Helmut-Schmidt-Universität, Postfach 700822, 22008 Hamburg

HELMUT SCHMIDT UNIVERSITÄT
Universität der Bundeswehr Hamburg

Student/Bachelor/Master Project: Visualization of Parallel-In-Time Flow Simulation Data

Description: Parallel-in-time integration approaches such as Parareal [1] are a way to reduce time to solution of numerical simulations on supercomputers. They simulate a rough estimation of the future or even several potential future states, while the present state has not been fully computed yet. Typically they require several iterations of the entire simulation time to converge to a valid solution.
For a zero-dimensional problem, i.e. a single value signal over time, the behavior of Parareal over both, simulation and computation time, can be visualized e.g. as shown here (https://en.wikipedia.org/wiki/File:Parareal_Animation.ogv).
This student project aims to find, develop and implement new ways to visualize three-dimensional flow simulation data instead and to show both, the three-dimensional flow over physical time as well as the convergence over the computational iterations.

Prerequisites: At least basic C++ programming and Linux shell skills required. Experiences with computer graphics or visualization software such as Blender, Paraview, Matplotlib or others is helpful, but not strictly required.

Contact: Chair for High Performance Computing
Piet Jarmatz, jarmatz@hsu-hh.de
Prof. Dr. Philipp Neumann, philipp.neumann@hsu-hh.de

References:

[1] J.-L. Lions. A ‘parareal’ in time discretization of PDE's. *Academie des Sciences Paris Comptes Rendus Serie Sciences Mathematiques* 332.7 :661-668, 2001