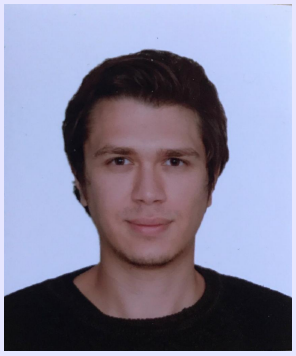
RESEARCH DAYS

MECHANICAL ENGINEERING DEPARTMENT

MIDDLE EAST TECHNICAL UNIVERSITY

November 07, @ 14:30

E Block - Room 200



Speaker

Onur Ata

Mechanical Engineering Department, METU

Onur Ata is a research assistant and PhD candidate in mechanical engineering at Middle East Technical University. His research interests include computational fluid dynamics, high-order numerical methods and high-performance scientific computing. He is a member of the Accelerated Multiphysics Laboratory in the Mechanical Engineering department. His current research includes adaptive mesh refinement accelerated on GPUs, and high-order accurate simulations of turbulent flows.

Implicit Large Eddy Simulations of Turbulent Flows using a High-order Galerkin–Boltzmann Formulation

Turbulent flows exhibit a wide spectrum of interacting spatial and temporal scales, posing major challenges for accurate and efficient numerical simulation. In this talk, we present a high-order Implicit Large-Eddy Simulation (ILES) approach based on a Discontinuous Galerkin (DG) discretization of the continuous Boltzmann–BGK equations. The proposed method leverages the inherent numerical dissipation of high-order DG schemes to model subgrid-scale effects implicitly, without introducing explicit turbulence models or artificial filtering. We will discuss the stability of the DG–Boltzmann formulation and its ability to capture transitional and turbulent flow dynamics under under-resolved conditions. Validation is carried out on canonical benchmark problems, including the Taylor–Green vortex and flow past a sphere at transitional Reynolds numbers, demonstrating the method's potential for robust, accurate, and scalable turbulence simulation. The talk will also highlight implementation aspects, numerical stabilization strategies, and prospects for extending the approach to adaptive and multi-GPU environments.

Mechanical Engineering Department
Middle East Technical University
Ankara / Turkey
Tel: 0312 210 2539