

Maintenance Work Packaging-Based Augmented Reality Remote Maintenance Considering Maritime Network Environment

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Extended Abstract

With the growing interest in autonomous ships, the demand for ship automation is accelerating in the shipbuilding industry [1]. Owing to such technological developments, the number of sailors aboard ships will gradually decrease. Moreover, as more experienced sailors prefer to work on land, sailors aboard ships will find it increasingly difficult to gain expertise. This results in novice sailors who are unacquainted with automation systems feeling overwhelmed by their work.

Additionally, many resources and equipment are required for ships, and the cost of maintenance work accounts for 60 to 70% of the total operating cost [2,3]. Such high costs are attributed to difficulties in accessing ships at sea and the increased waiting time associated with temporarily halted operations. If the maintenance work on a ship can be quickly performed, the ship will not stop, and the stability of its operations will increase. Furthermore, the costs of simply replacing damaged parts can reach 70% of the total maintenance cost [3], making it essential to find alternative policies that can reduce maintenance costs. Accordingly, many studies have been conducted on the design and development of mobile-based real-time maintenance support tools and applications to prevent unnecessary errors [4]. Moreover, owing to the rapid development of augmented reality (AR), more studies exploiting the advantages in visualizing engineering data during maintenance work are being conducted [5]. These trending technologies contribute greatly to the development of remote maintenance support systems.

Although these technologies show a good performance in terms of data visualization, experts are still crucial in situations wherein errors occur, and the necessary data for maintenance systems are absent. Additionally, even if remote support is available, receiving it is difficult owing to the instability of communication in the maritime environment. Therefore, in this study, we propose a maintenance work packaging (MWP) system to smoothly support the decision-making of sailors involved in maintenance work and also propose a maintenance plan to be implemented according to the communication environment. MWP is a planned and feasible work process involving the definition of error code, maintenance plan, execution that are implemented from the initial plan of a project to the course of its execution, and it is an effective method for systematic and efficient maintenance management. Additionally, we developed a real industrial scenario to test the proposed MWP system and conducted a functional test to determine whether the developed application could perform all the necessary functions. Finally, to verify the financial feasibility of the proposed system, we assumed a ship communication environment and calculated and analysed the associated costs.

References

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