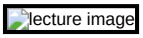

Special Guest Lectures

Derivative-enhanced Simulation Approach Via Automatic Differentiation Method

Jong Kim
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Johnston Hall 338
June 12, 2006 - 10:00 am

Abstract:
Based on the chain rule of derivative calculus, the automatic differentiation (AD) method allows an efficient analytical derivative computation scheme. It provides a powerful capability to compute the true tangent linear and adjoint sensitivities for large size application codes. Important contributions of the AD-based approach are found in the solution step of involved PDE systems, multivariate sensitivity analysis, and parameter optimization and inverse modeling schemes. In this talk, various applications of the AD-based approaches will be introduced for geophysical flow systems including subsurface fluid flow and global climate modeling systems. For the subsurface fluid flow applications, an AD-based PDE solution approach will be reviewed especially for the nonlinear solution step of the involved PDE systems. An important role of the AD method to enhance the inverse modeling capability of current subsurface modeling systems will be discussed. In addition, the AD-based sensitivity analysis and parameter tuning scheme for a climate modeling system will be introduced in a model evaluation and integration framework of the current DOE CCSM (Community Climate System Model) modeling components. Main idea for the use of the AD method in the CCSM model development is to establish an objective computational scheme for parameter tuning and inverse modeling processes in the incorporation of various climate observational data.

Speaker's Bio:
Jong Kim received his PhD from the University of Utah in Chemical Engineering Department. He was a post-doc researcher at Argonne National Laboratory working for Mathematics and Computer Science Division and Energy Systems Division and then worked for Korea Institute of Science and Technology Information as senior researcher. Currently, he is an assistant computational scientist at Argonne National Lab. Current research interests are in developing tangent linear and adjoint derivative computation codes. The applications include global climate simulation models and subsurface flow modeling systems: sea ice, ocean circulation, atmosphere models, geological carbon sequestration systems, and unstructured discrete fracture network models. Another area of interest is inverse modeling and optimal flow control schemes based on sensitivity-enhanced simulation methodologies.

Refreshments will be served.
This lecture has a reception.

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