The 26th Computational Engineering Conference of JSCES

特別講演・計算工学大賞 2019 授賞式

The JSCES Grand Prize 2019 Lecture and Ceremony

2019 年度計算工学大賞を受賞されたスペイン・カタルーニャ工科大学の Antonio Huerta 教授の特別講演ビデオをオンライン放送します。多数のご視聴とご参加をお待ちしております。

日 時 / Date　２０２１年５月２７日（木）１４：１５－１５：０５*
形 式 / Form　司会による紹介の後，A. Huerta 先生の特別講演ビデオを放送します。
司 会 / Chair　Junji Kato (Nagoya University)

From low to high-order approximations in surrogate models for parametric flows

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Abstract　Daily industrial practice requires fast and robust strategies to solve computationally-demanding problems. Moreover, Computational Fluid Dynamics (CFD) simulations in industrial design and optimization procedures involve the exploration of large sets of admissible configurations. Parameters of interest may include boundary conditions, physical properties of the fluid and geometric configurations. Hence, efficient tools to solve multiple queries of the same flow problem are required. Surrogate models based on reduced order methods are commonly employed to ease the computational burden of such high-dimensional problems, allowing to efficiently perform parametric studies and to evaluate quantities of interest in real-time.

Two major issues will be discussed. On the one hand, the development of robust computational technologies to accurately reproduce complex flows. Novel advances for robust high-order and low order strategies in compressible and incompressible flows will be described. Special emphasis will be given to a unified framework for the treatment of Riemann solvers in high-order strategies and to the face-centered finite volume (FCFV) method that secures first-order accuracy for the stress tensor without the need for gradient reconstruction, thus being insensitive to cell distortion and stretching.

On the other hand, this talk reviews some recent contributions involving a priori and a posteriori surrogate models for the solution of parameterized incompressible flow problems, from microfluidics to viscous laminar and turbulent flows. The Proper Generalized Decomposition (PGD) will be used because it provides separated solutions, explicitly depending on the parameters of interest for the problem. The performance of a priori PGD and sampling-based a posteriori PGD is compared in terms of accuracy and computational cost for the simulation of Stokes flows in geometrically parameterized domains. This problem is particularly challenging as the geometric parameters affect both the solution manifold and the computational spatial domain. Moreover, in order to make the a priori PGD strategy appealing for industrial applications, a non-intrusive approach exploiting OpenFOAM native solver for incompressible flows is devised for viscous laminar and turbulent Navier-Stokes equations coupled with the Spalart-Allmaras model.

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* 予定時刻となります。