Automation of Dip Picking — New Approaches to Dip Evaluation and Interpretation

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9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

Borehole images provide information on sedimentary and structural features crossing boreholes. The higher definition the image, the more information we can extract and interpret, however this can be highly time consuming. Dip information is key for reservoir geometry definition, and borehole images thus play a key role in geometry evaluation of the sub surface around the wells. In this paper, we demonstrate a workflow for automatic dip picking and classification. This can be available as close as possible to the time of the borehole image acquisition (at or accessed from the wellsite) or utilized later for further detailed geologic interpretation. It works for all types of imagers, electrical, ultrasonic, density, LWD (Logging while drilling) or Wireline. First the dips are automatically extracted from the borehole image using dip trends and an A-contrario algorithm, second a classification of layers is proposed based on statistics and probability of dips' dispersion along the borehole, third the dips are used for sedimentary and structural evaluation; applying geological rules to build the final 2D and 3D near well structural model. The implementation of this approach is demonstrated on several wells in different sedimentary environments. The automatic picking was compared with handpicked events, and we debate in this paper the benefit of using automatic methods for repeatability and precision and the future possibility of using the results as training models for machine learning. This paper shows the importance of dip accuracy, error evaluation/impact for well placement and reservoir geometry evaluation. The automated workflow described here is repeatable, unbiased, uses systematic techniques and improves speed of delivery and accuracy of the geological and structural interpretation from borehole images.