ПРИМЕНЕНИЕ ГРИД-СИСТЕМ ДЛЯ ПОИСКА ПРЕДЕЛЬНЫХ ГРАНИЦ РУДНЫХ МЕСТОРОЖДЕНИЙ С ИСПОЛЬЗОВАНИЕМ ПАРАЛЛЕЛЬНОГО ГЕНЕТИЧЕСКОГО АЛГОРИТМА

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Проводится теоретическое обоснование генетического алгоритма нахождения предельных границ карьеров рудных месторождений, исследуются вопросы параллельной реализации сформулированного алгоритмического подхода на многопроцессорных вычислительных системах и приводятся результаты вычислительных экспериментов на базе грид-системы под управлением платформы Globus Toolkit.

APPLYING THE GRID-SYSTEM TO COMPUTE NEAR-OPTIMAL OPEN PIT LIMITS BY USING PARALLEL GENETIC ALGORITHM

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The problem of finding the open pit limits is one of the most important stages of planning the development of minerals by opencast methods. Its solution is, first, to evaluate the amount of profits, and secondly, is the foundation for the next stages of design, such as finding the optimal network of transport routes and career choice of locations for waste dumps and processing factories.

In finding the open pit limits must be considered the spatial distribution of minerals, and made of technologically permissible angles of pit slopes. From a computational point of view, this task is extremely difficult, because to model the fields, even mid-sized accounts to handle large data sets. Therefore, to solve this problem, it is advisable the use of grid systems.

Traditionally, to find the open pit limits, apply the modifications of "floating cone" algorithm and based on graph theory Lerch-Grossman algorithm. These algorithms are characterized by low accuracy (floating cone) and a large computational complexity (Lerch-Grossman algorithm), so there is a need to develop new methods for solving this problem.

Were conducted a theoretical study of the genetic algorithm for finding the open pit limits and investigate the issues formulated by the parallel implementation of the algorithmic approach to grid system under Globus Tollkit middleware.

To expand the search area, reducing the likelihood of premature convergence and reduce computation time has been developed parallel version of the algorithm - a hierarchical parallel genetic algorithm with two levels of parallelism.

The first level of parallelism is organized by the use of the island model parallel genetic algorithm. This acceleration is achieved by allocating some of the initial populations of developing independently, and periodically exchanging the best genetic material. This exchange is through the mechanism of migration of individuals between populations.

The second level of the hierarchy is organized through the use for each subpopulations "master-slave" model of parallel genetic algorithm. It lies in the fact that within a single population of each individual's fitness function is calculated in the evaluated independent stream, which eventually leads to an acceleration of the algorithm.

The proposed model of parallel genetic algorithm is well superimposed on the architecture of large heterogeneous distributed computing systems, such as the grid system. The results of computational experiments have shown high potential of the proposed method to perform calculations on regular block model mineral deposits, open method developed.

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