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Partitioned simulation of the fluid-structure-interaction of flexible marine propellers in unsteady flow conditions

Tobias Lampe[1], Lars Radtke[2], Alexander Düster[2], Moustafa Abdel-Maksoud[1]

[1] Institute for Fluid Dynamics and Ship Theory, Technical University Hamburg
[2] Institute for Ship Structural Design and Analysis, Technical University Hamburg

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With respect to new propeller materials and designs, vibrations and large deformations are becoming increasingly relevant for propeller design and operation.

Therefore, simulation methods need to be developed which take into account the interaction of fluid and structure while retaining a computational effort suitable of the design stage.

In the approach presented, the fluid mechanical subproblem is solved by means of the boundary element method *pan*MARE [1], which is based on the potential flow theory. The structural-mechanical subproblem is engaged using *AdhoC*, a FEM program which enables the use of high-order finite elements. Information exchange between the subproblems is managed by the numerical method *comana* [2]. In addition to an investigation regarding the behaviour of flexible propeller geometries in unsteady flow conditions, an efficient implicit coupling algorithm and a validation of the method are presented in the paper.

REFERENCES

[1] M. Bauer and M. Abdel-Maksoud. A 3-D Potential Based Boundary Element Method for the Modelling and Simulation of Marine Propeller Flows. In *7th Vienna Conference on Mathematical Modelling*, pp. 1179-1184, 2012.

[2] M. König, L. Radtke, and A. Düster. A flexible C++ framework for the partitioned solution of strongly coupled multifield problems. *Computers & Mathematics with Applications*, Vol. **72**(7), pp. 1764-1789, 2016.