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Acoustic device for recording and tracking rock hazards on the mining face

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Abstract

To enhance personnel safety and operational efficiency in underground mining, this project introduces an innovative acoustic device for recording and tracking rock hazards on the mining face. This system combines advanced acoustic analysis with an ultra-wideband (UWB) location system to interpret sounds produced during rock mass sounding and scaling. The location system is georeferenced to the mine's local coordinate system using available survey pegs. By integrating these technologies, each acoustic data point includes a spatial XYZ coordinate which facilitates tracking of loose rock locations throughout the mining excavation process. This dual-sensory approach advances previous methods by leveraging the innovation of acoustic technology and tailoring algorithms to specific rock types, enhanced by the tracking function so that rock hazards encountered underground can be mapped and communicated to the operational team. The collected data offers a systematic approach to hazard identification and enhances mine designs and operational strategies by providing insights into the dynamic response of the rock mass during excavation under different mining conditions. This project offers a new approach to proactive hazard management, potentially transforming how mines are operated and mine designs monitored to ensure safety and efficiency.