Free Running 6DOF CFD for High-Speed Small Craft[1]

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ABSTRACT

CFD simulations of a high-speed small craft, the Generic Prismatic Planing Hull (GPPH), are performed with 6DoF motions. Both single- and multi-phase flow solvers are used for the simulations including variable fidelity modeling (VFM) and high fidelity (HF) methods. The propeller body force and propeller and gear case force models are used in VFM method to replace the actual propeller and gear case geometries used in the HF method. The hull form and propulsor of the GPPH are scaled to match a deep V fishing boat (DVFB). The on water experimental data of the DVFB was collected by Mercury Marine (MM) for self-propulsion, which is used for qualitative validation. Many captive and free running conditions for the high-speed small craft are considered including some most critical conditions, such as 2DoF captive motion, free running self-propulsion, turning circles in calm water and waves, acceleration (including use of the engine curve), and avoidance line tests.

The present work is the first known CFD study for the free running of high-speed small craft with 6DoF motions and is exploratory in nature. The accuracy and performance of the VFM methods are evaluated with the issues identified. Other issues for the simulations of the high-speed small craft are also discussed including the optimum grid sizes, submerged depth of the gear case, and instabilities. All of these can be provided as recommendations for the future research improvements (Stern et al., 2022). In the full paper, the experimental study, numerical methods, computational setup, and simulation results will be reported with some simulation issues identified and discussed.

REFERENCES

[1] F. Stern, M. Diez, Z. Wang, E. J. Lee, E. R. Kubina, “Digital Design: The Way Forward”, *AVT-366 Research Workshop*, Sibiu, Romania, 23-27 May 2022.

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