Guest Editors’ Introduction
Douglass E. Post and Scott Sundt

Product Innovation Through Computational Prototypes and Supercomputing
Loren Miller
Changing from physical prototype–based product design to computational (virtual) prototype–based product design requires more than leading edge computational engineering codes, brilliant researchers, and meticulous quantification. The Goodyear Tire & Rubber Company’s experience illustrates a successful, crisis-driven transition to virtual prototype–based product design.

Verification and Validation in CREATE Multiphysics HPC Software Applications
Richard P. Kendall, Lawrence G. Votta, Douglass E. Post, E. Thomas Moyer, and Scott A. Morton
The goal of the CREATE program is to develop and deploy physics-based computational engineering tools that can be used to develop virtual prototypes of ships, air vehicles, ground vehicles, and radio frequency antennas to accurately predict their performance. Naturally, verification and validation is an important part of this process.

HPCMP CREATE-GV: Supporting Ground Vehicle Acquisition
Larry N. Lynch, Christopher Goodin, Kevin Walker, Jody D. Priddy, and Michael Puhr
The development of high-fidelity, physics-based software for analyzing ground vehicle concept designs and the mobility performance of wheeled and tracked ground vehicles is increasingly important. The CREATE-GV toolset’s three modules are integrated to provide a complete performance evaluation of vehicle concept designs.

A Scalable and Extensible Computational Fluid Dynamics Software Framework for Ship Hydrodynamics Applications: NavyFOAM
Sung-Eun Kim, Hua Shan, Ronald Miller, Bong Rhee, Abel Vargas, Shawn Aram, and Joseph Gorski
The main challenge facing simulation-based hydrodynamic design of naval ships comes from the complexity of the salient physics involved around ships, which is further compounded by the multidisciplinary nature of ship applications. Simulation of the flow physics using “first principles” is computationally very expensive and time-consuming. NavyFOAM offers a solution.
SOFTWARE ENGINEERING

40 Containers for Portable, Productive, and Performant Scientific Computing
Jack S. Hale, Lizao Li, Chris N. Richardson, and Garth N. Wells
Containers are an emerging technology that holds promise for improving productivity and code portability in scientific computing. Linux container technology for the distribution of a nontrivial scientific computing software stack and its execution on a spectrum of platforms from laptop computers through to high-performance computing systems offers an intriguing step forward.

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