

Bachelors and Masters projects

Simulation and analysis of microswimmer swarms:

A microbial swarm may be composed of up to many millions of individual bodies, and due to such immense numbers, swarms often exhibit behavioural properties different from that of their individual members. In this project, we aim to perform a simulation-based study of the motion of swarms, using a coupled framework of pe and waLBerla, two simulation tools developed at the Chair for System Simulation, FAU. The tasks of the project participant will range from the formulation of the appropriate physical set-up to simulate (keeping in mind the existing experimental evidence) to the analysis of the simulation data. This will involve studying the literature, performing theoretical calculations, and running simulations oneself.

Analytical solution of swimmer models:

In this project, we try to understand the behaviour of micro-bodies in fluids. It is known that a simple assembly of three spheres connected by arms which contract and expand in a controlled manner is a sufficient model for a micro-swimmer, meaning that it satisfies all

the conditions that a microswimmer must in order to be able to move through fluids. The aim of this project is to use the Stokes equation to describe the motion of similar models, using both analytical and numerical methods. The tasks of the project participant will include solving theoretical swimmer models analytically, and running and analysing simulations.

