



Estimation of Ship Properties for Energy Efficient Automation

Master Thesis Project Proposal

ABB is a leading supplier of power and propulsion systems for ships and is ever expanding its offerings in marine automation and advisory systems. The demands for accuracy and intelligence for such systems have increased due to new requirements concerning vessel performance, energy efficiency and operational safety. Hence, there is an expanding shipping market for advanced systems within decision support, signal processing, optimization and control. Sensor data processing is common for all these systems and a central problem is to extract useful information from the sensors, including properties that cannot be measured directly during normal operation. A few examples are a ship's trim angle, inertia, draft and mass. Knowing these properties and hence, being able to predict the ship's behavior, is essential to maneuver the ship in a safe manner and to increase energy efficiency.

Many of these properties are time-varying and in some cases, it is important to estimate them to be able to either implement new or extend existing functionality. One natural approach to obtain these estimates is to apply methods from system identification and sensor fusion. This is an active research area and many open problems remain. In this master's thesis, estimation of ship properties will be studied for a particular vessel equipped with various control and sensor systems.

The goal of this thesis is not only to solve a specific estimation problem, but rather to do a broad investigation of what is possible with a certain combination of sensors and actuators. In the thesis, real data from large ships will be used as a basis for this investigation. This master's thesis can be seen as an extension of certain parts of the method developed in Linder (2014), which serves as a starting point, but also as a way to take this method one step closer to the industrial application.

The master's thesis will be performed at ABB Corporate Research in Västerås in cooperation with the Division of Automatic Control at Linköping University. There might also be an opportunity to visit ABB Marine in Finland to collect additional data from their ship simulator and to discuss customer and market needs.

Inquiries should be directed to Shiva Sander Tavallaey (shiva.sander-tavallaey@se.abb.com) at ABB Corporate Research.

References

Jonas Linder. *Graybox Modelling of Ships Using Indirect Input Measurements*. Linköping Studies in Science and Technology. Thesis 1681. Linköping University, Sweden, 2014.