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3D Visualization Technology, Reducing Cycle Time and Improving Performance, from Basin Scale Assessment through Prospect Identification to Optimal Drill Site Selection

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Abstract

Visualization technology has changed dramatically over the past few years, moving from a high end tool used on the most expensive projects to a desktop solution applied to significant range of exploration to field development opportunities. Visualization has become a tool both to speed 3D interpretation and integrate multiple geologic and geophysical databases to understand complex geology or work deep poorly imaged structures. The rapid change in adoption is being driven by the constant requirements for cost reduction and cycle time improvement. This paper will focus on a small number of technical workflows and demonstrate how visualization can play a vital role in improving the quality of the interpretation and provide new insights into the data. The workflows will also highlight that further productivity gains are still achievable as new hardware and software expands our outlook of what is possible with visualization.

Introduction

Interpretation Workstations originated as a tool to digitally capture what was once a laborious process of using a time-stick, to manually measure seismic horizon 2-way time, which was then posted to a map for hand contouring. The innovation was to us the workstation, to digitally post data with drafting software or to grid and map the data with the company's mainframe computer. The advent of workstations coincided with the first 3D surveys, and was seen as a way to organize the large new datasets into a virtual library of 2D lines in x and y directions.

Workstations took the two dimensional paper seismic line into a computer version ready to be worked by the geophysicist. As seismic interpretation software, workstations, and data evolved into the present sophisticated computing and advanced imaging of today, many mainstream interpreters continued with the traditional line by line, two-dimensional workflows which, date back to paper sections. Only today traditionalists use high-end Linux workstations to display the map and seismic line. Visualization Interpretation software is as large a step change as the move from paper to workstation. The adopters of this new technology have a competitive edge in the challenging exploration environment of today. Visualization technology now enables interpreters to interact with multiple 3D volumes. Workflows for seismic volume interpretation are facilitated by auto-trackers and wavelet based propagation tools. The volume interpreter can validate his automated interpretations rapidly by driving through the seismic volume, stopping as needed to correct auto-interpretation busts. The volume interpreter can quickly generate surfaces and dip attributes to visually identify areas where his interpretation is geologically incorrect and then make immediate data based, interpretative decisions to correct his propagated horizons. With volume based fault interpretation there is immediate feedback in the form of auto-correlated fault surfaces. Interpretation errors are quickly recognized on auto-correlated fault planes when surfaces become non-geologic. Instant fault plane tessellation means that the interpreter recognizes a correlation bust or poor fault pick as soon as it is made, and can make immediate corrections. Visualization technology is now however, moving beyond 3D seismic interpretation into a true 3-dimenstional geologic interpretation platform. Multiple arrays of data from 2D and 3D seismic to georeferenced surface geologic maps, cross sections, core, and dipmeter, to EM data can be displayed in true vertical and geographic 3-dimensional context. This context is scale independent and can be used from the basin scale new venture context to field development for geosteering a horizontal well. In today's competitive landscape, traditional interpreters are outmatched by those using visualization technologies.