SEG 2017 Conference

Fluid flow interpretation in fossilised hydrothermal systems using vein measurements from underground photography

Shawn B Hood*, Matthew J Cracknell

*CODES – ARC Centre of Excellence in Ore Deposits, Hobart, Australia, Tasmania, Email: Shawn.Hood@utas.edu.au

The use of computer vision for feature recognition in digital imagery has become commonplace, pervading many aspect of modern life. While algorithms for open source computer vision are readily available, they are not typically used to solve structural geological problems. Structural geologists are domain experts trained to recognise and interpret certain geological features. For example, visual assessment of vein geometries combined with orientation measurements, are used as proxies for understanding deformation stresses and related fluid flow pathways. In a mining and exploration context, these interpretations can be used to extend and predict ore body locations and geometry.

This research demonstrates automated vision-oriented pattern recognition methods that provide geologists with information useful for interpreting ore bodies without the direct supervision of a domain expert. Here we show that underground mining face photos from development drives from an Archean shear-hosted gold deposit can be rapidly analysed to produce models representing high fluid flux during ore deposit formation. Our findings add to the existing knowledge of hydraulic connectivity in such shear zones.

The ability to derive structural information and interpretations from underground photographs provides an opportunity to add value from an underutilised mining dataset. We anticipate our methodology will assist mine geologists to model geological features representing possible ore shoots, such as dense stockwork or breccia. Structural interpretations of ore deposits are commonly built by scaling manually recorded geometrical relationships from outcrop-scale upwards. Our approach also generates information from outcrop, but with an aim towards speed and objectivity. The resulting deposit-scale interpretations are intended to create an independent model of permeability to assist resource modeling and geological controls on ore shoot geometry.