Numerical Identification of Ship Maneuvering Hydrodynamic Derivatives

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1 BACKGROUND

Growing vessel sizes and a predicted increase in future traffic on European waterways, as well as the advance of ship handling simulators have brought the numerical prediction of ship maneuvering to an increased attention of the marine CFD community. Various numerical approaches exist to identify the so-called hydrodynamic derivatives in the maneuvering equations of motion, which represent fluid inertia and damping coefficients of the maneuvering ship. Methods based on the solution of the Reynolds-averaged Navier Stokes (RANS) equations have emerged as a powerful means to replicate Planar Motion Mechanism (PMM) tests known from model testing.

The scope of this thesis is to apply the virtual PMM test method to a sample ship the geometry of which will be provided. Special attention shall be paid to the influence of the heeling angle on hydrodynamic forces in steady drift motion. Recent investigations revealed a significant low pressure field around the bilge of a drifting ship which can induce an additional heeling moment.

2 TASKS

The solution of the above outlined task will roughly follow the below steps:

1. Introduction to maneuvering theory
2. Literature survey
3. Virtual Planar Motion Mechanism (PMM) tests with a RANS-CFD code
4. Discussion
5. Documentation

Depending on the findings and progress of the work, as well as whether the student will work on a Bachelor or Master thesis, this agenda will be changed accordingly (which can also mean be extended!). Given a successful solution of this problem we will use the findings to write a scientific paper which can be submitted to a conference in the field.