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PROCEEDINGS

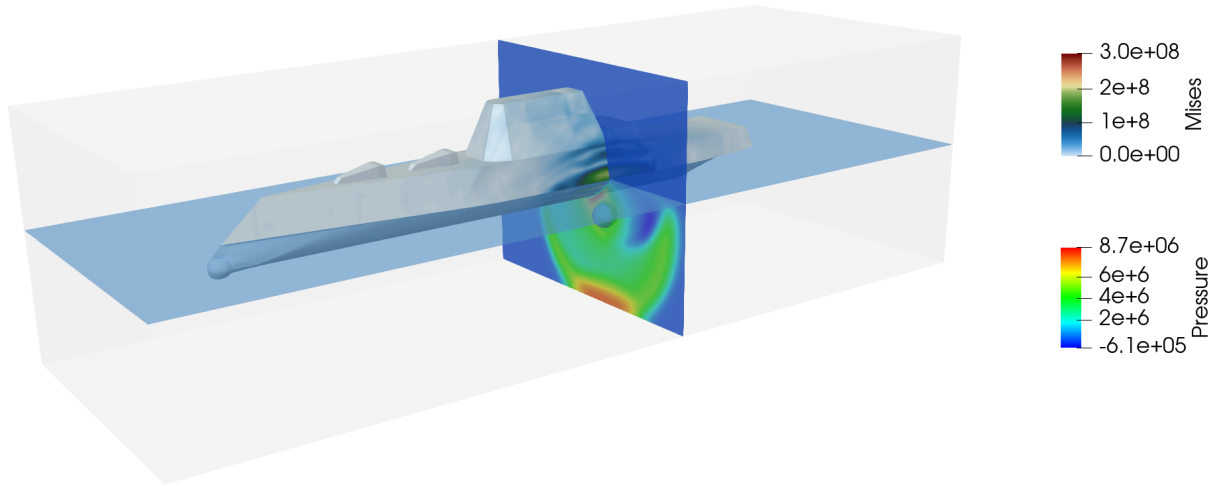
Fluid-Structure Interaction Model for Analysis Underwater Explosion Structural Damage Based on BDIM

Biao Wang[1], Yuxiang Peng[1,*] and Wenhua Xu[2]

[1]School of Ocean Engineering and Technology, Sun Yat-sen University, Zhuhai, 519080, China
[2]School of Civil Engineering and Transportation, South China University of Technology, Guangzhou, 510000, China
[*]Corresponding Author: Yuxiang Peng. Email: pengyx55@mail.sysu.edu.cn

ABSTRACT

The damage process of ship structures under near-field underwater explosions involves strong nonlinear coupling effects of multiple media, and its numerical simulation poses a serious challenge to traditional numerical algorithms. Based on previous research, this article first establishes a highly compressible multiphase flow numerical calculation model based on the high-precision Discontinuous Galerkin Method (DGM) and a ship elastic-plastic damage dynamic model based on the meshless Reproducing Kernel Particle Method (RKPM). Furthermore, we develop an algorithm for grid-independent dynamic expansion of cracks. Based on this, the Boundary Data Immersion Method (BDIM) is used to couple the DGM underwater explosion load numerical calculation model with the RKPM ship structure damage numerical calculation model and a highly nonlinear coupled mechanical model and calculation method for ship structures under near-field underwater explosion loads are established. The numerical prediction of ship damage characteristics under near-field underwater explosions is preliminarily achieved, which can provide technology for optimizing the design of ship protection structures.



KEYWORDS

Boundary data immersion method; Discontinuous Galerkin Method; fluid-structure interaction; smooth kernel approximation

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