FS Dynamics is a focused and independent consultancy company providing highly skilled competence within fluid- and structural dynamic analysis.
We are recruiting excellent engineers with equality and diversity in mind and can offer our employers competence development,
a work environment surrounded by satisfied and motivated colleges at the leading consultancy company within technical calculations.

Master Thesis work about

Method development of 1D and 3D CFD coupling

FS Dynamics has a well-developed cooperation with the automotive industry where FS Dynamics contributes with experience and deep theoretical knowledge within various simulations. In many of the applications within automotive, fluid dynamics plays an important role. Both 1-dimensional (1D) computational tools and 3-dimenstional (3D) computational fluid dynamic (CFD) analysis are utilized to model the fluid dynamics within different systems and components. The 1D approach has the advantage to offer fast solutions, and even real time simulations, of quantities such as flow speed, pressure and temperature, in complex systems of channels connecting different components. The 3D simulations are more time consuming and are used to study detailed 3D effects in components and offer input for 1D modelling or as boundary conditions to 1D simulations. However, sometimes it can be interesting to couple the 1D and the 3D simulations and let them communicate in both directions as the simulation time proceeds.

The present Master Thesis proposal is a cooperation with Scania and is about method development concerning the coupling of 1D and the 3D simulation tools. The simulation case will be taken from an automotive application including a system of flow channels that can be modelled in 1D and components where one of the components will be modelled in 3D. The aim of the project is to build the 1D and 3D models, run them both independently and coupled and compare the results. A part of the project is also to calibrate the model with other models, experimental data and experience. The project is of a high technical level and if it is successful it will be of great benefit to FS Dynamics and Scania.

Outline of the project:

1. Literature study of previous work regarding coupling of 1D and 3D CFD tools.
2. Gaining user experience of the relevant 1D and 3D CFD tools.
3. Preparing the simulation models and perform the 1D and 3D simulations.
4. Set up the coupling between the models and run coupled 1D/3D simulations.
5. Evaluation of results and calibration of the models.
6. Summary in report.

The assignment is suitable for one student with genuine interest of technical simulations within fluid dynamics. The assignment is done at earliest the spring semester of 2018 at FS Dynamics's office in Stockholm at supervision of experienced engineers within CFD. Travels to Scania in Södertälje can exist.

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