

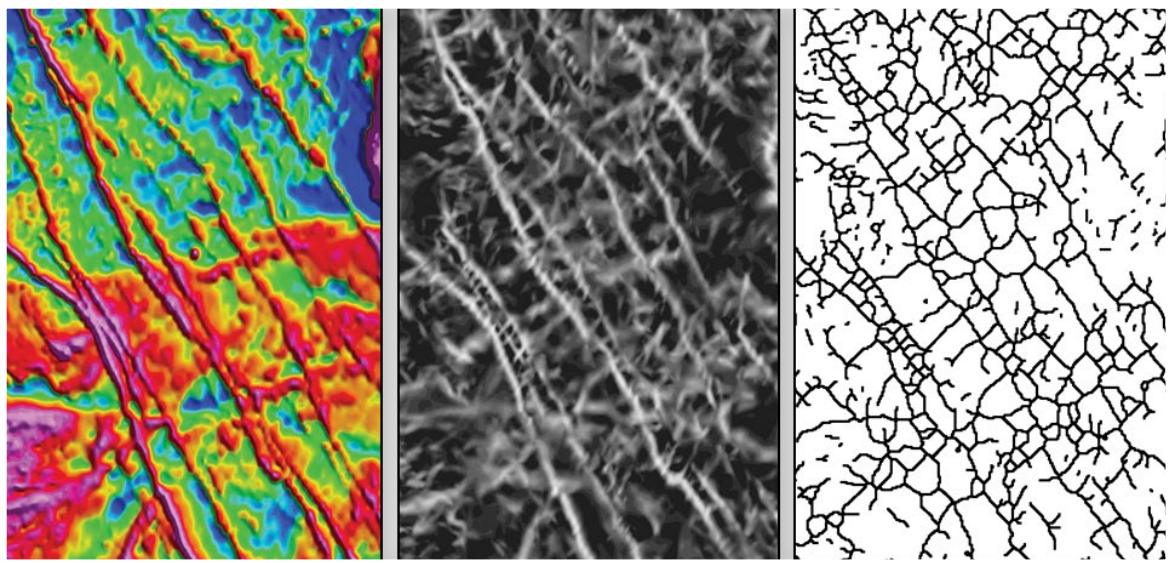
CET Grid Analysis

montaj Extension developed by Geosoft

The CET (Centre for Exploration Targeting*) Grid Analysis extension for Oasis montaj™ consists of a number of tools that provide automated lineament detection of gridded data, which can be used for first-pass data processing. As explorers often have large volumes of gridded data to interpret, these tools provide a rapid unbiased workflow that reduces the time with which one can interpret gridded data.

The CET Grid Analysis extension contains tools for texture analysis, phase analysis, and structure detection. These are versatile algorithms useful for grid texture analysis, lineament detection, edge detection, and threshold detection.

The extension is specifically designed for mineral exploration geophysicists and geologists looking for discontinuities within magnetic and gravity data. The CET Grid Analysis provides a step-by-step trend detection menu which offers two different approaches to trend estimation. The first method, *Texture analysis-based image enhancement*, is suitable for analyzing regions of subdued magnetic or gravity responses where texture analysis can first enhance the local data contrast. The second method, *Discontinuity structure detection*, is useful in identifying linear discontinuities and edge detection.



The magnetic grid (from the Geological Survey of Western Australia) is shown on the left-hand side. The middle grid is the Phase Congruency output and the structural lineaments are on the far right.

Texture analysis-based image enhancement

Useful for highlighting local intensity variations, this method enhances regions of discontinuity within aeromagnetic/gravity datasets. Trends are found in the data by identifying regions of textural complexity in the local magnetic response before looking for axes of symmetry. Such axes are likely to be distinct linear discontinuities in the signal. Regions of magnetic/gravity discontinuity usually correspond with, and can reveal, lithology boundaries, faults, and dykes critical to understanding the geology of an area.

Using the texture analysis output, it finds the skeletal structure of the regions of the magnetic/gravity discontinuity. The output is a set of binary skeletal line segments that belong to each of the discontinuity regions, clearly showing the changes of orientations and offsets within the structures.

The process uses the following techniques:

1. **Texture Analysis** – Highlights the locations of complex local textures often associated with discontinuities in magnetic data.
2. **Phase Symmetry** – Using the results of the texture analysis, detects any laterally continuous line-like regions of discontinuity.
3. **Structure Detection** – Using the phase symmetry results, reduces the regions containing discontinuities into skeletal structures detailed as a binary grid.

Discontinuity structure detection

This approach applies phase-based edge detection directly to data to find edges whose noise characteristics and poor contrast limit the effectiveness of traditional gradient-based approaches. As an alternative method of identifying linear discontinuities, edge detection can be performed directly on magnetic or gravity data. Using a phase-based approach will ensure that even features lying in low contrast regions will be detected.

This process emulates the traditional manual drawing of interpretive lines along the discontinuity.

1. **Phase Congruency** – Find edges in magnetic or gravity data irrespective of their orientation or contrast with the background.
2. **Structure Detection** – Generate trend line estimates from the edge information detected by the phase congruency transform.

CET Grid Analysis Key Benefits

- Provides access to new layers of information assisting with the interpretation of magnetic and gravity data.
- It works very fast. This technology is a productivity aid for all explorers to help create a first pass unbiased view of the data.
- Scalable as it can be used in regional scale or property scale data sets.
- Versatile as the tools can be used on different data and in different ways.
- Two workflows are included. The first method is suitable for analyzing regions of subdued magnetic or gravity responses where texture analysis can first enhance the local data contrast. The second method, edge detection, is useful in identifying linear discontinuities.

*The CET Grid Analysis extensions were developed by the Geophysics and Image Analysis Group of the University of Western Australia (UWA)'s [Centre for Exploration Targeting \(CET\)](#), within the School of Earth and Environment. CET is supported through a partnership between UWA, Curtin University of Technology and the exploration industry.