A 3-D Boundary Element Model to Analyze the Multidirectional Random Wave Diffraction in Harbor with Complex Geometry

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Abstract

A numerical model is presented to analyze the response of the multidirectional random wave diffraction in a harbor with complex geometry. Based on shallow water approximation, an incident wave spectrum associated with diffraction, refraction and reflection are described. The domain of interest is dived in to two regions, i.e., open sea and harbor region bounded by harbor walls. In this study, we have considered the partially reflecting boundaries with variable bathymetry in the bounded region. A 3-D Boundary Element Method (BEM) is used to analyze the wave field in the harbor region. The discretized form of Mitsuyasu's spectrum[3]has been implemented to analyze the incident waves from various directions. The present numerical model is implemented on realistic Pohang New Harbor (PNH), which is situated in southeast part of South Korea at Pohang city. This numerical scheme is validated through comparison of simulation results with measurement data recorded at various recorder stations in the PNH. Based on the comparison results, it is concluded that present numerical model is an adequate and efficient model to predict the wave field in the interior and the boundaries of the harbor for various practical applications.

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