prospect hole (within the extraction level area) and the value of useful components. Thus, the neural network will have two input variables and one output. During using this method analysis, the data are divided into three groups – for training, for testing in the process of training, and for post-training testing.

So far, neural network application has not been employed extensively in estimations and prognoses concerning mineral deposits. Besides, the unique character of natural conditions, varying even within the same type of deposit, requires experimenting with different types of prognostication model.

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THE RELEVANT IMPORTANCE OF THE ISSUE OF ENHANCING THE EFFICIENCY OF ORIENTATION AND CONNECTION SURVEYS AND HEIGHT BENCH MARK TRANSFERS

Transferring height bench marks into a mine's underground workings and orientation-connection surveys are specific types of mine surveying that impact the accuracy of the surveying support for underground mining and it is therefore necessary to take into account the particular importance of their performance.

The increasing depth of mining makes rock bursts and other cataclysms more likely, so the issue of enhancing the accuracy of determining the height bench marks used to solve a wide range of problems in underground mining is becoming more relevant.

As is known, the orientation of underground mine survey networks completes two tasks: the transfer of the directional angle (network orientation) and that of the planned coordinates X and Y (network centring). The transfer of the height bench mark (the third coordinate) information is carried out independently of the results of the orienta-

tion-connection survey, since it involves the use of completely different instruments and equipment.

The aforementioned types of operations are usually performed by using known conventional methods. The main disadvantages of those methods are the considerable complexity of work, the necessity of introducing a large number of adjustments into measurements (for temperature; for comparing tapes, wires, measuring disks; for expansion due to the own weight and the suspended load, etc.) and, as a consequence, a high error rate of determining the height difference between the bench marks. Other disadvantages include limitations of using traditional methods due to the considerable depth of mine operations.

Quite frequently, a mineshaft has to be stopped from operating for a day or more, which results in significant financial losses and the impossibility to use the shaft as an emergency exit.

When making adjustments, there must be a strict compliance with the reference samples of the materials used for manufacturing parts of measuring instruments, which is almost impracticable. The fact of a slight mismatch between the differences in height when retransferring a bench mark data is therefore not a sign of the high accuracy of determining the difference in height between the bench marks on the surface and in the mine.

When orienting mine workings, problems sometimes arise with lowering plumb bobs into the shaft and with the bobs' oscillations, which significantly complicates measurements. Similarly, the probability of foreign objects accidentally falling into the shaft from the mine surface or from the mine's upper levels constitutes a heightened risk of work on a lower mine level, while the separate performance of the related horizontal and vertical surveys increases the complexity of work and the duration of the entire set of operations.

The use of gyroscopic orientation and laser scanning systems is almost indispensable at depths of underground workings of more than 500 m, since it is not dependent on installing plumb bobs in mineshafts and stopping the descent or ascent of people or loads. Specialized organizations usually perform this kind of work. They have the appropriate equipment such as gyro-theodolites, gyroscopic fixtures or lasers. Such operations are quite expensive and not every

mining company can afford them. However, the qualification of surveying personnel of most mining companies makes it possible to perform the orientation independently, so the traditional orientation methods have not lost their importance, and are used quite often.

In order to enhance the efficiency of mine orientation and connection surveys as well as height ones, a comprehensive new method is required that would improve the accuracy of transferring spatial coordinates and directional angles and would be significantly more cost-effective for companies.

Theoretical studies in this area have shown that it is possible to carry out orientation and connection surveys simultaneously with the transfer of the height bench mark information, and this can be done by using digital photography and processing the obtained images with the help of digital photogrammetry methods.

In order to make a transition from theoretical research to its practical implementation, it is necessary to investigate the issues concerning the choice of the most advantageous geometry of the mine's vertical shaft entry figure and to substantiate a correct number of binding bench marks. That should be done considering the impact of underground mining conditions on the modern photo cameras and the minimization of error sources.

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PREDICTION OF MINERAL RESOURCE QUALITY INDICATORS IN BALANCE RESERVES

The problem and its relation to the scientific and practical problems. The problem of forecast evaluation of the mean values of geological features in the interior - one of the most important functions in the implementation of geological surveying and quality control of ores and ore processing. The use of methods based on the theory of random functions, gives satisfactory results for blocks of small size, low "lit" intelligence, which most often occur in existing enterprises.