

Intelligent Practices and Prospects for Shiphandling System

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Abstract

This report provides a comprehensive overview of the intelligent development of shiphandling systems. It begins by reviewing the evolutionary trajectory of these systems—from electrification, through automation and networking, to the current stage of intelligence—while clearly defining the core connotations of intelligent shiphandling. Subsequently, it highlights key challenges currently impeding the development of intelligent shiphandling: insufficient perceptual capability under adverse sea conditions, difficulties in multimodal information fusion, significant complexities in decision-making under complex scenarios, and persistent bottlenecks in ship modelling and high-precision control algorithm design under special operating conditions.

The report also details practical achievements to date, including successful real-vessel tests of autonomous collision avoidance, automatic berthing and unberthing, and other functions in scenarios such as open waters and confined waterways. Finally, it offers a forward-looking perspective, outlining future efforts that will focus on deep integration of multisource information, large-model-based decision-making in the navigation domain, and other technologies. The ultimate goal is to develop a highly autonomous, safe, and reliable autonomous shiphandling system capable of operating across all sea areas, thereby contributing to the construction of a maritime powerhouse.



Xiaoming Zhao, Male, Ph.D., Professor / Doctoral Supervisor. Chief Expert of China State Shipbuilding Corporation Limited (CSSC), recipient of the Special Government Allowance of the State Council. His main research fields include ship navigation and precision instruments. He has long been engaged in research on inertial navigation technology, and the inertial navigation products he developed have been applied in major national projects such as navigation satellites and large vessels. He serves as the Chief Project Manager of National Key Research and Development Programs and has led/participated in multiple major national special projects. He has published four academic monographs and received more than ten provincial and ministerial-level science and technology awards.