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Mining a multi-billion-dollar wearables market

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Mining companies across geographies are collaboratively trying to explore the use of mixed reality and wearable technology to revolutionize the way the industry visualizes proposed mining and engineering designs, and simulate mining activity in virtual space before a single blast.

They are able to use the same technology to train workers in a virtual mining environment, simulating conditions using HoloLens style technology and haptic devices such as gloves and vests to simulate physical sensation to the wearer.

Companies are able to utilize wearable technologies to monitor employee safety and manage equipment's on a worksite.

As per research and advisory firm CCS Insight's latest sector reporting, the wearable technology market could be worth US\$34 billion by 2020.

Many mining organizations have already started to experiment with smart wearables such as helmets, glasses, jackets, gloves and watches. These technologies can be used to improve productivity and to make dynamic working conditions more predictable and prepare for maintenance and safety hazards via simulation training. Field smart wearables will make it easier to identify whether any personnel or equipment is in close proximity to a potentially hazardous area or a catastrophic incident.

Mining companies are also investigating the use of mixed reality technology - virtual, augmented and artificial intelligence - in visualization of geological models and mine design, and in simulation of mining activities from mine planning.

Companies are looking for, and requesting, the ability to do simple and interactive virtual reality with various elements of mine design and infrastructure, and rock mass characterizations, such as lithologies, alterations, grade, fracture density and others.

The companies are looking to provide geologists, geotechnical and mining engineers with new insight into an orebody, and understanding of how a mine will perform.

At the moment the use of mixed reality technology such as HoloLens is restricted to office-based settings. However, as wearable computing power and technology improves and gets smaller, devices such as smart contact lenses, linked with spatial edge connectivity in the mine environment, will enable visualization of mine design in the mine operation environment for direct comparison of planned versus actual progress.

Smart wearables in mines

Wearable augmented reality technologies such as smart helmets allow hands-free communication with a central mine operations control room. As part of new digital programs mining companies are actively investigating the use of smart helmets integrated with their mine communication networks.

Via PoCs. Hardware companies, as part of their IoT offering, are collaborating with system integrators on innovations in edge-device and helmet interactions.

Proof of concepts are being developed to access standard operational procedures for maintenance activities from content management systems, providing computer-voice guided workflows for field inspections, and remote mentoring functionality for subject-matter-expert interaction with field operators.

The smart helmets enable field data capture of simple maintenance or incidents forms - with the ability to integrate voice and video input for extra contextual information - to boost routine equipment inspection, while AR and location awareness capabilities of the smart helmets allow for historian and edge device interfacing to obtain IoT sensor data for analysis of simple trends when workers come within range of equipment.

Wearables such as Google Glass and Realwear have the ability to scan the equipment for its health status and to guide field personnel in maintenance activities by acting as a virtual remote operations centre.

Smart watches with maps-enabled features will help in finding the shortest and safest possible route within a mine as well as give the physical location of the miner. This will ensure continuous monitoring of the movement of the miner and the rescue and emergency team can be immediately contacted in case of any unnatural event. It will also be equipped to measure the miner's biomechanical data in real time and send fatigue warnings.

A smart shoe with microelectronics and sensors that are integrated into the sole will help to measure the miner's biomechanical data in real time and evaluate their form. It informs him of incorrect posture position, and sends warnings about potential slip conditions and fatigue conditions.

The miner of the future will be 'enabled' with a smart sensor that provides smarter mine safety solutions by accurately monitoring the safety of the people on site and improving communications by providing real-time alerts based on continuous tracking of workers. And a smart jacket with gaming technologies which can send a pulse to the wearer can be used in a mining scenario for collision avoidance or danger proximity warnings.

Smart wearables in training

Virtual reality technology is being used in training and visualization exercises. There are many companies working in the AR/VR training space, using near-realistic animation engines to simulate maintenance operations on equipment using original-equipment-manufacturer 3D parts and plant engineering 3D models. Capture of historian and IoT sensor data can be played back via this 'digital twin' to provide realistic training scenarios.

The smart jackets and gloves and other haptic devices can be using in training and simulation scenarios - like in gaming - to provide near-realistic feedback on mining environment conditions.

It is not uncommon that workers that have undergone expensive training are not prepared for an underground mining environment. Smart jackets and gloves can be used to help simulate the environment, adjusting temperature, simulating vibrations and signalling equipment proximities. The fabric of the jacket can be fitted with a cooling element that changes the body temperature of the miner, to simulate mine temperature changes. The closer the experience of the working conditions in a training environment the better the 'experience' for the worker.

Futuristic smart wearables

Breakthrough inventions expected to disrupt the wearable tech industry include drone-enabled features in smart watches which give a watch the capabilities of drones - capturing images and providing live feed to a control centre.

The wearable market of the future will see user experience improved through amalgamation of current technologies with cognitive solutions such as machine learning and artificial intelligence. Workers will be able to scan equipment in real time for defects and share the same with people placed at far off locations to solve problems at a faster rate.

This will boost mining company maintenance strategies.

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