

Real Time Dynamics in Urban Surveying and Mapping Engineering Based on RTK Operating System

Lijun Wei

College of engineering, Yunnan University of Business Management, 650000, Kunming, Yunnan Province, China

ynjgygcwlj@163.com

Keywords: RTK Operating System; Urban Surveying and Mapping Engineering; Real Time Dynamics

Abstract: With the accelerating urbanization process in China, urban surveying and mapping has gained more extensive attention. In the city surveying and mapping project, it mainly includes collecting and processing the required information data in urban buildings, such as terrain and engineering. Because it plays an extremely important role in the development of urban architecture, it plays an important role in the sustainable development of urban architecture. Therefore, it is necessary to further strengthen the research of urban mapping technology. With the application of RTK technology, it brings more convenience to the development of urban surveying and mapping work. Based on this, this paper mainly discusses the effective application of real-time dynamic positioning of urban surveying and mapping engineering based on RTK operating system. Fully digital measurement and real-time dynamic positioning using the RTK operating system not only reduces the number of operators and work processes, but also improves the speed and quality of data acquisition, thus effectively improving work efficiency.

1. Introduction

The urban surveying and mapping project mainly studies the theory, techniques and methods of terrain and engineering-related information collection and processing, engineering construction stakeout, deformation monitoring analysis and forecasting, and related to measurement and engineering[1]. Information is managed and used. With the rapid development of surveying and mapping technology, the operation mode in urban surveying and mapping engineering is no longer limited to the original traditional mode[2]. The use of new technical means and new instruments and equipment has made engineering surveying and mapping tend to be automated, intelligent, dynamic and integrated. Real time. As a new measurement operation technology, RTK operation system is becoming more and more mature in the surveying and mapping industry[3]. Therefore, it is of great practical significance to study RTK operation system and its application in urban surveying and mapping engineering.

In recent years, domestic information technology has been continuously improved, and RTK technology has also been continuously developed. Data communication circuits, data processing centers and reference station networks together constitute the key to network RTK technology. A reference website is equipped with a dual-frequency full-wavelength GPS receiver, and this The receiver can also observe at the same time[4], and the accuracy is high. The coordinates of the reference station are determined very accurately. According to the coordinate axes, the GPS static relative positioning method is used to determine according to different time lengths. In the field measurement, RTK technology can obtain the positioning accuracy and results in real time, and support all-weather observation work, so in the field of surveying and mapping, RTK technology has a wide range of applications. Urban engineering measurement Due to the complex construction environment, the application of RTK technology is more extensive[5].

With the rapid development of satellite positioning technology in the world, especially with the provision of global information, the reliability and accuracy of satellite positioning have been

greatly improved after the cross-integration of satellite positioning technology with computer technology and wireless communication technology. In this paper, the method of combining theory with practical engineering projects is used to study and analyze the theory of engineering survey and RTK operation system[6]. The practical operation flow of RTK technology and the process of data acquisition and data analysis are elaborated. The RTK operation system is analyzed and summarized in engineering survey[7]. The advantages of RTK system as a new technology in current engineering surveying are pointed out by using existing GPS control network points for project control surveying and comparative analysis of data in surveying results.

2. Real time dynamics technology based on RTK operating system

2.1. Basic principle and composition of RTK technology

RTK real-time dynamic positioning technology is a real-time differential GPS measurement technology based on carrier phase observation. It uses two or more GPS receivers to simultaneously receive satellite signals[8], one of which is placed at a known coordinate point as a reference. Station, other as a mobile station. In the RTK mode, the base station keeps tracking at least 5 satellites at the same time[9]. The base station continuously observes the visible satellites and sends the data with the known point positions to the coordinates of the observations by means of the station. To the mobile station receiver, the mobile station receiver combines the GPS observation data collected by itself and the data received from the reference station to form a differential observation value for real-time processing to obtain three-dimensional coordinates.

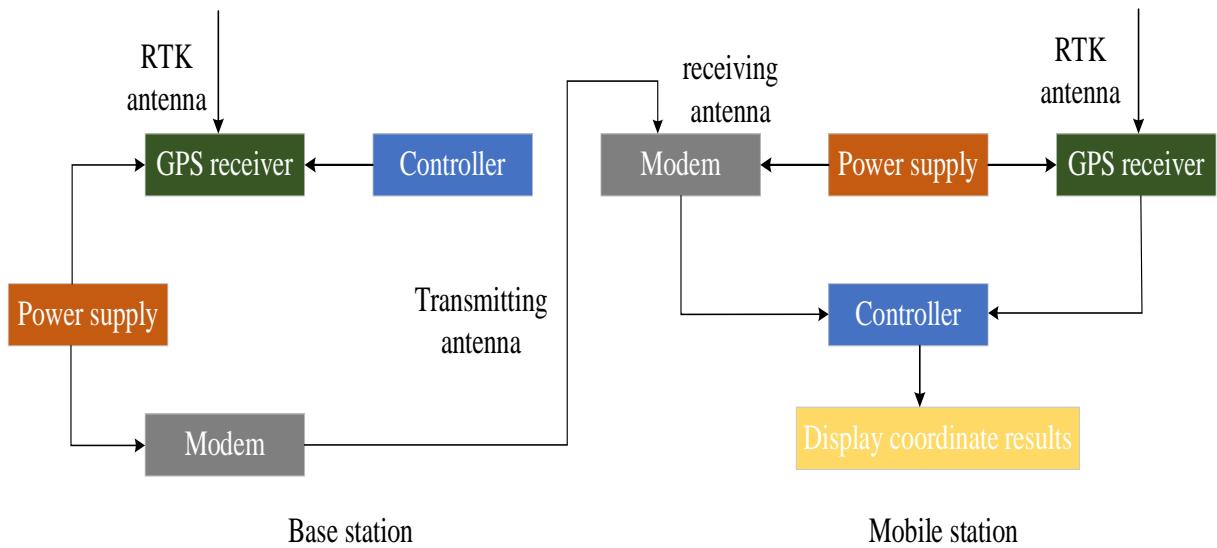


Figure 1. Principle of RTK positioning

2.2. Advantages of RTK technology

RTK technology has many advantages, such as high efficiency, reliable data, high accuracy, high automation and no limitation of visibility. In general topographic conditions, the application of RTK positioning technology can complete a radius measurement of 4 km at a time, and its measuring area is relatively large, which is incomparable with ordinary measuring instruments. In the electromagnetic environment, coordinates can be obtained in a short time. The operation speed is very fast and the intensity is low[3]. It can effectively save operation costs and enhance labor efficiency. With RTK positioning technology, there is no error accumulation, the number of moving stations is reduced, and the measurement accuracy is relatively high. Usually, the elevation and plane accuracy of RTK technology can reach centimeter level. RTK technology also has great advantages in automation and visual conditions[5]. The mobile station can automatically realize the mapping function without manual control by using software control system, which reduces the workload of surveyors, reduces human errors and ensures operational accuracy, and is not restricted

by visual conditions, seasons and climate. In complex terrain, it is difficult to see through the area because of obstacles. It can locate quickly and accurately only if it meets the basic conditions of RTK positioning[7].

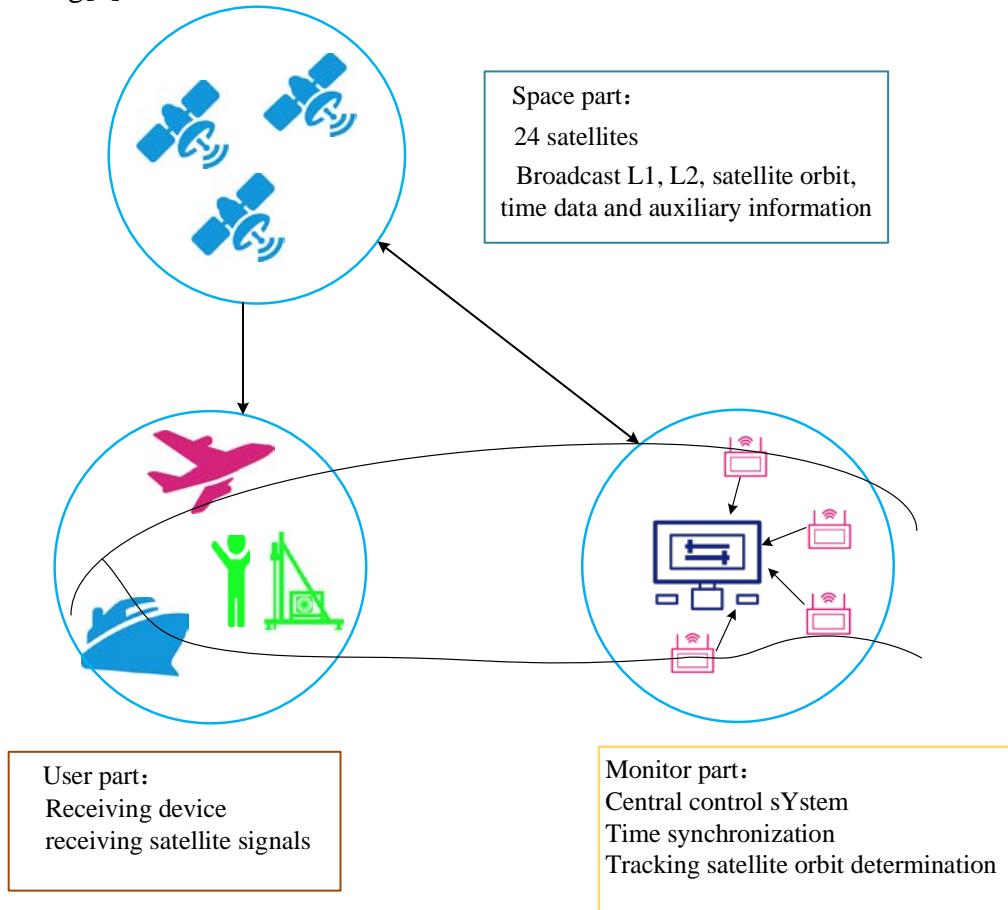


Figure.2. Advantage of real time dynamics based on RTK technology

3. Application of real time dynamics in urban surveying and mapping engineering based on RTK operating system

3.1. Preparation

In order to ensure that the RTK operating system can be effectively applied to the urban surveying and mapping project, the following preparatory work needs to be completed before the actual surveying and mapping: (1) Before the urban surveying and mapping, the staff needs to survey the surveying environment to avoid the environmental impact of the surveying area. Mapping results. (2) Determination of conversion parameters. After obtaining the corresponding coordinate parameters, coordinate parameter conversion is performed, and the corresponding GPS control points are jointly measured by matching the joint measurement method to ensure that valuable parameters can be retained and the accuracy of the parameters is effectively improved. (3) Monitoring of accuracy[9]. The application of RTK operating system in actual city surveying and mapping engineering can not only make the surveying accuracy reach the corresponding standard, but also can monitor the surveying accuracy, thus effectively improving the accuracy of coordinate points and elevation data[4].

3.2. Control measurement

With the continuous improvement of the level of modern urban construction, higher requirements have been put forward for urban planning. In the actual planning and design, the staff needs to combine the geological mapping information to carry out planning and design to ensure the orderly construction of the follow-up construction. The acquisition of geological information

mainly comes from engineering surveying and mapping. Although RTK technology has many functions and advantages, it also needs to improve the level of surveying and mapping management to ensure that the technology can be effectively applied to urban planning surveying and mapping projects. The RTK operating system also has the function of controlling measurement. Due to the long mapping time of traditional GPS technology and poor visibility, it can not meet the actual requirements of urban mapping, and the RTK operating system effectively solves these problems, and in actual mapping. Once the inaccurate mapping problem occurs, the system can quickly re-measure, which effectively improves the accuracy of the surveying results and reduces the mapping period.

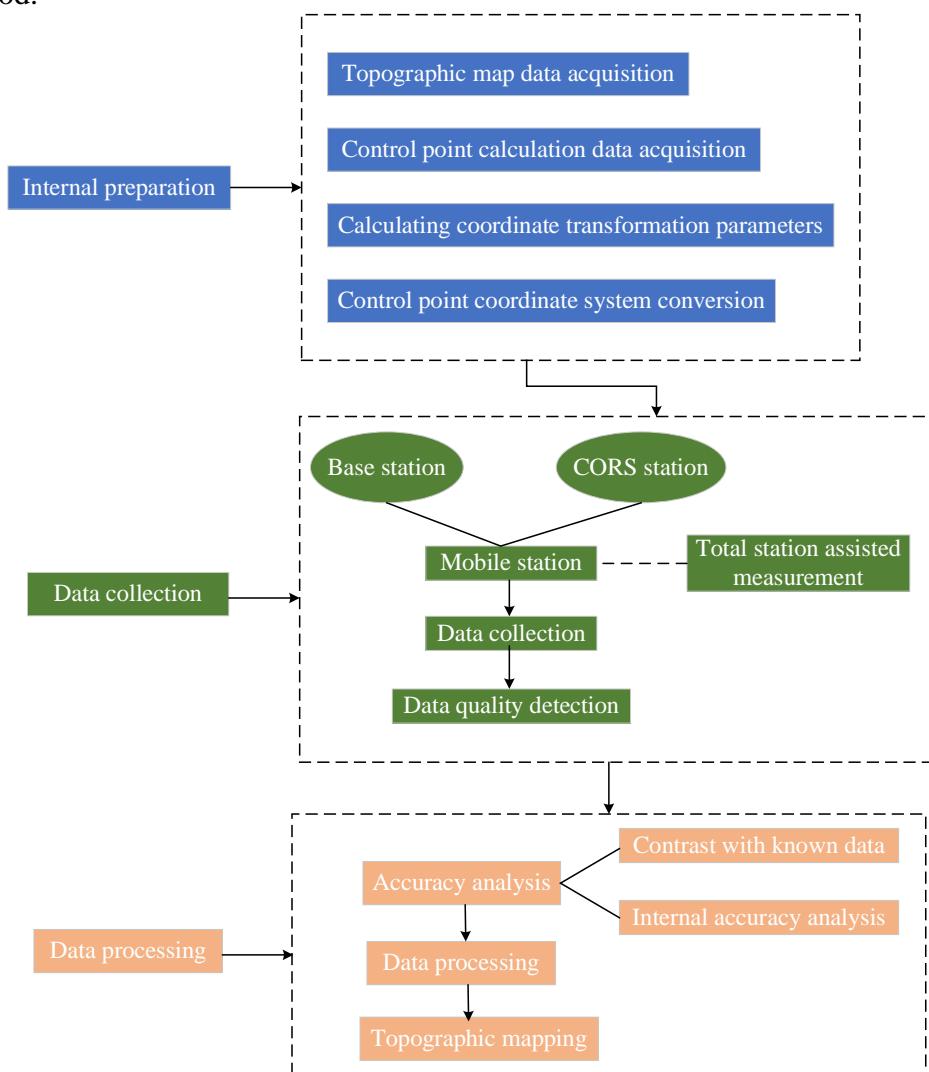


Figure.3. Application of RTK technology in urban surveying and mapping

3.3. Topographic mapping

First of all, RTK technology can be applied to the measurement of various terrains, especially for the wide-area mapping, changing the mapping method of traditional topographic mapping from the control point, changing the traditional mapping work by the number of control points and distance constraints Larger situation. When using RTK technology for terrain measurement, the dependence on control points is greatly reduced. It can directly cross complex terrain such as mountains and gullies, and does not require control points to view. It can collect various data in real time according to changes in terrain, which not only reduces surveying and mapping. The workload and work intensity of the personnel, and effectively ensure the accuracy of surveying and mapping.

3.4. Building planning release line

When applying the RTK operating system for urban planning measurement, it involves the

planning and laying out of the building. When carrying out the work, the geometric properties of the building itself should be considered on the one hand, and the accuracy of the stakeout should be ensured on the other hand. Points: (1) Stakeout in strict accordance with the convergence of measurement points to ensure the normal application of the RTK operating system; (2) For points with low precision requirements, certain errors will occur; for points with high precision requirements, The RTK can be effectively applied for planning and release to meet the corresponding requirements.

4. Conclusion

In summary, RTK technology is the core of GPS mapping technology. RTK technology can provide accurate measurement data for people in the process of testing. Therefore, it has been widely used in urban control measurement engineering, and has achieved good results. Not only in urban surveying and mapping engineering, work efficiency level, or data accuracy control level, it has significant advantages, can better meet the urban surveying and mapping engineering standards, we need to constantly improve RTK technology in order to obtain more accurate measurement. To increase the intensity of its research investment, to develop a better urban surveying and mapping engineering technology system, to pursue higher precision, better serve the city surveying and mapping engineering, and broaden its application fields.

References

- [1] Guo Q, Zhao T, Zhang C, et al. Digital Topographic Mapping in Urban Obstructed Environment Based on Multi-GNSS Network RTK Technology[J]. Journal of Physics: Conference Series, 2017, 910(1):012026.
- [2] Ying X, Wu C. Performance Analysis of GPS/BDS Dual/Triple-Frequency Network RTK in Urban Areas: A Case Study in Hong Kong[J]. Sensors, 2018, 18(8):2437.-llon P. Kant: The Art of Judgment in Aesthetic Education[J]. American Journal of Obstetrics & Gynecology, 2014, 163(6):1944-1947.
- [3] Yuan H. The Application Research of Basic Surveying and Mapping Product in Urban Management [J]. Advanced Materials Research, 2014, 998-999:1630-1633.
- [4] Min W, Cai H, Pan Z. BDS/GPS relative positioning for long baseline with undifferenced observations [J]. Advances in Space Research, 2015, 55(1):113-124.
- [5] Hyunchul R, Jinyong J, Younggun C, et al. Accurate Mobile Urban Mapping via Digital Map-Based SLAM[J]. Sensors, 2016, 16(8):1315.
- [6] Charoenkalunyuta T, Satirapod C. Effect of Thai Ionospheric Maps (THIM) model on the performance of network based RTK GPS in Thailand[J]. Empire Survey Review, 2014, 46(334):1-6.
- [7] Li W, Li W, Cui X, et al. A Tightly Coupled RTK/INS Algorithm with Ambiguity Resolution in the Position Domain for Ground Vehicles in Harsh Urban Environments[J]. Sensors, 2018, 18(7):2160.
- [8] Bae T S, Kim M. Performance Analysis of Network-RTK Techniques for Drone Navigation considering Ionospheric Conditions[J]. Journal of Sensors, 2018, 2018:1-8.
- [9] Heine E, Kogelbauer I, Prokoph A, et al. Hydrographic Surveying of the Steppe Lake Neusiedl – Mapping the Lake Bed Topography and the Mud LayerHydrographie des Steppensees Neusiedler See – Vermessung des Seebodens und der Schlammschicht[J]. Photogrammetrie - Fernerkundung - Geoinformation, 2014, 2014(5):339-350.