An edge-based smoothed point interpolation method for underwater acoustic propagation

†Xiangyu You [1, 2, 3], Yingbin Chai [1, 2, 3], and *Wei Li [1, 2, 3, *]

[1]School of Naval Architecture and Ocean Engineering, Huazhong University of Science and Technology, Wuhan China, 430074

[2]Collaborative Innovation Center for Advanced Ship and Deep-Sea Exploration, Shanghai China, 200240

[3]Hubei Key Laboratory of Naval Architecture & Ocean Engineering Hydrodynamics, Huazhong University of Science and Technology, Wuhan China, 430074

*Presenting author: hustyxy@hust.edu.cn

*****Corresponding author: hustliw@hust.edu.cn

Abstract

The novel edge-based point interpolation method (ES-PIM) is employed to approximate numerical approximations of acoustic problems addressed by the well-known Helmholtz equation in this paper. It is well-known that the numerical results from several classical numerical approaches, such as the finite element approach and several meshfree techniques, are not always sufficient to provide satisfying numerical solutions because of the pollution effect for relatively high wave numbers. The pollution effect may generally come from the "overly-stiff" property of the numerical model constructed using several numerical approaches. Owing to the appropriate softening feature resulting from the edge-based gradient smoothing technique (EGST), the ES-PIM can effectively depress the pollution error effect of the numerical solutions. Numerical results validate that the ES-PIM could provide much more accurate solutions compared with the FEM with the same node distribution.

Keywords: **Meshfree method; ES-PIM; Pollution effect; Helmholtz equation**