A Machine-Learning Approach to Predict Main Energy Consumption under Realistic Operational Conditions

The paper presents a novel and publicly available set of high-quality sensory data collected from a ferry over a period of two months and overviews existing machine-learning methods for the prediction of main propulsion efficiency. Neural networks are applied on both real-time and predictive settings. Performance results for the real-time models are shown. The presented models were successfully developed in a trim optimisation application onboard a product tanker.
Statistical modelling for ship propulsion efficiency

This paper presents a state-of-the-art systems approach to statistical modelling of fuel efficiency in ship propulsion, and also a novel and publicly available data set of high quality sensory data. Two statistical model approaches are investigated and compared: artificial neural networks and Gaussian processes (GP). The data presented is a publicly available full-scale data set, with a whole range of features sampled over a period of 2 months. We further discuss interpretations of the operational data in relation to the underlying physical system.
Mining of Ship Operation Data for Energy Conservation

This thesis presents two state-of-the-art systems approaches to statistical modelling of fuel efficiency in ship propulsion: a regression model and a dynamical model. Three statistical regression model approaches are investigated and compared: Artificial Neural Networks (ANN), Gaussian processes (GP), and Gaussian Mixture Models (GMM). A dynamical modelling approach is introduced. This modelling approach has not been used before in the context of ship propulsion modelling, and solves problems encountered with the regression model in an onboard trim optimization application. The dynamical model is introduced through a study of the well-known sunspot time series, and then on ship data. The dynamical modelling approach is investigated using both the Artificial Neural Network and the Gaussian mixture model. The thesis also presents a novel and publicly available data set of high quality sensory data on which all the models are based and tested. No other similar publicly available data set exists. The data presented is a publicly available full-scale data set, with a whole range of features sampled over a period of 2 months. The data is online with an accompanying homepage, where all the results are also presented.

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Phd Student:
Petersen, Jóan Petur (Intern)
Supervisor:
Jacobsen, Danjal Jakup (Intern)
Main Supervisor:
Winther, Ole (Intern)
Examiner:
Larsen, Jan (Ekstern)
Bertram, Volker (Ekstern)
Ohlsson, Mattias (Ekstern)

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