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CRITICAL STUDY OF REAL-TIME KINEMATIC (RTK) SURVEYING

Yogesh S. Dudhagamwar[1], Hitesh H. Mehta[2], Abhilash S. Kasbe[3]

[1]*U.G.Student,Department of Civil Engineering , jawaharal Darda Institute Of engineering And Technology Yavatmal, Maharashtra, India,* ***dudhagamwar321997@hotmail.com***

[2]*Assistant Professor, Department of Civil Engineering , jawaharal Darda Institute Of engineering And Technology Yavatmal, Maharashtra, India,* ***hitmehta09@gmail.com***

[3]*U.G.Student,Department of Civil Engineering , jawaharal Darda Institute Of engineering And Technology Yavatmal, Maharashtra, India,* ***abhilashkasbe321@gmail.com***

Abstract

Real Time Kinematic (RTK) surveying is a technique used to enhance the precision of position data derived from satellite-based positioning systems (global navigation satellite systems, GNSS) such as GPS, GLONASS, Galileo, and BeiDou. It uses measurements of the phase of the signal's carrier wave, rather than the information content of the signal, and relies on a single reference station or interpolated virtual station to provide real-time corrections, providing up to centimeter-level accuracy With origin dating back to the mid-1990s, Real Time Kinematics (RTK) is a differential GNSS technique which provides high positioning performance in the vicinity of a base station. The technique is based on the use of carrier measurements and the transmission of corrections from the base station, whose location is well known, to the rover, so that the main errors that drive the stand-alone positioning stop out. A RTK base station covers a service area spreading about 10 or 20 kilometers, and a real time communication channel is needed connecting base and rover. RTK, which achieves performances in the series of a few centimeters, is a technique commonly used in surveying applications.

Index Terms:- *satellite navigation, real time kinematics, base station, corrections, rover, communication channel ,surveying etc.*

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1. INTRODUCTION

The Real Time Kinematic (RTK) move toward is a differential positioning technique that uses known coordinates of a reference station occupied by one receiver to determine coordinates of unknown points visited by a rover receiver . Similar to static GPS the reference station is set on a point of known coordinates but the use of a data link, to transfer measurements acquired at the reference receiver to the roving receiver, permits the calculation of the rover coordinates at the time of measurement. RTK system is the best compromise between usability and accuracy. The accuracy of RTK compared to the static GPS and total stations was investigated by many authors. According to the work by, a horizontal coordinate accuracy of 1 cm has been achieved. Reference [7] compares between total station and GPS tools from different points of view including range, accuracy, flexibility and price. He mentioned that the correctness of total station is 3 to 10 times better than the GPS. The vertical accuracy of RTK and his results indicated that the RTK-GPS has a vertical error of about 2 cm. when using RTK system, 9 mm in horizontal and 1.5 cm accuracy in vertical coordinates has been achieved. RTK provides high-resolution control on topographical surveying within limits on the order of 1 cm level accuracy in the horizontal and 2 cm in vertical dimension. the average time needed for high accuracy RTK measurements The high accuracy of RTK makes it a common positioning tool for most of civil engineering applications like precise mapping, setting out of utilities, bridge movement measuring, road alignment and construction.

2. HOW RTK WORKS?

RTK stands for Real-Time Kinematic and is a technique that uses carrier-based ranging and provides ranges (and therefore positions) that are orders of magnitude more defined than those available through code-based positioning. RTK techniques are complicated. The basic concept is to reduce and remove errors common to a base station and rover pair First set base station receiver on a known point somewhere around the project site.

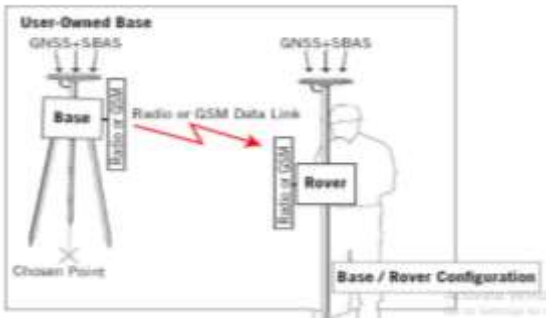

Figure 1 RTK System

At a very fundamental conceptual level, the range is calculated by determining the number of carrier cycles between the satellite and the rover station, then multiplying this number by the carrier wavelength. The calculated ranges still contain errors from such sources as satellite clock and ephemerides, and ionospheric and tropospheric delays. To eliminate these errors and to take benefit of the precision of carrier-based measurements. The base station receiver sends modification data to the surveyor who is operating the survey receiver (Rover). The correction data is typically sent via UHF or broaden spectrum radios that are built specifically for wireless data transfer.

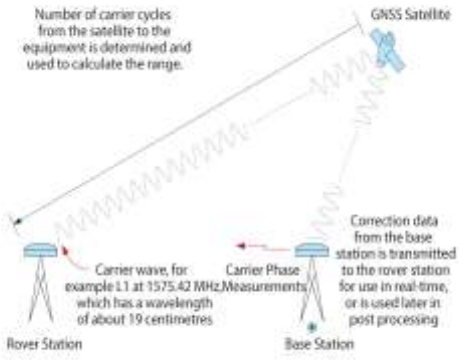

Figure 2 RTK Waves System

3. CONCLUSION

From above study we can conclude that RTK techniques estimated cost savings of 25% - 50% compared with ground survey methods. RTK-GPS based surveys not only are practical and fast but also yield more accurate topographic maps for design purposes. RTK can collect the positioning data successfully and quickly.

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REFERENCES

[1]. Open Journal of Civil Engineering, 2015, 5, 312-321 Published Online September 2015 in SciRes. http://www.scirp.org/journal/ojce http://dx.doi.org/10.4236/ojce.2015.53031

[2]. Lemmon, T. and Gerdan, G. (1999) The Influence of the Number of Satellites on the Accuracy of RTK GPS Positions. The Australian Surveyor, 44, 64-70. http://dx.doi.org/10.1080/00050351.1999.10558774