COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Hydroelastic Analysis of the Surface Ships subject to Wave and Slamming Forces

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A design tool will be developed to improve sea-keeping and scantling calculations for efficient structural designs for ships and offshore platforms. It will also help in accurate estimation of wave forces and determination of rigid body and flexural response of platforms and ships to ocean waves. The tool development will be based on theoretical models and numerical algorithms. Most ocean platforms and naval crafts are required to operate almost all round, or any time of the year including in high seas. The structures, subjected to large wave loads, are thus prone to capsizing and structural failure. Rigid-body motion and elastic (including slamming) responses of a surface ship in waves are investigated. The modeling is divided into the three parts (i) rigid body motion, (ii) hull girder vibration and (iii) deformation of hull plates due to wave and slamming forces. Wave forces are characterized into Froude Krylov forces and Wagner's slamming forces. For arbitrary geometries, boundary integral method will be used to determine wave radiation forces. Hull girder vibrations are modeled as free-free beam vibrations under wave slamming forces. Deformation of hull plates is studied using the Gorman's superposition method with wave forces modeled using the Froude-Krylov and Wagner's theories. Results highlight effects of wave parameters and ship motions on structural deformation. Results and findings will be used to determine critical parameters affecting failure and contribute to updating/improving classification society rules and guideline on scantlings.