Geodetic Monitoring For Definition Of Deformation Of Engineering Constructions

Davron Juraev, Khusnora Juraeva, Pokizakhon Muslimova

Abstract: In this article applicate of spatial methods of interpolation for results of geodetic monitoring of constructions allows to simplify processes of planning, control and decision-making.

Index Terms: Geodata, geo informatics, geostatistical, deformation, model, spatio-temporal, techno genic, variogram, visualization.

1 INTRODUCTION

Nowadays of a problem of geodetic monitoring of objects and the spatial analysis of deformations are the most difficult in geodetic branch as they demand achievement of the maximum accuracy of measurements, automation of the process of supervision, the maximum reliability of used devices and presence of extremely flexible tools of processing and the analysis of the data.

2 METHODS OF RESEARCH

One of the most interesting trends in the field of geodesy and geo informatics is the issue of introducing geo information systems and technologies in human production. The importance and relevance of this issue is due to the fact that geographic information systems and technologies that allow you to create, store, analyze, process and provide consumers with spatially distributed information are the most important and rapidly developing component of the life of modern society [1,2,3,4,5,6]. The introduction of modern methods of modeling and analysis of geodetic data into modern science and production is an important factor in the successful economic development and competitiveness of territories. The vital activity of the city has a significant impact on buildings and structures under construction and already built, it leads to the emergence of additional negative impacts of a natural and techno genic nature (accelerated corrosion, techno genic dynamics, deterioration of properties, soils). To make effective decisions to reduce the risk of living in areas affected by natural and techno genic factors, reliable information on the real deformation state (residual resource) of buildings and structures built in these regions is required. Such information is provided by monitoring the technical condition of structures and spatial analysis of the results of geodetic observations of deformations of the foundations of buildings. To raise efficiency of the existential analysis probably by means of the unified storage of the available information by results of geodetic monitoring of deformations of the bases of buildings. Such possibility is provided with bank of the geospatial data.

- *Davron Juraev, PhD at Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan.*
- *Khusnora Juraeva, Senior lecturer at Tashkent Institute of Architecture and Civil Engineering, Tashkent, Uzbekistan.*
- *Pokizakhon Muslimova, Lecturer at Tashkent institute of design, construction and maintenance of automobile roads, Tashkent, Uzbekistan.*

In such databank the actual information on deformation process of the basis of a building contains. On the basis of inquiries to a databank it is possible to make the existential analysis with application, so-called geostatistical methods. Scopes of geostatistical methods are rather various. They have received wide application in geology, cartography at the decision of such spatial problems as creation of a card of distribution of temperatures, an estimation of natural risks and etc. However, such methods in engineering-geodetic practice were not applied almost [7,8,9,10,11] In engineering-geodetic practice it is expedient to use the existential analysis for interpolation of results of supervision over deposits of engineering constructions and creation of digital models of surfaces. On the basis of the modern measuring technics and GIS-Technologies it is possible to put computing problems of iterative character, that is to check a number of alternative hypotheses and to estimate the end results. Geostatistical methods allow to reveal fuller information on a technical condition of the bases and a building as a whole, and also to define areas non-uniform a deposit, to construct digital models construction deposits, besides, using various methods of interpolation, to simulate model errors. However, at use of spatial methods of interpolation for results of monitoring of engineering constructions there are some questions [12,13,14,15,16]. There are questions of a choice of the software which would allow to use most effectively geostatistical methods and to carry out interpolation relative and absolute a deposit. Annually the number of the problems connected with processing and interpolation a deposit of engineering constructions on the basis of the Computer increases. Thus methods of interpolation and algorithms of processing are constantly improved. Important also questions of improvement of quality of algorithms of modelling, construction of digital models construction deposits, a choice of the model most qualitatively describing results of monitoring a deposit and modelling of errors of models for today are represented.

3 RESULTS

One of important problems is methodological maintenance of processes of gathering, processing, interpretation and visualization of the geodata at supervision over deformations of buildings and constructions. At the same time, it concerns and creation of digital models a deposit of constructions for the decision of engineering problems and information support for acceptance of well-founded decisions. Besides, there is a problem of an estimation of accuracy of the spent interpolation of the data for the analysis of quality of received models.

To achieve this goal, it is necessary to solve the following tasks:

1) to investigate methods of spatial analysis and 3D modeling of deformation processes using GIS technologies;
2) to develop a methodology of spatio-temporal analysis of deformations of the foundations of buildings and structures from geodetic observations using digital precipitation models;
3) establish the principles of variogram and covariance analysis to obtain interpolation surfaces based on the results of geodetic observations of precipitation of the base of buildings and structures;
4) to develop a geospatial data bank structure for the unified storage of geodetic observations of deformations and the calculation of mathematical characteristics of sediments.

- develop methods of spatio-temporal analysis of deformations of foundations of engineering structures with the construction of digital models of sediments;
- develop a comprehensive method for digital modeling and analysis of the results of geodetic observations of precipitation, taking into account the coefficient of water saturation and soil density;
- the structure of a geospatial data bank was proposed for the automated processing of the results of geodetic observations and analysis of the deformation processes of the foundations of buildings and structures.

The theoretical significance of the work is to develop:

- methods for analyzing the results of geodetic monitoring of deformation processes of the foundations of buildings taking into account soil parameters;
- an algorithm for assessing the accuracy of interpolation surfaces for digital models of sediments of engineering structures;
- three-dimensional modeling of the sediment of the foundations of structures based on spatial analysis methods using an exponential variogram model.

4 CONCLUSION

Consequently, practical significance of the work is to increase the accuracy of the deformation model by choosing the parameters of the function of constructing the interpolation surface, detailing the spatial analysis of the sediment foundations of engineering structures. In addition, in the development of digital precipitation models for solving engineering problems, namely: for a more complete analysis of precipitation observations; modeling of interpolation surfaces; calculation of precipitation values of inaccessible or lost grades; analysis of deformations of objects located in large areas, and others.

5 REFERENCES

[1] Nikolaev S.A. Statistical studies of sediment engineering structures. M: Nedra, 1983,112 pp.
[2] Clayton, V. Deutsch. Geostatistical reservoir modeling. Oxford, University press, 2002.
[3] Jurayev D.O. Theory of mathematical operation of geodetic measurements. Textbook Part 2 The least squares method. Tashkent, 2014.160 p.
[4] Golubev V.V. The theory of mathematical processing of geodetic measurements. Book 1 Fundamentals of the theory of errors. M., MIIGAiK, 2005, 70 pp.
[5] Markuse Y.I. The theory of mathematical processing of geodetic measurements. Book 2: The Basics of the Least Squares Method and Equalization Computing. M., MIIGAiK, 2005, 288 pp.
[6] Ganshin, V.I. Measurement of vertical displacements of structures and stability analysis of benchmarks / M: Nedra, 1981.
[7] Ganshin, V.N. Geodetic work during the reconstruction of industrial enterprises / M: Subsoil. 1990.- 149 pp.
[8] Gulyaev, Y. P. Prediction of deformation of structures based on the results of geodetic observations / Novosibirsk: SSGA, 2008, 256 pp.
[9] Gulyaev, Y.P. Prediction of deformation of structures according to geodetic data /Geodesy and Cartography. - 1983. No. 12.17-21 pp.
[10] Zhukov, B.N. Guidance on the geodetic control of structures and equipment of industrial enterprises during their operation / Novosibirsk: SSGA, 2004, 376 pp.
[11] Zhukov, B.N. Geodetic control of structures and equipment of industrial enterprises: monograph / Novosibirsk: SSGA, 2003.- 356 pp.
[12] Guidance on field observations of deformations of hydraulic structures and their foundations by geodetic methods.M: Energy, 1980.200 pp.
[13] Guidelines for observing deformations of the foundations of the foundations of buildings and structures. M: Stroyizdat, 1985, 160 pp.
[14] Guidelines for observing deformations of the foundations and foundations of buildings and structures. M: Stroyizdat, 1975, 142 pp.
[15] ArcGIS™ 3D Analyst™: Using Geostatistical Analyst ESRI 380 New York St. Badlands, 2002. - 307 pp.
[16] 16. ArcGIS: Geostatistical Analyst, White Paper 08 2001 ESRI 380 New York St. Badlands, 2001, 22 pp.