OpenFOAM & Combustion Simulation

Fast Reactive Flow Simulations Using DLBFoam: The Method and Applications

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Host: Dr. Shangpeng Li (National University of Singapore)

Register: https://nus-sg.zoom.us/webinar/register/WN_B6cMQD6qSIKPH773ta_6rA

Abstract

In the talk I will address recent implementation of a dynamic load balancing chemistry speed-up technique into OpenFOAM environment via the DLBFoam package [1,2]. First the main theoretical aspects of the technique will be introduced along with benchmark cases. Second, several applications of the method will be discussed for non-premixed and partially-premixed combustion applications. The discussed applications will focus on spray combustion and spray-assisted combustion of multi-fuel mixtures with relevance to gas engine operation.

The demonstrated cases indicate a high potential to carry out such finite rate chemistry simulations with relatively large chemical mechanisms.

[1] https://www.sciencedirect.com/science/article/pii/S0010465521001855
[2] https://aip.scitation.org/doi/pdf/10.1063/5.0077437

About the Speaker

Associate Professor Ville Vuorinen has received his M.Sc.(Tech.) in computational physics in 2004 in the Helsinki University of Technology and his D.Sc.(Tech.) in 2010 in computational fluid dynamics at Aalto University, Finland. Since 2014, Vuorinen has worked as assistant professor in energy and fluid dynamics at Aalto University, School of Engineering, Department of Mechanical Engineering and he was tenured in 2022. Vuorinen has approximately 80 peer reviewed journal publications on fluid dynamics in various energy applications including heat transfer, reactive flows and two-phase flows. The research mainly involves usage of OpenFOAM for reactive multiphase flow applications in engine combustion context with particular focus on spray ignition of dual-and tri-fuel mixtures. The research focuses on usage of large-eddy simulation (LES) and direct numerical simulations (DNS). Recently, the team has developed chemistry speed-up techniques enabling efficient finite rate chemistry LES of reactive sprays.