

# Moving Horizon Estimation for Automated Trajectory Drilling

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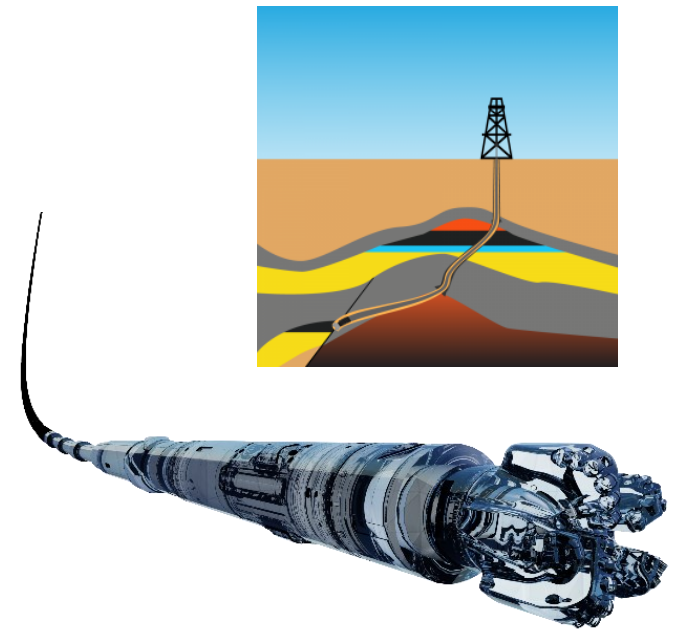
## Proposal for a Master's Thesis Topic

Directional drilling is the art and science of steering a downhole assembly to adhere to a predefined 3d trajectory. Over the last decade, the drilling industry has been pushing towards full automation to improve both safety and consistency while simultaneously reducing costs. In order to automate trajectory drilling, it is necessary to characterize the curvature and orientation of the wellbore in real time. Downhole measurements are periodically transmitted to the surface and occasionally high-quality stationary "surveys" are taken. These measurements are asynchronously sampled in the depth domain and form the basis of the directional estimation problem.

Within the scope of this project, you will implement a moving horizon estimator (MHE) and consider simple dynamic models to consolidate the real-time measurements with the stationary surveys, thus estimating the curvature of the wellbore and predicting the bit position. Several modelling approaches shall be considered to find the best fit to real-world data. Additionally, it will be required to consider offsets between the real-time and survey azimuth measurements as well as to account for data corruption via automated outlier detection.

The project can be done in English or German, but strong English skills are required. Background knowledge in estimation theory (and ideally MHE) is required. Experience in MATLAB/Simulink and/or Python is also required for algorithmic implementation. If you have any questions, feel free to contact us.

This project is done in cooperation with the Baker Hughes Company.



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