THE POLARIMETRIC MEASUREMENT OF RELIEF AND ASSESSING ACCURACY DEPENDING ON THE SPEED OF MEASURE.

A. Skripets , V. Romanenko , V. Tronko, A. Klochan
The National Aviation University, Ukraine , Kiev, Komarova 1, e-mail: avionika2006@ukr.net

In this paper we described polarimetric method of measuring terrain and assessed measurement accuracy depending on the measuring speed.

Introduction

The proposed method relates to the field of geodesy measurements and designed for automatic measurement of terrain. The proposed method can be used to measure the slope of road and airport surfaces, railway lines, geometric description surface of complex engineering objects, such as bridges, roofs of buildings, architectural elements.

In modern ground geodesy in the performance measurement work required two conditions: to measure accurately and cost time. Most existing methods that involve the use of of geodetic instruments (theodolites, levels, light rangefinder, tachometers, etc.) are precision. At the same time the speed measurement process, that they provide is low. In addition, a labor costs in the performance measurement work, despite the automation of certain operations is still considerable.

The low speed of modern ground geodetic instruments due to the peculiarities methods measuring process. In particular, during the measurement in determining the coordinates of an arbitrary geometric point of relief must focus its image, and measurements on reference areas by levels, theodolites, accelerometers [4]. And it takes some time.

Description of the method

The proposed method polarimetric measurements in terrestrial geodesy and other fields makes it possible to solve the problem while ensuring high precision and speed measurement. Also provides autonomy and full automation of the measurement process.

The proposed method provides a considerable reduction in time required to conduct measuring work. The presence of mobile base in the design of the measuring system ensures its portability. The proposed method makes it possible to carry out work both day and night, as well as weather conditions, that causing poor visibility. It also allows to carry out rapid monitoring area, with constantly changing relief, such as the runway at the airport.

In the simplest case, the method may be implemented using a light source 2, polarimeter 3, device processing and storing information 4, that are installed on moving from 1 (Figure 1).

The essence of the method is as follows (Figure 1). Light source 2, which is used as a laser, generates a light beam. In polarimeter 3 carried polarization of light using a polarizer. At the launch pad before the movement basis 1 track to the plane of oscillation of the light vector polarized light with respect to the direction of the light beam was located at an angle of 90^{o}. Moving base 1, moving along the surface relief, receives position which corresponds to the angle α relative to the horizon at some fixed point of the route. Because the polarizer polarimeter 3 rigidly attached to the base 1, the plane of oscillation of the light vector polarized light will also be rejected on this same angle as the mobile base. Azimuth deviation of the measured plane analyzer polarimeter 3 with high accuracy. Information on the measured angle α is fed into the device processing and storing information 4. It is calculated $tg\alpha$. This value is the slope of the tangent line and the derivative of a function at some fixed point curve relief.

Then make integration tgα, which resulted to the set of fixed points describing the path traversed by the measuring device. Curves this way and will determine the relief.

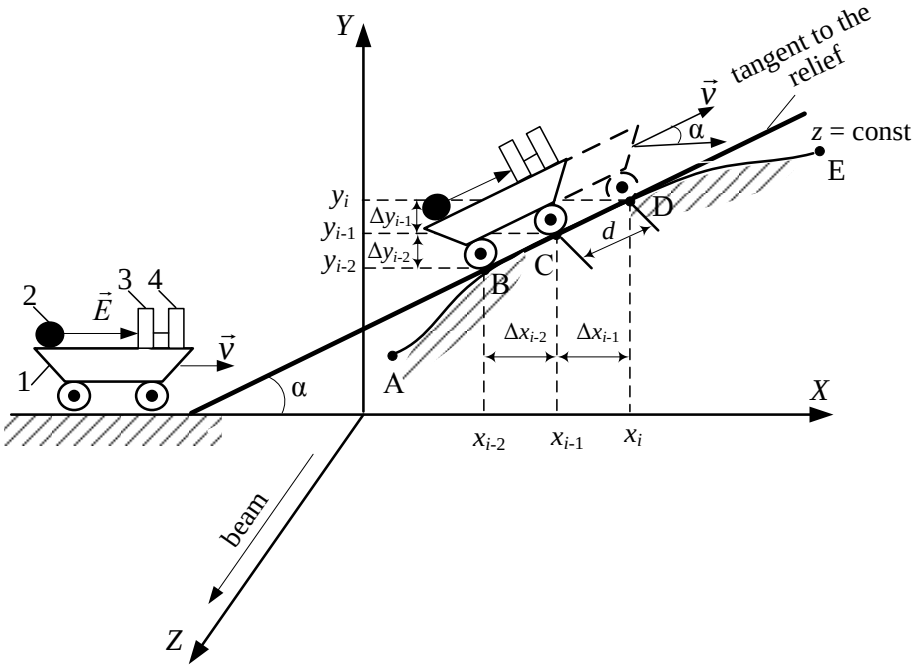

FIG. 1 The scheme of polarimetric measurements of surface relief: 1 - mobile base, 2 - light source, 3 - polarimeter; 4-device processing and storing information.

Investigation of accuracy

In conducting the measuring works is a definite relationship between accuracy and time measurement. This dependence is determined by the product of time measuring on the value the measuring accuracy.

What is constant for a given type of devices.

$\Delta \cdot t = const$

From the formula it follows that for a constant increase in accuracy is possible by increasing the measurement time. During the research were obtained mathematical dependencies defined precision characteristics polarimetric method of measuring terrain versus time. Analysis of the results of this calculation formulas showed that for constant polarimetric method of measuring is one of the smallest.

Conclusions

1 polarimetric method of measuring terrain provides high accuracy and speed of of geodetic measuring work.

2 found that the constant product at the time of measurement accuracy for polarimetric method is one of the smallest.

References

1. Генике А.А., Побединский Г.Г. Глобальная спутниковая система определения местоположения *GPS* и ее применение в геодезии. – М.: Картгеоцентр, 2005.–286 с.

2. Дерюгин И.А., Кузнецов Ю.А., Тронько В.Д. Фотоэлектрический поляриметр инфракрасного диапазона. – Л.: Оптика и спектроскопия, 1970. – С.415-418.

3.Шерклифф У. Поляризованныйсвет / У. Шерклифф; пер. с англ. под ред. Н.Д. Жевандрова. – М.: Мир, 1965. –264 с.

4. Боровна В.О., Борисюк Л.В., Бурачек В.Г. Автоматизація геодезичних вимірювань. – Чернігів: Чернігівські обереги, 2004. – 368 с.