OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG

VST FAKULTÄT FÜR VERFAHRENS- UND SYSTEMTECHNIK

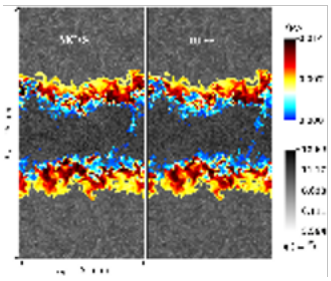
Masterarbeit Nr.: LSS-Mxx
Aufgabenstellung für die Masterarbeit von: xxx (Matr.-Nr. xxx)

TITLE: **Benchmarking OpenFOAM against DINO for turbulent reacting flows**

SHORT DESCRIPTION:
For many practical applications, in particular connected to energy generation and power (engines, gas turbines, furnaces…) detailed chemistry models are needed to simulate in a quantitative manner pollutant emissions and ignition/extinction limits of a given mixture. Since such processes typically take place in turbulent flows, the resulting numerical complexity is extremely high: only very few tools can really describe such turbulent reacting flows at the required level of details. It is claimed that the open-source software OpenFOAM is now able, thanks to its module "EBIdnsFoam", to carry out such simulations. The purpose of the present thesis is to check this claim very thoroughly by carrying out test computations for selected cases, comparing results from OpenFOAM with reference data from our own solver DINO, quantifying the obtained performance regarding stability, computing time, and accuracy.

Major steps:
- Get acquainted with the subject by reading the available literature on the topic, starting with [1]
- Carry out and document the results for all benchmarks involving the Taylor-Green-Vortex
- Carry out further simulations of turbulent reacting flows
- Document and compare the obtained results

Pre-requisites:
- Good knowledge of Fluid Dynamics
- First practical experience of Computational Fluid Dynamics
- Practical experience with a Linux environment
- Interest for chemical processes/energy generation



Supervision:
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- Dr. Abouelmagd Abdelsamie (ISUT/LSS)

Beginning: **as soon as possible**
Due: xxx

[1] T. Zirwes, M. Sontheimer, F. Zhang, A. Abdelsamie, F. E. Hernández Pérez, O. T. Stein, H. G. Im, A. Kronenburg, and H. Bockhorn, "Assessment of numerical accuracy and parallel performance of OpenFOAM and its reacting flow extension EBIdnsFoam," *Flow Turbul. Combust.,* in press, 2023.