**Background and motivation**

Due to the economies of scale, the size of modern merchant ships has been increasing rapidly. Accidents and incidents have been reported along with the fast increase of ship size. The major factors that contribute to these accidents are the hydroelasticity responses, such as springing and whipping, which happen more frequently even in sea states that were regarded moderate before.

There are no generally accepted numerical tools that can estimate the wave and vibration-induced loads on ships with acceptable accuracy. In view of this, a Joint Industry Project (JIP) was initiated by the major classification societies, aiming to conduct a global comparative study of the existing numerical methods for hydroelastic analysis, and to provide large-scale hydroelastic model tests as a standard database for verification and validation. Several well-reckoned universities and research institutes worldwide, including Chalmers, are the JIP participants.

**Objectives**

The thesis project aims to simulate the hydroelastic behavior of large ships in waves using a coupled CFD and FEA method. The fluid-structure interaction (FSI) of the hull under regular and irregular waves will be analyzed.

**Methods and tools**

The wave loads will be simulated using the CFD solvers: STAR-CCM+. The computed wave loads will be input for FEA using ABAQUS. The numerical results achieved from this study will be compared with those from the other JIP participants and will be validated by the model tests.

**Prerequisites**

- Knowledge CFD (and FEA preferably).

**The MSc thesis project should incorporate the following tasks:**

- Literature studies will be firstly conducted that form the basis of state-of-the-art knowledge within the research subject of hydroelasticity.
- Decoupled fluid-structure analysis.
- Coupled fluid-structure analysis.
- Comparison with the model tests.
- Write a thesis report and present it on a public seminar.

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