



Rig Side Online Drilling Support System for Prediction and Prevention of Upcoming Crises

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Safety requirements play a central role in drilling operations worldwide. Especially, protecting the crew from injury, preventing damage to equipment and avoiding environmental pollution are of utmost importance. Prevailing drilling procedures already provide a high degree of safety; but uncertainties hinder efficient and accurate risk assessment. Uncertainties are primarily introduced due to the unknown structure of the rock formation and other unknowns in the drilling process. Insufficient insight into ongoing processes may therefore lead to unexpected and unwanted critical drilling situations.

To support drilling engineers in the early detection and subsequently in the prevention of upcoming crises, we present a modular drilling support system for in-situ usage on rigs which improves insight into processes and current drilling operations. In our case, the system consists of a complete data processing chain including several modules for data acquisition from sensors on the drilling platform, feature generation, online learning and problem-specific visualization. While data acquisition modules collect data from sensors at the rig and produce a live data stream in an appropriate format, the data processing algorithms analyze the data streams in real time and classify the drilling operations, detect emerging potentially critical situations and give appropriate advice to the drilling crew, if possible. A (geo-)physically motivated extended feature generator produces additional features to improve the quality-performance (recognition rate) of the algorithms. Finally, all sensor data streams as well as the output of the extended feature generator, the results of several adaptive online learning algorithms and a set of sensor data quality indicators of the rig are visualized in a novel user interface to support drilling employees at the rig. As a result, the current drilling situation is presented in a comprehensive manner and in real time.