Math. Model. Nat. Phenom.
Vol. 6, No. 3, 2011, p. 1
DOI: 10.1051/mmnp/20116300

Preface

Computational aerodynamics is nowadays considered as an established tool for the design and analysis of many engineering applications. At the same time, the design and study of new computational methods still continues, as the modern industrial requirements for a simulation tool imply modeling of real-life physical problems about realistic geometries with high accuracy and reliability. Correspondingly, the complexity of modern research and engineering problems and the rapid increase in computational power often require a researcher to reevaluate the essential features of aerodynamic codes.

In September 2009 the 'Modern Trends in Computational Aerodynamics' (MTCA'09) workshop was held in University of Birmingham, UK. The workshop aimed to discuss the most recent ideas and methods in computational aerodynamics as well as problems that should be addressed for future progress in this field. It was therefore not surprising that considerable attention was paid at the workshop to the problems of grid generation and solution grid adaptation and to implementation of high order discretization schemes in computational aerodynamics. Those topics remain vital for the successful design of a modern industrial code and they should be thoroughly explored prior to commitment to built a full three-dimensional simulation tool. Thus lectures given at the MTCA'09 workshop discussed the mathematical theory behind computations as well as computational challenges arising in industrial applications where grid generation/adaptation and high order discretization schemes play a dominant role.

This special issue of Mathematical Modelling of Natural Phenomena further develops and enriches the discussion started at MTCA'09. As a whole, the carefully selected collection of ten papers provides a broad view of the modern challenges in computational aerodynamics where the enormous complexity of modern aerodynamic solvers is demonstrated throughout its various aspects with the emphasis put on grid generation/adaptation and the choice of a discretization scheme for real-life computations. Due to the multi-disciplinary nature of its topic, this thematic issue of MMNP can be equally interesting and thought-provoking to researchers in mathematics, physics, computer science and engineering. It also is our hope that this special issue on computational aerodynamics will contribute to the successful solution of a hugely challenging problem of transforming potentially powerful computational technologies into accurate, robust and efficient industrial codes.

Natalia Petrovskaya
University of Birmingham, UK

Article published by EDP Sciences and available at http://www.mmnp-journal.org or http://dx.doi.org/10.1051/mmnp/20116300