



Advanced Simulation & Computing Workshop



Error Estimation, Uncertainty Quantification, and Reliability in Numerical Simulations

August 22nd and 23rd, 2005
Stanford University

Objective

Large scale, multi-code, multi-physics, multi-scale simulations are routinely performed in the framework of the DoE's ASC program. These calculations typically involve unsteadiness, turbulence, strong compressibility effects, multiple materials and phases, combustion, etc. within one or multiple computer codes running on a multiprocessor architecture. Evaluation of the predictive capabilities of the numerical simulation tools is a key priority to increase the level of trust and reliability within ASC. Verification of numerical codes and validation of the predictions against experimental data are necessary steps towards this end. However, typical V&V procedures do not provide an objective mathematical framework to identify uncertainties. Error estimation formalism is well developed for certain areas of computational mechanics (e.g. finite element techniques) but are not available for conventional methods based on finite volume schemes. In addition, the vast majority of current research work in this area is focused on steady-state or simple wave-propagation problems. The objective of this workshop is to bring together worldwide experts from the field to discuss the current state of the art and the most promising research directions.

Workshop format

Four invited lecturers will provide an extensive discussion of error estimation and uncertainty quantification approaches. Two half-day sessions will be devoted to presentations from the five ASC/Alliance centers, the DOE Labs and academia. Scientists with active interest in error estimation and uncertainty quantification are invited to present their research in these sessions. Details will accompany the formal announcement of the workshop. Limited travel assistance will be available through the Stanford ASC program. A final panel discussion will close the workshop.

Tentative Workshop Agenda

August 22nd, 2005

08.45 - 09.00	Welcome		
09.00 - 09.30	ASC Program Overview	P. Moin	Stanford
09.30 - 10.30	Error Estimation Overview	T. Barth	NASA Ames
10.30 - 12.00	Duality-based Error Estimates	P. Houston	U. Leicester, UK
12.00 - 13.00	Lunch Break		
13.00 - 14.30	Developing Error Estimation	J. Pereira	MIT
14.30 - 15.00	Break/Discussion		
15.00 - 17.00	Presentations Session 1		

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9.00 - 10.30	Error Budgets: A path from uncertainty quantification to model validation	R. Ghanem	USC
10.30 - 11.00	Break/Discussion		
11.00 - 12.30	Uncertainty Quantification using Evidence Theory	W. Oberkampf	Sandia
12.30 - 13.30	Lunch Break		
13.30 - 15.30	Presentations Session 2		
15.30 - 16.30	Panel Discussion		

The workshop is sponsored by Stanford ASC Program

Organizers: G. Iaccarino, T. Barth, F. Ham, P. Moin