A Hierarchical Multigrid Method for Oil Production Optimization

The large-scale optimization problems that arise from oil production optimization under geological uncertainty of industryscale reservoir models poses a challenge even for modern computer architecture. In combination with ensemble-based methods for production optimization under uncertainty, gradient-based optimization algorithms provides a powerful approach that ensures a high convergence rate. However, the spatial resolution and complexity of typical industry-scale models has a significant computational impact that renders the optimization problem intractable. To reduce the computational burden model reduction is essential. In this paper, we introduce a grid coarsening method that maintains the overall dynamics of the flow, by preserving the geological features of the model. Furthermore, we present a hierarchical multigrid method for oil production optimization. The method utilizes a hierarchy of coarse level models based on the high-fidelity model. We present the workflow of the hierarchical multigrid optimization procedure and a numerical example that demonstrates the application of oil production optimization on a synthetic reservoir. (C) 2019, IFAC (International Federation of Automatic Control) Hosting by Elsevier Ltd. All rights reserved.