SPE/IADC-194082-MS

Creating Open Source Models, Test Cases, and Data for Oilfield Drilling Challenges

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This paper was prepared for presentation at the SPE/IADC Drilling International Conference and Exhibition held in The Hague, The Netherlands, 5-7 March 2019.

Abstract

The drilling industry has substantially improved performance based on knowledge from physics-based, statistical, and empirical models of components and systems. However, most models and source code have been recreated multiple times, which requires significant effort and energy with little additional benefit or step-wise improvements.

The authors propose that it is time to form a coalition of industry and academic leaders to support an open source effort for drilling, to encourage the reuse of continuously improving models and coding efforts.

The vision for this guiding coalition is to 1) set up a repository for source code, data, benchmarks, and documentation, 2) encourage good coding practices, 3) review and comment on the models and data submitted, 4) test, use and improve the code, 5) propose and collect anonymized real data, 6) attract talent and support to the effort, and 7) mentor those getting started. Those interested to add their time and talent to the cause may publish their results through peer-reviewed literature. Several online meetings are planned to create this coalition, establish a charter, and layout the guiding principles.

Multiple support avenues are proposed to sustain the effort such as: annual user group meetings, create a SPE Technical Section, and initiating a Joint Industry Program (JIP). The Open Porous Media Initiative is just one example of how this could be organized and maintained.

As a starting point, this paper reviews existing published drilling models and highlights the similarities and differences for commonly used drillstring hydraulics, dynamics, directional, and bit-rock interaction models.

The key requirements for re-usability of the models and code are: 1) The model itself must be available as open source, well documented with the objective and expected outcomes, include commented code, and shared in a publicly available repository which can be updated, 2) A user's guide must include how to run the core software, how to extend software capabilities, i.e., plug in new features or elements, 3) Include a "theory" manual to explain the fundamental principles, the base equations, any assumptions, and the known