GPS ACCURACY

Accuracy achievable with GPS depends on several conditions, e.g., single or multi-receiver operation; single or dual frequency data; receiver noise level Selective Availability on or off (S/A has been put off since May 2nd 2000); P-code available or not; static or kinematic positioning; real-time or post-processed results extent of data modelling; accuracy of orbits; and fiducial concept (fiducial points means previously well-determined coordinates). The ultimate accuracy of GPS is determined by the sum of several sources of error already described in the previous section. The contribution of each source may vary depending on atmospheric and equipment conditions. In addition, the accuracy of GPS can purposefully be degraded by Selective Availability.