Special issue on computational fluid mechanics and fluid–structure interaction

Preface

Yuri Bazilevs · Kenji Takizawa · Tayfun E. Tezduyar

Received: 11 June 2011 / Accepted: 20 June 2011 / Published online: 8 July 2011
© Springer-Verlag 2011

This special issue is a collection of the papers contributed by authors who were invited to speak at the symposium on **Advances in Computational Fluid Mechanics and Fluid–Structure Interaction**, World Congress on Computational Mechanics, Sydney, Australia, July 19–23, 2010. The symposium was organized by Kenji Takizawa (Waseda University, Tokyo), Tayfun Tezduyar (Rice University) and Yuri Bazilevs (University of California, San Diego).

The special issue contains papers on advances in patient-specific cardiovascular hemodynamics, FSI modeling of parachutes, and wind turbine aerodynamics. The latter presents a new and important research direction, where modern CFD and FSI methods are showing a considerable improvement over conventional numerical methods employed in the field.

The papers mostly focus on moving-grid methods, such as the arbitrary Lagrangian–Eulerian and space–time formulations, but fixed-grid and particle finite element methods are also presented. The methods discussed address the challenges

of outflow instability for hemodynamics problems, solution techniques for linear systems of equations for incompressible flow, modeling of free-surface and thermally-coupled flows, modeling of fluid–soil–structure interaction problems, and fluid–structure coupling for thin structures on non-interface-fitted meshes. In this special issue, a variational multiscale formulation of incompressible flow in the context of space–time finite element methods is given for the first time.

The computational challenges addressed in this issue include the development of advanced mesh moving methods that allow modeling of shallow-water flows with moving shorelines, and other special-purpose methods for FSI modeling and dynamical analysis of parachute cluster designs that are of interest to NASA.

We would like to thank the authors for the effort in preparing their contributions, which will help advance the fields of computational fluid mechanics and fluid–structure interactions, and for meeting the special issue deadlines.

Y. Bazilevs
University of California, San Diego, USA

K. Takizawa
Waseda University, Tokyo, Japan

T. E. Tezduyar (✉)
Rice University, Houston, USA
e-mail: tezduyar@rice.edu