METHODOLOGY FOR DESIGNING AND EVALUATING RESULTS OF GEODESIC OBSERVATIONS OF ENGINEERING STRUCTURES USING THE LEAST SQUARE METHOD

Habib Mazen Hatoum
St. Petersburg Mining University, 2, Vasilievsky Island, 21 line, St. Petersburg, 199106, Russia, Ph. D. Student, Department of Engineering Geodesy, phone: (952)234-69-86, e-mail: habib.hatoum@gmail.com

Murat G. Mustafin
St. Petersburg Mining University, 2, Vasilievsky Island, 21 line, St. Petersburg, 199106, Russia, D. Sc., Professor, Head of the Department of Engineering Geodesy, phone: (812)328-86-84, e-mail: mustafinm@mail.ru

In geodetic practice, the use of robotic total stations in monitoring the deformation processes becomes the norm. In this case, various software systems for processing the measured values and their visualization are used. At the same time, issues of optimizing the deformation network and interpreting the results of observations remain very relevant today. In addition, ensuring the stability of control (initial) points still remains a problem in solving various tasks, and above all in monitoring observations. Previously, it was apriori assumed that the starting points located outside the zone of influence of the observed object are considered stable. However, to achieve reliable results with various measurements, the stability of the starting points should be checked and this should be considered as an additional monitoring parameter. There are developments in this direction, and they are related to the consideration of displacements and deformation marks and starting points in a single system (network). The research results presented in this article are novel in terms of the methodology and algorithm for calculating the coordinates of observation stations, deformation marks, and starting points without building a single network. At the same time, each observation cycle provides an assessment of the stability of all points. The observation technique was developed in relation to the construction of an engineering structure: an excavation for the subway lobby. The issues of optimizing the location of observation stations, deformation marks (points), and assessing the accuracy of their displacements are successively considered. When analyzing the relative displacements of the deformation marks, the ellipses of the error of the position of the points are compared. If the resulting displacement between the measurement cycles goes beyond this ellipse, then speaking about the significance of the displacement and its direction is allowed. A simplified method for detecting the displacements of the starting points by comparing the elements of the residual matrices determined in different observation cycles is also considered.

Keywords: monitoring, engineering structures, geodetic observations, least squares method, reference points, deformation network, displacements, deformations

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