Positioning by an Active GPS System: Experimental Investigation of the Attainable Accuracy

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ABSTRACT

In two Austrian regions, active GPS networks have been installed by the respective energy companies. The GPS networks are continuously operated and provide online positioning capability with a precision of a few centimeters. The user needs only to be equipped with a single GPS receiver, a radio link and a special software. The use of an active GPS system might also be promising for surveying tasks of large scale engineering projects.

We present the results of experimental investigations of the attainable absolute and local positioning accuracy using an active GPS system. The measurements were performed at a distance of about 8 km from the nearest control station which also serves as transmitter of reference station data and corrections. The results show the main critical requirements: (i) a high data integrity rate of the radio link, (ii) the successful resolution of the carrier phase integer ambiguity, and (iii) the elimination of all outliers.

In this paper we propose an outlier detection scheme which eliminates outliers already in the field. In the absence of outliers, the precision of the plane positions and heights of single stations is batter than 3 cm. The local positioning accuracy for short baselines (< 2 km) is about 1 to 2 cm if the two sites are occupied within one hour and about 3 cm otherwise.

We conclude that the current active GPS systems cannot generally be used for high precision control surveys and setting-out of a construction project. However, they are well suited for cadastral surveying, GIS applications, and for general surveying tasks.

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