Improved interface designs for automated analysis of potential field data

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Data interpretation forms the basis of decisions with significant financial implications in mineral exploration. However, these interpretations are highly subjective as the outcomes heavily depend on the interpreters’ ability and experience for the task. Specifically for structural and stratigraphic interpretation of magnetic data a number of automated methods (e.g. wavelet based or phase based feature detection) have been proposed to find lineaments within data to produce outcomes that are objective and reproducible.

We developed the CET Grid Analysis extension for Geosoft Oasis Montaj (licensed and marketed by Geosoft), a suite of algorithms which provides functionalities for enhancement, lineament detection and structural complexity analysis of potential field data. Recently, we released the dynamic range compression algorithm which combines high-pass filtering and tone mapping to emphasise anomalies with specific scales. With this new tool, a new workflow is introduced in the CET Grid Analysis extension, which combines the dynamic range compression algorithm with the existing phase based ridge detection techniques. This allows lineaments to be detected at different spatial frequency cut-offs. These tools may be effective for first pass analysis of large volumes of data to ensure fast and unbiased data interrogation.

Automated feature detection methods however, cannot reliably provide geological information such as the types of structures or the temporal order of the structural events, which are critically important for explorers’ decision making. Typically, the interpreter needs to apply their geological knowledge to post-process and interpret the automated analysis outputs. The post-processing step, which may be regarded as the cleaning of ‘false positives’, may cost significant time and effort especially if there are a large number of features to consider. This may be a major hindrance in the wider uptake of some automated data analysis systems by the minerals industry. Our research within the Centre for Exploration Targeting (CET) focuses on building design technologies to effectively harness the power of automated feature detection and interpreters’ geological knowledge. Here, we present on-going development of an interpretation assistive tool where interpreters are provided with candidate features based on data evidence to allow effective decision making on structural interpretation of potential field data. In this workflow, candidate feature options detected by the automated system only appear at locations where the interpreter is analysing, and the interpreter is able to select the features that align with
the geological knowledge of the area. This offers a more efficient alternative to the conventional workflow where interpreters are provided with all of the automated detection outputs simultaneously and need to clean up the outputs afterwards. Further, our interactive interface will allow interpreters to consider all possible feature options to maximise their intuition, with the final feature selection being made through geological knowledge of the interpreter.