Ensuring consistent fragmentation with Measure While Drilling (MWD) data and 3D image analysis

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ABSTRACT

In recent years, smart drills have enabled precise GPS hole navigation along with the generation of rich Measure While Drilling (MWD) data to provide a view of subsurface conditions. Over the same period, drones have enabled the collection of a visual, geometric and hyperspectral geological data which can be combined with MWD to optimise blast loading and timing.

Firstly, this paper provides an interpretation framework for MWD data and an understanding of how MWD can be used to gain unique insight into rock-mass properties. The MWD data can be integrated with a drone-generated 3D photo model to combine hole data with contextual 3D visual geometry and geoscience data. This information quickly empowers drillers and blasters with an understanding of bench conditions to optimise explosives loading and timing decisions. The MWD data can be further analysed to develop automated strata recognition in blast holes and automate the tailoring of explosives density to different strata bands within a hole.

This paper highlights the opportunities provided by integrating MWD data and drone-generated 3D models to industries that use explosives as an integral part of their rock extraction process. Actual case studies are reviewed that demonstrate the use of drones along with smart drill MWD data that compare the time required for use, the accuracy of the analysed data, and the benefits realised with their use in each case. Examples are reviewed of how drone generated data and 3D model MWD analysis is used to: develop and monitor accurate drill plans; evaluate blast performance, and increase safety.

In closing, this paper presents the future opportunities that machine learning (using data collected by smart drill and drones) will create for optimisation of blasting design.