Parameter Identification for Physics Based Models: Calibration and Prediction

John A. Burns

Virginia Tech

Jaburns@vt.edu

Abstract:
In this paper we consider parameter identification for physics based modeling and discuss differences between model calibration and model validation. We focus on the application of model development for model based design and optimization. It is well known that a well calibrated model may not be useful for design and prediction unless it is also validated. We consider the case where one assumes both modeling and measurement errors. Modeling errors are an important source of model discrepancy which can greatly limit the usefulness of a model for model based design. We discuss an approach based on physics based hierarchical modeling with uncertain disturbances to help develop prior knowledge about model discrepancy in order to improve the model's predictive usefulness. We apply these ideas to examples involving control systems defined by partial differential and delay differential equations to illustrate the ideas and suggest future area of research.