

Reliability Enhancement of Mobile Device Based Vibration Measurement on Ship Trials by ROI Optimization Algorithm

**Sung-min Eom¹, Daeho Nam², Hwan-Youp Oh³, Hye Young Jo³, Kyung-ho Sun⁴,
Yun-ho Shin¹**

¹Naval Architecture & Ocean Engineering, Pusan National University, Republic of Korea, ¹Innovative Machinery Systems Research, Korea Shipbuilding & Offshore, Republic of Korea, ¹Innovative Machinery Systems Research, Korea Shipbuilding & Offshore, Republic of Korea, ¹Department of System Dynamics, Korea Institute of Machinery & Materials, Republic of Korea

Conducting vibration measurements on ships presents substantial difficulties, particularly in challenging environments such as high-altitude locations, confined spaces, or areas remote from the ship's equipment or structure. The industry has been demanding a need for an adaptable, reliable, and precise vibration measurement tool. Therefore, this research has developed a mobile-based vibration processing system utilizing image processing. Among these image processing techniques, we employ the phase correlation-based template matching method which has advantages in vibration measurement. It extracts the Region of Interest (ROI) and compare phases to calculate the amount of vibration change. In the process, setting the ROI can lead to inconsistencies in accuracy depending on how the ROI is determined. Therefore, this study has researched and developed a system for identifying the optimal ROI. This study also examines the common challenges encountered in vibration data acquisition during sea trials, such as the impacts of deck vibrations and hand tremors. It can affect the recording process and the accuracy of the measurements. These adverse effects will be addressed to introduce mitigation strategies, aiming to refine the reliability of the mobile device-based system. Ultimately, this study has validated the effectiveness of the developed system by conducting and analyzing real vibration measurements on ships.