CANbus Based System For Course And Ride Control In Fast Ship Autonomous Model

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Abstract: In this paper a new experimental system for studies about the integrated course and active appendages control is introduced. The research focuses on fast ships. The appendages considered are moving flaps, fins, and a T-foil. They are used for motion smoothing. The fast ships use powerful waterjets that can be oriented for course control, instead of using rudders. When an actuator moves, course control is disturbed. An integrated actuators and course control system is needed. This is a main target of our research. A departing point for the research is to provide an experimental system for control studies. This system consists of an autonomous scaled physical model and an external support system (ESS). The on-board control system is based on a CAN bus, using several smart nodes.. The paper describes the distributed control system of the physical model, and the ESS. The distributed architecture of the model on-board system can be easily ported to real ships, since the CAN bus can be extended to relatively long distances.

Key-Words: ship control, ride control, seakeeping, CAN bus system, experimental ship control systems, scaled ship physical model.

1 Introduction

Some modern fast ships use active appendages, such moving flaps, fins, etc., for motion smoothing. Also, they use waterjets that can be oriented for course control, instead of using rudders. When a fin moves, it has a good influence to counteract rolling motion, but it can also disturb the ship heading. Likewise, any other action of the appendages and the waterjets cause good effects but collateral problems. An integrated control system is needed. This is a main target of our research. A departing point for the research is to provide an experimental system for control studies. This system consists of an autonomous physical model and an external support system (ESS). After considering a centralised computer-based system to handle the sensors and actuators in the model, this concept was abandoned and a more capable and flexible solution was devised. The new solution is based on a CAN bus, using several smart nodes. The distributed architecture of the model on-board system can be easily ported to real ships, since the CAN bus can be extended to relatively long distances.

Along this paper we will present first the research framework, which is related with fast ferries. Then, we will focus on the requirements to be observed for the scaled experimental system, which convey several difficulties. The main parts of the paper follow, describing the new distributed control solution for the model on-board system. Practical details are given, with several photographs. Finally, the paper describes the ESS system, showing some screens of the computer that, from the border of a basin or any other place in open-air experiments, is capable to monitor the data captured by sensors on the ship during the control experiments.

Relevant bibliographic references about seakeeping and ride control are [1][2].

2 Research Context

Our research deals with control design for pitch, heave and roll motion smoothing, while keeping a constant ship course, using actuators such flaps, fins and T-foil. A particular fast ferry has been selected for case study.

Figure 1 shows a view of the fast ferry. She has the following characteristics: 110 m. long, 1,250 passengers, aluminium-made deep-V monohull, reaching 40 knots or more. She uses powerful waterjets for propulsion and heading, having no