Accurate evaluation of the Kochin function for added resistance using a high-order finite difference-based seakeeping code - DTU Orbit (27/09/2019)

At the 32nd IWWFBF in Dalian, we presented our implementation of the far-field method for second-order wave drift forces based on the Kochin function, using the open-source seakeeping code OceanWave3D-Seakeeping. In that work we used Maruo's method (Maruo, 1960), and calculated the added resistance by a line integral along the azimuthal angle \( \Theta \) around the body in the far-field. Some difficulties were encountered with regard to evaluating the singular and improper integrals, together with identifying the highest frequency limit where we can practically and reliably calculate the Kochin function by a numerical integration over the surface of the body. Motivated by discussions with Prof. Kashiwagi during this workshop (Kashiwagi, 2017), we subsequently applied the Hanaoka transformation (Maruo, 1960) to change the integration domain from \( \Theta \) to a wave-number like variable \( m \). This allows a method developed by Prof. Kashiwagi to be used to evaluate the relevant singular integrals, leading to more robust and accurate results. In this abstract, we outline the numerical method and present new calculations for the added resistance of a submerged and a floating spheroid. These results are compared with near-field solutions, and calculations using boundary element codes where applicable.

General information
Publication status: Published
Organisations: Department of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering
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Number of pages: 4
Publication date: 2018
Peer-reviewed: Yes

Electronic versions:
IWWWFB2018_AminiAfshar_and_Bingham.pdf
URLs:
http://www.iwwwfb.org/Workshops/33.htm
Research output: Contribution to conference › Paper – Annual report year: 2018 › Research › peer-review