Other - Enabling Process Innovation through Computation (EPIC) Seminar Series

Innovative Computing for Complex Multiphase Flows

Damir Juric, Centre National de la Recherche Scientifique

Patrick F. Taylor Hall 1100
February 24, 2017 - 03:00 pm

Abstract:

The ability to predict the behaviour of multiphase flows accurately, reliably, and efficiently addresses a major challenge of global economic, scientific, and societal importance. Flows in which multiple interacting fluid phases are present are central to virtually every processing and manufacturing technology. Significant advances have been made in the numerical methods to simulate these flows, however, there remains a large gap between what is achievable computationally and 'real-life' systems; the latter are beyond what can be addressed with current methods. I will present the latest on the modelling framework that we are currently developing within a software platform called BLUE that will enable the use of numerical simulations as a quick and reliable design tool as well as highly refined simulations to access interface dynamics in detail. The framework features front-tracking/level-set hybrids, interface-adaptive, unstructured meshes, and sophisticated multi-scale, multi-physics models. BLUE is parallelised and can run on various platforms from laptops to supercomputers and has been demonstrated to scale well on over 132,000 parallel process threads. This allows the user the flexibility to choose between a quick 'answer' with a degree of uncertainty common to engineering applications; or, a high-fidelity solution, for targeted cases, that requires more computing time. The code also has built-in, user-friendly meshing capabilities that allow rapid construction of complex geometries. During the presentation, I will discuss a number of challenging problems of interest to process industries and biomedical applications, which include high speed jet atomization, the design of container-filling processes, product changeover, falling film reactors, microfluidics, non-isothermal, non-Newtonian fluids, and surfactant-driven flows.

http://epic.lsu.edu

Speaker's Bio:

Damir Juric is a research scientist at the Centre National de la Recherche Scientifique (CNRS) in France. He received his doctorate from the University of Michigan in 1996 and subsequently worked in the Los Alamos National Laboratory's Theoretical Fluid Dynamics Group (T3), at Georgia Institute of Technology and Worcester Polytechnic Institute. He has been with the CNRS since 2002 in the Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur (LIMSI) near Paris with visiting positions at Ecole Nationale Supérieure de Chimie et de Physique (ENSCPB) Bordeaux, Ecole Generaliste d'Ingenieur de Marseille (EGIM) and most recently at Imperial College London. Dr. Juric is known for his research in computational physics and high performance simulation of multiphase flows and phase change and maintains worldwide research collaborations.

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