Identification of High Porosity Sands using the Bayesian Decision Theory of Pattern Recognition

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Abstract
The present work is an application of a methodology for lithofacies identification and classification using the probabilistic theory of pattern recognition. This methodology uses the *Expectation Maximization* (EM) algorithm to identify and cluster lithofacies from a well log data set. The identified lithofacies from well log data, after up-scaled to the seismic resolution, are used to build a bayesian decision network to infer the identified lithofacies from a seismic volume, using seismic attributes as source of information. This application follows three main steps: i- lithofacies classification from well logs data; ii- defining the best seismic attributes to identifying each lithofacies and iii- lithofacies identification in a seismic volume. The final result was a spatial model of the classified lithofacies and an associated measure of uncertainty.

This methodology was tested with well log data set resulting in a very accurate facies model when compared with a standard petrophysical interpretation, speeding up the process of well log interpretation.

This methodology was applied in a marine seismic data set, focused in a deep-water turbidity play, offshore of Brazil, giving special attention to high-porosity oil-saturated sands. Four different lithofacies was identified from a well log data set. A seismic volume with the probabilities for each of these facies was computed and as a final result two other volumes: a lithofacies model and the associated uncertainty. The results achieved are interesting enough to incorporate this process in a reservoir characterization workflow.