Integrated Operations for Complex Resources

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ABSTRACT

This presentation covers the research programme for the ARC ITTC IOCR, a $12.5M, four-year programme comprising three university partners (University of Adelaide, University of South Australia, Curtin University), two mining companies (BHP and OZ Minerals) and 20 METS companies and other organisations.

The Training Centre objective is to deliver the enabling tools – advanced sensors, data analytics and artificial intelligence – for automated, integrated and optimised mining. Automating a mine requires integrating all stages of the mining and processing system so that intelligence across the value chain can automatically be generated, delivered and exploited. The Training Centre will train the next generation of engineers and scientists in developing and applying these enabling tools. This inter-disciplinary challenge requires an inter-disciplinary approach and includes researchers from ten distinct disciplines.

The presentation outlines the 16 PhD projects and the three Post-Doctoral Research positions which, with academic and industry supervisors and translation partners, will deliver the outcomes and translate them into industry-ready implementations:

- Cross-borehole seismic interferometry to interpolate rock mass and geometallurgical variables.
- Draw-point and cave operations and fragmentation sensing.
- Wireless sensor network RFID for continuously deployable tagging.
- Gold sensing: low chemical-low energy biological extraction.
- Vibration and accelerometer sensing for early stage roping detection in hydro-cyclones.
- Pulp chemistry monitoring for leach applications.
- Integration and analytics of drill sensor information to derive geometallurgical attributes.
- Fingerprinting ore types and blends by fusing hyper-spectral and other sensors using machine learning.
- Ore tracking model from uncertain resource model to belt sensors and run-of-mine stockpiles.
- Integrating sensors to maximise crushing plant throughput.
- Integrating grinding circuit sensors including ultrasonics for particle size distributions to maximise mill throughput.
- Integration and analytics of pulp chemistry sensor information with in-stream analysis for flotation plant optimisation.
- Integrating in-stream and particle size measurements.
- Rapid updating of resource knowledge with sensor information for rapid decision-making.
- Measuring and monitoring particle size distributions and grade to divert low-value waste.
- Linking the resource to downstream products.