**Improve Seismic Interpretation-to-Modeling Workflow Efficiency**

**Case Study:** New automated fault extraction technique yields overnight results on suitable datasets for Shell

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**Challenge**

Achieve rapid, accurate seismic fault interpretation results.

**Solution**

Evaluated the automated structural interpretation module on a suite of suitable seismic datasets.

**Results**

Delivered overnight results compared with manually interpreted faults, which took several weeks to report results. Provided a polar plot interface for filtering fault patches according to orientation, size, and confidence of extraction.

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**Find the shortest path**

Increasing workloads in seismic interpretation combined with unfavorable demographic trends have driven the need for more efficient workflows. Yet speed is only part of the story. Results must be accurate and high quality, particularly in field development stages of the exploration and production life cycle. Automated interpretation methods have a valuable role in enabling expert efforts to be focused on critical areas.

Shell has long been active in providing proprietary volume interpretation productivity tools, including data conditioning, structural highlighting, and volume fault interpretation tools. A comparable new SIS automated fault extraction technique attracted interest from Shell because of its integration with the static model building process in the Petrel* seismic-to-simulation software system. With the potential benefits of workflow efficiency and model quality in mind, Shell evaluated the Petrel automated structural interpretation module on a suite of varying quality seismic datasets.

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**Gain efficiency and quality**

The evaluation assessed the benefits gained from the automated structural interpretation workflow in Petrel software, using four Shell in-house 3D seismic datasets. The results demonstrated the potential for highly efficient interpretation-to-modeling workflows in 50% of the datasets evaluated. The extraction of fault patches from seismic data with high signal-to-noise ratio was successful. The manually interpreted faults took several weeks of interpreter effort before a final interpretation was delivered, while the automated structural interpretation module provided a polar plot interface for filtering fault patches according to orientation, size, and confidence of extraction.

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*Figure 1: (Left) A fault-enhanced volume illustrated in transparency mode with patches extracted from this volume. (Right) Conversion of these fault patches to fault interpretation, with no smoothing or editing, yielded a result comparable with lengthy manual interpretation.*

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Have more time to edit and control quality

A key aspect of the value of the automatic extraction is the time to edit and focus on quality control of the automatically extracted faults compared with the effort of a traditional manual interpretation. Shell found that sufficient time should be invested in fine-tuning the automated structural interpretation parameters to derive an optimal result given the quality of the 3D seismic data, especially in relatively low signal-to-noise zones or data.

The possibility of combining Shell proprietary volume interpretation software with the SIS automated approach of fault extraction integrated with model building is of particular interest. This combination provided added benefit to the overall fault interpretation workflow.

In all cases, the need for sound geological judgment when assessing automated structural interpretation output remained a critical success factor.

Enhance edges of fault surfaces

The automated structural interpretation evaluation indicated that where the seismic data supports the generation of high-quality, edge-detected attributes that coincide with faults, the Petrel automated structural interpretation module will further enhance these edges and subsequently extract these as fault surfaces. This process significantly improved the interpretation-to-modeling workflow.

The automated structural interpretation module is regarded as a valuable complement to Shell’s in-house volume interpretation toolkit, and is being deployed through Shell worldwide as part of Petrel toolkit.

E-mail sisinfo@slb.com or contact your local Schlumberger representative to learn more.

“New volume approaches to fault highlighting and interpretation, when closely linked to model building, offer the prospect of very highly efficient workflows for generating quantitative 3D structural models.”

Ru Smith
Project Manager,
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