ESTABLISHING A COMPREHENSIVE UNDERGROUND GEOTECHNICAL CONVERGENCE MONITORING PROGRAM USING THE LATEST SLAM TECHNOLOGY

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**Advancing Underground Geotechnical Monitoring: Comprehensive Monitoring of the Entire Mine Using SLAM Technology**

In underground mining, the displacement and movement of rock can have significant consequences, ranging from injuries to personnel to costly production delays. Effective monitoring of change and convergence across entire excavations is crucial for ensuring safety and operational efficiency. Traditional methods such as damage mapping, extensometers, and total stations, while useful, have limitations in coverage, accuracy, and frequency. Whilst previous SLAM (Simultaneous Localization and Mapping) scanning solutions have not been widely adopted due to highly manual and time-consuming software workflows. These constraints often result in insufficient monitoring, posing risks to safety and profitability.

This paper covers the methods, instrumentation and workflows associated with establishing a convergence monitoring program at a geotechnically challenging Tasmanian mine. This case study outlines how Emesent’s Hovermap SLAM hardware was combined with their novel alignment and processing software, Aura. This approach enables the site to frequently and rapidly acquire, high-resolution data throughout production areas. By enabling large-scale and regular monitoring, this solution enhances decision-making processes for engineers and site staff, helping to mitigate risks and optimize mine productivity. It provides a robust foundation for safer and more efficient mining operations by delivering actionable insights into excavation stability and deformation patterns.

This paper is the first to document the recently released convergence workflows within the Aura software, eliminating user subjectivity by leveraging the SLAM algorithms to non-rigidly align scans during the processing and alignment workflow. This enables an easier, faster, more repeatable and less subjective output results. This innovative approach represents a significant advancement in underground geotechnical LiDAR-based convergence monitoring. Furthermore, how this method compares to previously documented workflows is also discussed.

This paper will present the components of this solution, the algorithms that empower them and the different site based geotechnical workflows it supports, aiding others to implement a similar solution.