3D Visualisation Using Octree Compression Techniques

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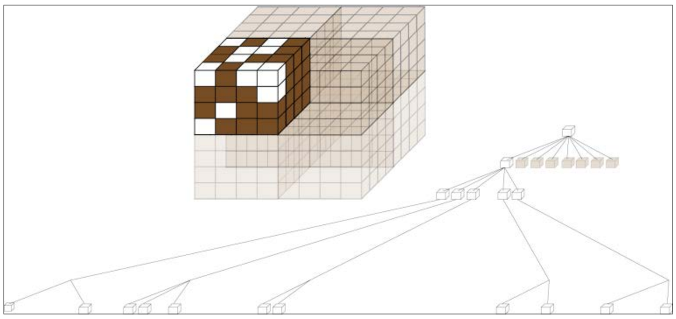
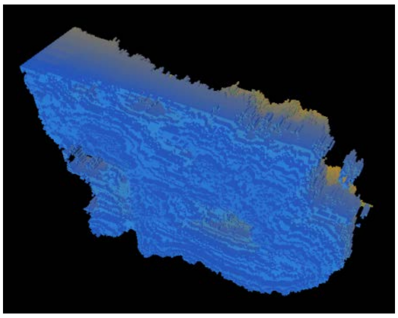
Oil reservoirs can be extremely large spanning several miles horizontally but are very thin. The subsurface is scanned using seismic sampling and the resulting data can be used to give a 3D representation of potential oil fields. The more accurate the model required the smaller distance between samples. Due to the volumes of rock being represented in these data sets storing this data generates large files. The greater the demand for accuracy the greater the frequency in sampling resulting in larger file sizes.

Octree compression techniques have been used for several years for compressing large three dimensional data sets into homogeneous regions. This type of compression is ideally suited to datasets which have similar values in clusters. Oil engineers represent reservoirs in a 3D grid where the volumes of hydrocarbons occur naturally in clusters. This research looks at the efficiency of storing such a matrix using octree compression techniques where the grids are broken into active and inactive regions. Active cells are those homogeneous volumetric regions within the oil reservoir which contain accessible hydrocarbons and inactive cells are those which do not. The resulting compressed binary files only store these active cells and the parent header cells. This results in a far more compact data structure.

Experiments yielded high compression ratios with significant savings in file space. Further savings in computation time and memory were possible as 3D visualisations were generated while streaming in the compressed files with only the active cells being sent to the graphics card eliminating the need of reconstructing the original matrix.



Octree structure illustrating active white leafcells in a 8 x 8 x 8 element matrix



3D visualisation of a test reservoir sample