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Prediction of S-wave velocity using complete ensemble empirical mode decomposition and neural networks

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One of the key elements in hydrocarbon reservoirs characterization is the S-wave velocity (Vs). Since the traditional estimating methods often fail to accurately predict this physical parameter, a new approach that takes into account its non-stationary and non-linear properties is needed. In this view, a prediction model based on complete ensemble empirical mode decomposition (CEEMD) and a multiple layer perceptron artificial neural network (MLP ANN) is suggested to compute Vs from P-wave velocity (Vp).

Using a fine-to-coarse reconstruction algorithm based on CEEMD, the Vp log data is decomposed into a high frequency (HF) component, a low frequency (LF) component and a trend component. Then, different combinations of these components are used as inputs of the MLP ANN algorithm for estimating Vs log.

Applications on well logs taken from different geological settings illustrate that the predicted Vs values using MLP ANN with the combinations of HF, LF and trend in inputs are more accurate than those obtained with the traditional estimating methods.

Keywords: S-wave velocity, CEEMD, multilayer perceptron neural networks.