**XI International Conference on Computational Methods in Marine Engineering**

# Numerical simulation of naval hydrodynamics by the LBM-IBM coupling

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## ABSTRACT

The Lattice Boltzmann Method (LBM) is a recent numerical method compared to the classical approaches used to simulate fluid flow. Historically, it was presented in the 90s, to process gases on the lattice by cellular, and it could be seen as a particular discretization of the discrete velocity of the Boltzmann equation (BE), which describes the behavior of a fluid at a mesoscopic level. The LBM, which is based on the theory of statistical physics to solve numerically the BE. In this equation, the distribution of the different particles that compose a fluid is explicitly addressed in addition to the macroscopic quantities (speed, pressure, and density) [1]. For complex geometries, most LBM algorithms prove difficult to implement, but the Immersed boundary method (IBM)appears to offer a good practical compromise.

The application of LBM to naval hydrodynamics begins to immerse in the community. The aim of this paper is to couple the LBM method with the solid boundary management strategy based on the immersed boundary method. To study the performance of this coupling, we simulate the hydrodynamic flow around a river boat. In particular the reproduction of the ripple waves. The results of the stimulations will be compared to those available in the literature, but also to those obtained experimentally. Finally, we try to apply the results of the model to the estimation of the bedload transport induced by the movement of the boats.

## References

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