K.A. Belibassakis, Th.P. Gerosthathis, K.V. Kostas, C.G. Politis, P.D. Kaklis, A.I. Ginnis and C. Feurer, 2011, “A BEM-Isogeometric Method with Application to the Wavemaking Resistance Problem of Ships at Constant Speed”, Proceedings of the ASME 2011 30th International Conference on Ocean, Offshore and Arctic Engineering, OMAE 2011, June 19-24, 2011, Rotterdam, The Netherlands.

Abstract:
In the present work IsoGeometric Analysis (IGA), initially proposed by Hughes et al (2005), is applied to the solution of the boundary integral equation associated with the Neumann-Kelvin (NK) problem and the calculation of the wave resistance of ships, following the formulation by Brard (1972) and Baar & Price (1988). As opposed to low-order panel methods, where the body is represented by a large number of quadrilateral panels and the velocity potential is assumed to be piecewise constant (or approximated by low degree polynomials) on each panel, the isogeometric concept is based on exploiting the NURBS basis, which is used for representing exactly the body geometry and adopts the very same basis functions for approximating the singularity distribution (or in general the dependent physical quantities). In order to examine the accuracy of the present method, in a previous paper Belibassakis et al (2009), numerical results obtained in the case of submerged bodies are compared against analytical and benchmark solutions and low-order panel method predictions, illustrating the superior efficiency of the isogeometric approach. In the present paper we extent previous analysis to the case of wave-making resistance problem of surface piercing bodies. The present approach, although focusing on the linear NK problem which is more appropriate for thin ship hulls, it carries the IGA novelty of integrating CAD systems for ship-hull design with computational hydrodynamics solvers.