Automated Interpretation of 3D seismic data using genetic algorithms

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Over the past twenty-five years Geoscientists have acquired more than 550,000 square kilometers of 3D seismic data [APPEA statistics] over continental and offshore Australia in the pursuit of mineral and petroleum deposits. Whether the target is hydrocarbons of any phase (solid, liquid or gas) or minerals, the information extracted from the 3D seismic data when integrated with other geological and geophysical data helps form models of the subsurface. These models are the foundation upon which decisions are made, directing the design and the development of many aspects of the mine site. The success of these activities often depends upon the accuracy of these models.

Many advances in acquisition, processing and interpretation methods have been implemented since the first 3D seismic surveys were acquired in Australia during the 1980s. As a consequence of these advances, the geoscientist today is faced with dramatic increases in the volumes of high quality data available for analysis. However, the time available for the thorough examination, analysis, extraction and integration of the information from these large often multi-volume datasets is always limited and is becoming more problematic. Typically, the geoscientist will spend most of their available time extracting information from small portions of these datasets with a disproportionately amount of time spent thinking about the significance of the results.

Fortunately, Geoscientists are not the only, or the first Scientists, to face challenges associated with the analysis of large amounts of data. Specifically, ideas developed during the course of the thirteen (13) year Human Genome Project (HGP) have been adapted to help interpret seismic data by automatically segmenting and identifying all surfaces within a 3D volume of data; which is then stored into a visual database. Using this technology enables the Geoscientist the ability to analyse large amounts of data in a unbiased manner and thereby incorporate much more data into their models. The application of this patented technology is discussed and demonstrated on several 3D seismic datasets collected over several Queensland Bowen Basin Coal Mine sites.