SIMULATION OF FUEL INJECTION IN AN INTERNAL COMBUSTION ENGINE

Figure 1: 'Optical IC engine' with diagnostic equipment

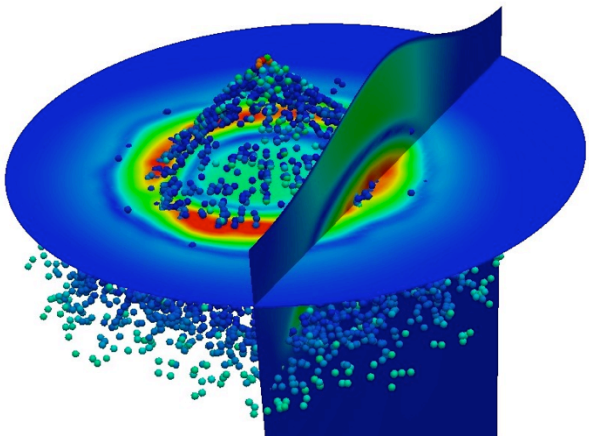

Figure 2: Visualization of a spray simulation

Current developments in internal combustion (IC) engine technology aim at reducing pollutant formation and fuel consumption while maintaining acceptable cost. Further improvements can be achieved by analyzing the process in greater detail, through non-intrusive (optical) diagnostics or computer simulation.

The present project focuses on the numerical simulation of the fuel injection, as examined in an optically accessible engine ('glass engine', fig. 1) at the IVG.

The project student will first familiarize himself/herself with the available software (OpenFOAM or Star-CCM+) and the theory of jet break up and spray formation. Suitable mathematical closure models shall be considered, compared, documented and ranked to identify the most suitable approach. The geometry of the test case must be described by creating (or modifying) computational grids before the simulations are set up, carried out, and monitored. The results must be processed, mined, visualized (fig. 2) and analyzed to gain a useful understanding of the process. Experimental data available for comparison will help enhance the knowledge on the process, and permit to assess the reliability of the simulation relative to the experiment. The student should then run further simulations to enhance the accuracy of the predictions through the lessons learned.

In a final step, the results of the simulations will be documented in detailed report and presented to an audience of experts and other students.

An opportunity may exist to collaborate with another student to work on an equivalent experimental project.

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