Design and performance assessment of a hydrographic unmanned surface vessel for enhanced autonomous bathymetry operations in shallow water areas

Indian Journal of Geo-Marine Sciences • Article • 2024 • DOI: 10.56042/ijms.v53i04.10580

Norazaruddin M.A. [a, b] ; Abidin Z.Z. [a, b] ; Anuar T.A.T. [a, b]

[a] Department of Mechatronics, Kulliyah of Enginnering, International Islamic University, Kuala Lumpur, Malaysia, 53100, Malaysia

Abstract

This paper details the development and performance evaluation of an Unmanned Surface Vessel (USV) designed for enhanced autonomous bathymetry in shallow water areas. Through significant technological enhancements, including the integration of a CXSense controller, M1G2 GNSS receiver, KVH C100 magnetic compass, and SBG System INS, the USV demonstrated exceptional operational capabilities. Performance metrics revealed a cross-track error of 0.92 to 2.39 meters, surpassing the International Hydrographic Organization's Category 2 standards. The study outlines the comprehensive upgrades undertaken on the USV's propulsion, GNSS positioning, course control, and data transmission

systems, which collectively facilitated robust automated operations. The successful deployment of low-cost multi-GNSS receivers illustrates a shift toward more economical hydrographic survey methods, challenging the need for expensive professional-grade equipment. The findings underscore the potential of USVs in revolutionising hydrographic surveying, offering substantial improvements in cost-efficiency, operational flexibility, and data accuracy, thereby enhancing marine research and commercial maritime operations.

Author keywords

Autonomous bathymetry; Autonomous navigation; Hydrographic surveying; Maritime technology; Unmanned Surface Vessel

Indexed keywords

GEOBASE Subject Index

bathymetric survey; data transmission; GNSS; navigation; performance assessment; positioning system; shallow water; ship design; unmanned vehicle

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Hidrokinetik Technologies Sdn Bhd and International Islamic University Malaysia		
Research Management Centre, Universiti Teknologi Malaysia See opportunities by RMC		RMC
International Islamic University Malaysia See opportunities by IIUM		IIUM