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Opinion

Increasing Importance of Using Artificial Intelligence Methods and Regarding Uncertainty in Mining and Tunneling Constructions (Special in Urban Spaces)

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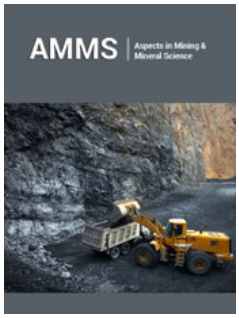

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Opinion

In the 21st century, the mining and tunneling constructions are confronted with high complications in comparison to the past. These complexities are more obvious in urban areas. It's caused increasing project's risks.

What factors have caused increasing of these complications?

Increasing effective parameters: With development of technology and population growth in the world, effective parameters on projects have increased more and more. For example, if we want to construct a tunnel under a crowded city, we need to consider tensions caused from buildings, people and automobiles. When we know some these parameters are variable, regarding of them are very tough.

Prediction of ground's behavior is very difficult: In analysis of ground's behavior, we are encountered with some uncertainty. The measure of this uncertainty has depended on intact of ground, reducing intact is caused increasing uncertainty. As the city is becoming crowded, required facilities for people are growing continuously. Hence we have to use most spaces that exist underground. For example, under a city, the number of constructions are increasing for various purpose such as the electric power grids, gas grids, municipal water systems, sewage treatment systems, storm drains, and communication services. These constructs aren't independent from each other. So we have to consider all of them before the beginning of each ones.

Initial cost (before and during constructing a project): Today, unlike in the past, the number of construction contractors have been increased, so a high competitive space has been created to enter into a project's contract. Therefore, contractors have to minimize costs, whereas conditions have complicated and become hard.

Secondary costs and atonements (after happening an accident during a project): The immense costs imposed after failing a project are the most important thing changed in comparison to the past. With the development of communication technologies, public opinion has supervised on progress and failure of projects. Sometimes, the costs caused from a project's damaging can be more than entire initial costs. Therefore, contractors have to be careful about project's risks before happening of them.

Why we need to use artificial intelligence?

According to above mentions, uncertainties and complication in mining and tunneling projects are a serious problem so we have to consider them carefully in initial phases. On the other hand, we know it is impossible to analyze ground's behavior directly. Artificial Intelligence (AI) can be a useful solution. Artificial intelligence includes several various methods such as Artificial Neural Network (ANN), pattern recognizing, image processing. Each of these methods can be effective if we apply them correctly. ANN has been used in prediction and management of underground constructions risks that have been published in various journals. The most important reason why AI is useful is that AI learn relations of among effective parameters from real data. If it is learned correctly, we can confide that complexity and uncertainty have regarded appropriately.