

SUPER – Stuttgart University Program for Experiencing Research Project Information

Institute's Information

Name of Institute Institute of Aerodynamics and Gas Dynamics

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Duration of Project/Number of Students

June/July x

June/July/August

Number of Students 1-2

Name of Project Accuracy of Finite-Difference Methods (Revisited) – User Friendly Tools

Beneficial Skills & Knowledge

Math: complex-number calculus, wave-like solutions, eigenvalue problem
Numerics: finite differences, ODE integrators, advection/diffusion equation; basic
knowledge on computational fluid dynamics; some coding ability
(Stage: BSc junior/senior or MSc student; Language: some German reading
ability is beneficial but Google translation does it as well)

Description of Work

The aim is to upgrade and extend a set of existing diagram catalogues and PC tools on the fundamental accuracy and stability of finite-difference methods (explicit/compact FDs and filtering). One issue is the stability and accuracy of ODE integrators, another on space discretization of wave-like solutions and the combined accuracy of spatial discretization and time integration. We are in an engineering (AE) faculty, *and all is eventually about (fundamentals in hi-order) computational fluid dynamics*; pure math is not the top subject. For example ODE/time integrators like implicit Runge-Kutta schemes shall be included for a simple model equation (by a PC script; first versions exist). In spatial direction, non-periodic boundary conditions may be taken into account, or methods for pseudo-discontinuities. The brief introduction at the beginning of each catalogue is so far in German but will be in English for the upgraded versions; for more information see my ResearchGate site (->publications, ->technical reports).

