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PRINCIPLES OF CREATION OF PERMANENTLY WORKING SATELLITE STATE GEODESIC NETWORKS (CORS) POINTS OF UZBEKISTAN

Suyunov A. S.
Samarkand State Architecture and Construction University

Urokov O. A.
Samarkand State Architecture and Construction University

Mirzayev A. A.
Samarkand State Architecture and Construction University

Berdikulov U.
Samarkand State Architecture and Construction University

Abstract
In the article, the determination of the coordinates of the triangulation points and the errors in them were studied through the state satellite networks that work continuously in Uzbekistan. In the course of field research, based on the materials of the authors' research work in the Samarkand region, the error in determining the coordinates and distances by satellite methods was studied when the satellite moved away from the station. Building a network of GNSS stations is a new technology based on the use of satellite tools to increase geodetic accuracy.

Keywords: GPS/GNSS receiver, reference station, permanent satellite state geodetic network, CORS station, reference geodetic network, geodetic points, differential method.

Introduction

O‘ZBEKISTON DOIMIY ISHLOVCHI SUN’IY YO‘LDOSHLI DAVLAT GEODEZIK TARMOQLARI (CORS) PUNKTLARINING YARATISH TAMOILLARI

Suyunov A. S.
Samarqand davlat arxitektura – qurilish universiteti

Urokov O. A.
Samarqand davlat arxitektura – qurilish universiteti

Mirzayev A. A.
Samarqand davlat arxitektura – qurilish universiteti

Berdikulov U.
Samarqand davlat arxitektura – qurilish universiteti

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Annotasiya
Maqolada O‘zbekistonda doimiy ishlaydigan davlat sun'iy yo'ldosh tarmoqlari orqali triangulyatsiya punktlarining koordinatalarini aniqlash va ulardagi xatoliklar o'rganildi. Dala tadqiqotlari jarayonida mualliflarning Samarqand viloyatidagi tadqiqot ishlari materiallari asosida suniy yo‘ldosh usullari bilan koordinatalar va masofalarni aniqlashda suniy yo‘ldosh stansiyadan uzoqlashganda xatolik o‘rganildi. GNSS stantsiyalari tarmog'ini qurish - geodezik aniqlikni oshirish maqsadida sun'iy yo'ldosh vositalaridan foydalanishga asoslangan yangi texnologiya hisoblanadi.

Kalit so‘zlar: GPS/GNSS priyomnik, referes stansiya, doimiy sun’iy yo‘ldoshli davlat geodezik tarmoq, CORS stansiya, etalon geodezik tarmog‘i, geodezik asos punktlari, differensial usul.

Аннотация
В статье изучены определение координат пунктов государственной геодезической сети и ошибки в них непосредственно использованных постоянно действующих спутниковых сетей в Узбекистане. В ходе полевых исследований по материалам исследовательской работы автора в Самаркандской области изучена погрешность определения координат и расстояний спутниковыми методами при удалении спутника от станции. Построение сети станций GNSS — это новая технология, основанная на использовании спутниковых инструментов для повышения геодезической точности.

Ключевые слова: приемник GPS/GNSS, опорная станция, постоянная спутниковая государственная геодезическая сеть, станция CORS, опорная геодезическая сеть, геодезические пункты, дифференциальный метод.

I. INTRODUCTION

Application of GPS/GNSS satellite systems based on modern technologies, geoinformation systems, digital and laser-electronic measurement and calculation techniques, as well as laser scanning technologies to production in the system of geodetic works has become a modern demand [1] .

Establishing a permanent satellite network - base stations in the Republic of Uzbekistan is one of the new tasks. In the territory of Uzbekistan, at present, the creation of state geodetic reference points is a satellite technology. Its accuracy and economic efficiency are the main factors in solving geodetic supply tasks [4]. The advantages of permanent satellite stations over the traditional method are that they can operate 24 hours a day and do not require line-of-sight between them. The geometry of the network is not as important as in traditional geodetic networks, the accuracy is higher and more stable. Permanent satellite stations provide a single geodetic basis for accurate and high-precision global navigation systems. Application of GPS/GNSS satellite systems, geoinformation systems, digital and laser-electronic measuring and computing techniques and technologies to production is one of the important issues. Placement of differential satellite geodetic networks in our republic, design of permanent satellite state geodetic network (CORS station), use of satellite system in the establishment of

state geodetic networks and geodetic survey extensive measures are being taken to improve the measurement results [1].

II. OBJECTIVE OF THE RESEARCH

The evaluation of distances measured in geodetic networks is of great theoretical and practical importance. Due to the assessment of accuracy, it is possible to solve issues of technical and economic importance:

- to study the laws of measurement errors affecting the transmission of point coordinates and distances in geodetic grids of various forms;
- to determine the most rational option for establishing a network with different measurements of the points, azimuths and base sides located on it, based on the assessment of accuracy by modeling with the help of computer programs, by observing the earth's satellites;
- checking whether the nearest network element has achieved the required accuracy result through measurement methods during network establishment [1].

Placement of differential satellite geodetic networks in our republic, use of permanent satellite state geodetic network CORS points for further processing of GLOBAL positioning system (JAT) techniques and applications simultaneously at base stations (CORS) allows for differential correction of statistical GPS measurements obtained by reference to collected signals. In addition, CORS plays an important role in defining the geodetic information system of the country. The established coordinated CORS system then helps the online positioning user service to process in a single positioning mode to ensure the corresponding accurate and uniform positional coordinates [3].

III. METHODOLOGY

Continuous satellite geodetic network points are denoted by the following abbreviation CORS (Continuously Operating Reference Station) and are a system with an infrastructure for determining the precise coordinates of a point. CORS is a network of permanently installed GNSS receivers and antennas distributed over a certain area, which can transmit stable and high-precision RTK (Real Time Kinematic) correction data to users. CORS allows researchers to conveniently carry out topographic-geodetic field research without installing base stations [2].

The data received from the satellite is used to create and update cadastral plans and maps of the exact location in the fields of geodesy and cartography, to check the surface and subsurface layers of the earth, to determine the boundaries of land and real estate, to determine the geodetic and cartographic coordinates of geodetic networks, aerial photography It is used to solve the problems of photographic center photography, industrial and civil construction, project-research work, pipeline laying, power line design, soil and structure change monitoring, utilities, high-precision navigation work in transportation [4] .

IV. RESULTS

It is recommended to control the correctness of the assessment of the accuracy of the coordinates of the geodetic points. The accuracy of GNSS measurements is affected by the error of the light passing through the ionosphere and troposphere, the error of the receiver, the

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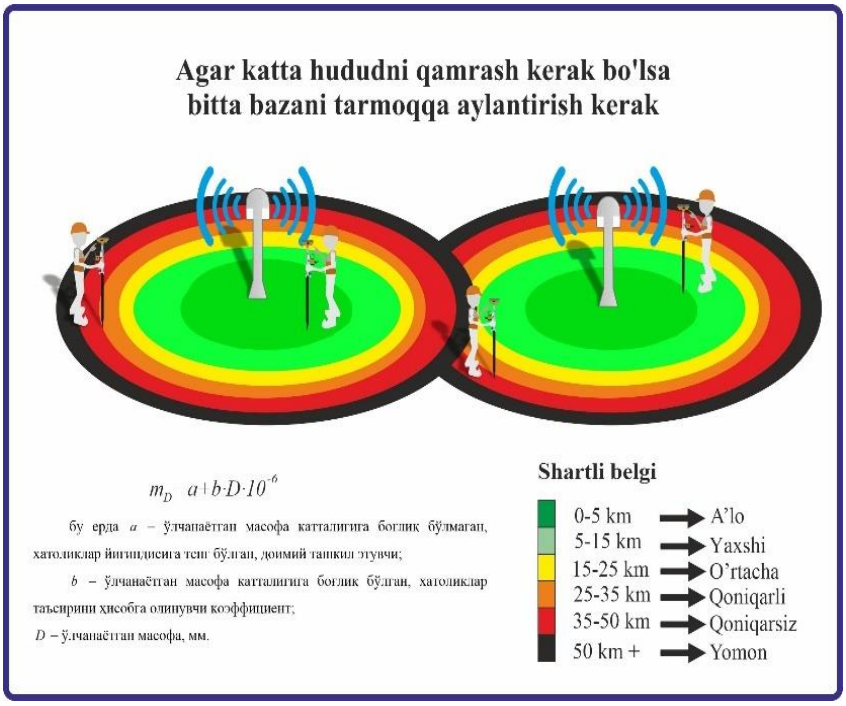
error of the reflection of the light from surrounding objects, etc. In addition, the "geometric factor", that is, the value of the angles between the directions depending on the satellites, also affects. The larger these angles, the better the approximations, and therefore the more accurate the measurements.

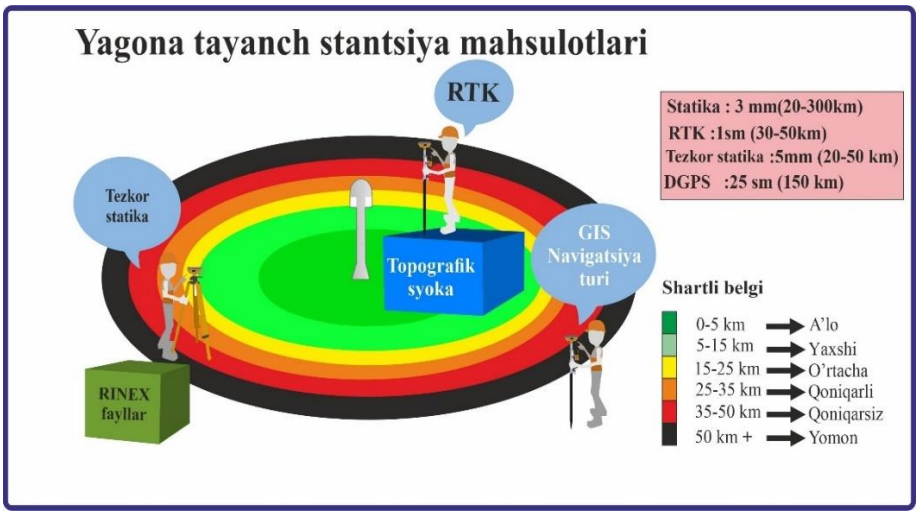
In high-precision geodetic wave receivers, the accuracy of measuring lines in practice is the following level, where - the length of the base (base) line (5-10 km). [1,2,5]

Using the algorithm of "Leica Geo Office" program that equalizes the GNSS measurement results mentioned above, errors and corrections are taken into account by measuring and equalizing the base line [3].

The modern geodetic instruments used in the creation of the geodetic network created in the city of Samarkand were subjected to metrology on the reference basis. Their results are presented in the appendices section (Fig. 1).



a)



б)

Figure 1. CORS GNSS Communication Base Station Satellite Tracking Server Linking and Error Estimation

At present, in the territory of the Republic of Uzbekistan, the points of the unified coordinates and height systems, respectively, permanent satellite state geodetic network (DSYDGT) are operating. Subjects engaged in geodesy and cartography are widely using this database, but the analysis of its accuracy is not fully covered [4].

V. CONCLUSION

Creating a network of permanent satellite state stations in Uzbekistan is a timely task, which requires further expansion until it covers the entire territory of the country.

The implementation of the project allows to increase the investment aspects of the economy of the Republic of Uzbekistan, to expand international cooperation, as well as to train specialists in the field of satellite navigation and to increase the scientific and technical potential in this regard.

The permanent satellite state geodetic network guarantees an increase in the quality of the work performed by using high-precision initial data collected at the objects.

To reduce costs during the period of differential correction and high-precision navigation area design, reconnaissance, establishment of points in the state geodetic network, and geodetic observation (measurement works) created with the help of the permanent satellite state geodetic network. leads to [1,2,3,4].

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