ONLINE ISSN : 1881-1760
PRINT ISSN : 1880-3717

Journal of the Japan Society of Naval Architects and Ocean Engineers
Vol. 3 (2006) pp.139-145

[PDF (2641K)] [References]

An Estimation of Flow Field around a Ship in Oblique Motion by a Three Dimensional Vortex Method

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(Received February 24, 2006)

Summary: Present study applies a three-dimensional vortex method to estimate the flow field around a container ship in oblique motion. The three-dimensional vortex method which does not need the grid generaion as a pre-process is a Lagrangian method. The governing equations of the three-dimensional vortex method are vorticity transport equations and continuity equations. In order to solve the convection and diffusion term of vorticity transport equations, present study uses the operator-split algorithm proposed by Chorin. A discreted vorticity model used in present study is vortex blob which is a sphere type and has Gaussian distribution of vorticity. Core-spreading method which calculates the diffusion of vorticity by changing the radius of vortex blob is used and 2nd order Adams-Bashforth method which calculates the convection of vorticity is used. Three-dimensional Hess and Smith type panel method is used to estimate the initial flow field. In present study, flow fields around a container ship in oblique motion (β=3°, 6°, 12°) are shown as results of calculation and usefulness of three-dimensional vortex method is investigated.