Master thesis

To students at the Technical Faculty

(Computational engineering, Medical Engineering, Maschinenbau, Data Sciences)

Friedrich-Alexander-Universität Erlangen-Nürnberg

Title: Development of CFD-based software for designing river surfing waves

Standing river waves are becoming more and more popular for surfing, see Figure below from the standing wave in Nürnberg that is operating since 2021. For receiving a working, i.e. surfable wave, several boundary conditions have to be considered as overall geometry, topology of the floor behind the wave, inflow conditions, height of fall, water velocity. The goal of this work is to develop a CFD application based on the Lattice Boltzmann model using "OpenLB" (open source FSI/CFD solver provided by the Karlsruhe Institute of Technology - KIT). The goal is to develop a parametrized model where the above mentioned fundamental parameters, influencing the wave, can be changed enabling parameter studies and planning of new waves. The MA thesis builds up on previous theses and work.

The work will be supervised by **Prof. Dr.-Ing. Michael Döllinger (Department Informatik & AIBE)** and **PD. Dr.-Ing. Stefan Kniesburges (Laboratory CM I)**. The MA thesis is in cooperation with Dipl.-Ing.Matthias Schmidt (IGSM e.V.).

We search for a dedicated and motivated student with

- Courses in mechanics, fluid mechanics or similar
- experience in CFD modeling and simulation
- knowledge and experience in scientific programming in the field of fluid dynamics

Tasks:

- Develop the CFD model based on the Lattice Boltzmann method in OpenLB including necessary grid studies
- Develop a parametrized model considering all geometries and boundary conditions (e.g. channel geometry as length, depth and width, ramp characteristics, inflow, water-hights, friction on boundaries etc.)
- To analyse wave quality, parameters reflecting wave height, slope, wave dynamics have to be computed and visualized
- Develop a user friendly GUI where all previous algorithms are included to allow for parameter studies

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