



VoxelNET

The 3D network connecting
the intelligent mine

Challenge

More data has been generated worldwide in the past two years than in the rest of human history combined, and the pace is increasing. In the mining and minerals industry, an explosion of data has been stimulated by digital sensing and measurement, analysis, automation, simulation and control of equipment, transport and production.

Almost all this information relates to specific volumes of space, and is referenced in three dimensions. Yet the internet system we use to store, analyse, transmit and display it was built for handling text and documents in two dimensions. To work in 3D, it has to be modified with software plug-ins.

Mining3 researchers were challenged by problems—such as controlling underground drones and tracking specific ores through production—which demand a more efficient way of storing, analysing and sharing 3D information. So they embarked on developing a computing environment where information could be handled directly in 3D, and 3D data could be accessed, shared and communicated across different devices simultaneously. It is called VoxelNET.



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How it works

VoxelNET is linked to and supported by the internet. It is a simulated volume generated and made up of voxels, the 3D volume equivalents of the 2D pixels on a screen. The voxels are cubes, the size of which can be defined to fit the task at hand. In VoxelNET each voxel can be precisely located by means of an inbuilt addressing system, known as voxel protocol.

The voxels can hold information, such as density, ore grade or rock hardness. They can be programmed to store, integrate and cross-correlate data from many different sources, to act autonomously in finding and processing information, and to interact with each other in precise ways.

The voxels also come in several different varieties. Spatial Voxels, for instance, are linked directly to a precisely defined one-metre by one-metre grid of the Earth's surface from five kilometres underground to 20 kilometres above ground. The matter within Material Voxels can be labelled and traced wherever it moves.

The voxels and the data they contain can be subject to different defined layers of security—broad access allowed for some information or levels of simulation, restricted access for more confidential information. And data can be spatially referenced or anonymised.

Benefits

VoxelNET can be used to generate a virtual mine and simulate its working, to store remote sensing information on the fly, or to track or control equipment or material remotely, all in 3D and able to be accessed by many different devices simultaneously.

The applications include:

- Efficient storage, integration and processing of all data pertaining to a region of space
- Effectual sharing of 3D information
- Time stamping of information to allow tracking of changes in a region of space

- Remote control, including collision avoidance, of underground drones or other autonomous vehicles beyond line-of-sight from anywhere in the world
- Regulation and inspection of autonomous equipment
- 3D virtualisation of mine or production-sites for planning purposes
- 3D simulation of mining or production processes, including blasting
- Tracking of localised ore through the mining and production cycle
- Integration and tracking of production with financial transactions and accounting managed using block chain technology
- Efficient storage and greater accessibility and availability of 3D information, such as in film and media industry videos

Status

VoxelNET demands significant computer processing, storage resources and expertise. At present, it is only available through consultation with Mining3 3D systems researchers. But in 2018, VoxelNET will be released as a commercial product.

Development of VoxelNET as a cloud based distributed platform is in progress. The platform allows input of such information as drill hole data, real-time vehicle data, remote sensing data and 2D and 3D maps by a single client/user. The applications supported include simulation, remote vehicle control, and interactive visualisation. MineMIO, a 3D mine site monitoring and intelligent optimisation platform, is also available.

By the end of 2019 the research team plans to have the VoxelNET cloud platform in a form which will support networked integration and sharing of high-volume data input by multiple clients. The team is working towards an environment incorporating several different layers of security that are distributed among multiple servers, supports data input by multiple clients and can be accessed and used for multiple outputs.

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About Mining3

Mining3 is the world's leading research organisation, directed by its global mining industry members to develop and deliver transformational technology to improve productivity, sustainability and safety.

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