Call for Papers

SIMULATION, Transactions of the Society for Modeling and Simulation International Special Issue

High Performance Computing for Advanced Modeling and Simulation in Nuclear Energy (HPCMS) – S18-1

Introduction:

Nuclear energy is an effective way to resolve energy crisis and environmental pollution problems. Virtual reactor is a multidisciplinary research field involving nuclear engineering, high performance computing (HPC), applied physics, computational mathematics and software engineering. Virtual Reactor leverages science-based models, state-of-the-art numerical methods, leadership-class supercomputers and engineering practices, in order to accurately describe, analyze, and plan for the complicated phenomena in reactors. With the evolving in architecture and semiconductor technology, high performance computing has developed rapidly. The upcoming ‘exascale’ computing era (a billion billion calculations per second) offers the opportunity, as never before, for virtual reactors to solve some currently intractable problems in the nuclear energy field. Combing fundamental research and industry application, virtual reactor makes it possible to achieve reactor power uprates, life extensions, safety enhancement, material optimization and waste reducing for both existing and future reactors.

There are five essential physical components in virtual reactors: material behavior, thermal hydraulics, neutronics, mechanics structure, and fuel performance simulating softwares. In addition, there are some supporting components in virtual reactors, such as multi-physics coupling environment, pre-processing, post-processing tools, and database. As simulation of reactors is a high consequence research, verification, validation, and uncertainty quantification play a critical role in virtual reactors.

The unprecedented computing capabilities of ‘exascale’ supercomputers bring researchers great opportunities but also tremendous challenges on physical models, numerical methods, algorithms and software engineering technologies. In this special issue on High Performance Computing for Advanced Modeling and Simulation in Nuclear Energy (HPCMS), we invite manuscripts from fundamental research on mathematics, nuclear physics, chemistry, material science, and fluid which help bring high-resolution modeling and simulation to the nuclear energy field.
We welcome contributions in modern parallel technologies, numerical algorithms and advanced software engineering practices that execute on high performance computing systems. Moreover, we encourage innovations on multi-scale and multi-physics simulation which benefits the energy field. Last, but not least, we applaud contributions to the area of uncertainty quantification that help to identify and reduce the uncertainties.

Topics of interest include, but are not limited to:

- Models, numerical methods, algorithms and programming for advanced reactor simulation
- Multi-scale and multi-physics simulation
- Advances in numerical methods (Finite Volume Method, Finite Element Method, Spectral Element Method, etc.)
- Pre-processing and post-processing for advanced simulation
- Parallel techniques and hybrid programming for Exascale computing era
- Computational fluid dynamics
- Multi-scale methodology in material behavior research
- Big data of material science
- Neutronics
- Applied and computational mechanics
- Verification, validation, and uncertainty quantification

**Submission Guidelines:** All papers should be developed, formatted and submitted based upon the editorial guidelines provided in the instructions for authors for “Simulation: Transactions of the Society for Modelling and Simulation International” which can be accessed from [https://us.sagepub.com/en-us/nam/journal/simulation#submission-guidelines](https://us.sagepub.com/en-us/nam/journal/simulation#submission-guidelines). The authors should choose the Article Type as “Special Issue “at the first step of the submission process and put “Special Issue: S18-1 High Performance Computing for Advanced Modeling and Simulation in Nuclear Energy (HPCMS)” into both in the title and cover letter of your submissions. The process of review
and publication is the same as the regular issue of “Simulation: Transactions of the Society for Modelling and Simulation International.”

For inquiries, please contact Changjun Hu (changjhu.ustb@gmail.com) or Jue Wang (wangjue@sccas.cn).

Due Dates:

Submission deadline: Nov 30, 2018
Notification to authors of acceptance: April 15, 2019

Guest Editors:

Fei Gao (gaofeium@umich.edu), professor of University of Michigan since 2014. He was an Adjunct Professor in Washington State University from 2010 to 2014. He was the Chief Scientist in Pacific Northwest National Laboratory from 2008 to 2014. He also has other professional activities: Academic Editor in American Institute of Physics Advances (2010-2013); Editorial Board in Dataset Papers in Physics, Atomic and Molecular Physics (2011-present) and Conference Papers in Physics (2012-present); Honor Professor of University of Liverpool, UK; International Committee for Computer Simulations of Radiation Effects in Solids. He received his PhD from University of Liverpool, UK in 1995. His research interests are in the areas of Fundamental understanding of ion-solid interaction and radiation effects in ceramics and reactor materials, Fundamental understanding of ion-solid interaction and radiation effects in ceramics and reactor materials, degradation of spent nuclear fuel canisters, etc. His awards include Selected FZD (Forschungs zentrum Dresden-Rossendorf) Fellow from Institute of Ion Beam, Outstanding Research Award of Basic Energy Science from U.S. Department of Energy, and Outstanding Performance Awards from Pacific Northwest National Laboratory, etc.

Wen Yang (yangwen@ciae.ac.cn), professor, doctoral supervisor, researcher of China Institute of Atomic Energy (CIAE). His current appointments include Chinese technical director of the Chinese-British co-operation projects Integrated Nuclear Digital Environment (INDE), vice-director of Department of Reactor Engineering and Design in CIAE, the Head of Materials Irradiation Effects Group in CIAE. He was a Science and Technology Agency of Japan (STA) fellow on the properties research of SiC/SiC composite prepared by CVI Process in National Research Institute for Metal (NRIM, the predecessor of NIMS, National Institute for Material Science) in Japan. He received his PhD
Changjun Hu (huchangjun@ies.ustb.edu.cn) professor, doctoral supervisor, researcher in the School of Computer and Communication Engineering of the University of Science and Technology Beijing (USTB). He received a PhD degree from Peking University in 2001. Then he worked for Tsinghua University as a post-doctor from 2002 to 2004. His research interests are in the areas of High Performance Computing (HPC), numerical analysis, and data process. He mainly engaged in the Materials Scientific Data Sharing Network, which has more than one hundred thousand visitors until now. He was a member in the expert group of the national education information development project. He has published over 100 papers in journals, and conference proceedings. Currently he engages in the research of virtual reactor, which is an interdisciplinary research field including HPC, numerical analysis and reactor engineering.

Jue Wang (wangjue@sccas.cn) is currently working as an associate professor in Department of High Performance Computing Technology and Application Development, Computer Network Information Center (CNIC), Chinese Academy of Science (CAS). His current appointment is Director of Section of Technical Support and R&D Promotion. He serves as a group head in computational material and associate head of Youth Innovation Promotion Association, CNIC. His research interests are in the areas of high performance parallel computing and software, with particular emphasis on large scale parallel computation and programming models, high performance parallel numerical algorithms. He mainly engaged in the application and realization of parallel computing researches, including National High-tech R&D Program (863 Program), Natural Science Foundation of China, and Prospective Science and Technology Project of State Grid Corporation of China. He was a Managing Guest Editor of the 2016 Special Issue (Computer Physics Communications) on High Performance Computing for Advanced Modeling and Simulation of Materials. The review process of the special issue is the same with the regular issue. He was also a PC member of HPDIC workshop 03-04.

The Commitment of Acceptance Rate is 25% or less.