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A predictive approach for vibration analysis in underground mining operation

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Mine fatalities, accidents and incidents are often associated with ground, roof, stope or side instability. Attenuation of rock integrity or the presence of (under)ground pockets of gases or ground waters lead to the collapse of the tunnel. Safety sensors and machine learning tools are placed in the underground mine tunnels to alert for emergencies and immediate evacuation. Numerous reported data are found on condition monitoring of mining machineries but scarce are on monitoring of an underground gallery roof, floor or stope prior to the fatality or failure. Additionally, safe mining practices would include a proactive predictive approach instead of waiting for the occurrence of the unfortunate event. While the magnitude of vibrations could be measured with accelerometers, a programming model could assist with the prediction making use of curve fitting. This normally required knowledge of the pre-alarm and alarm standard level in order to assess the severity of the vibration. In this paper, we are discussing a predictive approach for the monitoring and the analysis of the vibration in an underground mining tunnel roof. This approach has been illustrated using the software MATLAB. Ultimately, an immediate action leading to proactively preventing any damage to the structure constitutes the main contribution of this work.

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