Navigational Decision Support System (DSS) for Optimal Ship Fuel Consumption

Project Description

Over 80% of global goods commerce are transported by sea. Carbon dioxide emission caused by shipping contributes to a sizable portion of the world's overall greenhouse gas emissions. Ship Fuel Consumption (SFC) makes up the majority of a ship's overall operating cost. It is essential for new and existing international commercial vessels to have systems such as SEEMP (Ship Energy Efficiency Management Plan) and EEDI (Energy Efficiency Design Index) as a way to reduce greenhouse gas emissions and enhance SFC. This capstone project aims to develop an onboard decision support system (DSS) for maritime navigation that can guide the operator of a BC Ferries vessel to optimize its SFC by adjusting its operational parameters in real-time. This would be done by implementing of a machine learning model that could predict SFC based on the situation around the ship and suggest optimized operational parameters and routes. A multitude of variables are recorded during vessel operation, and additional sensors were installed on a BC Ferries vessel between Horseshoe Bay and Nanaimo for this project. Sensor data available to the operator's dashboard includes draft, GPS data, wind, depth of water, radar, etc. and they were recorded over the last two years. In order to achieve the above objective, it requires the development of a prototype DSS or integration of an existing navigation support system framework that uses some or all of the above variables as input, and presents the optimized parameters to the operator. Many DSS are incorporating embedded engineering and edge computing to provide offline real-time navigational decision support to the operator. Thus, AI-powered navigational DSS are poised to advance conventional maritime navigation to provide optimized SFC for individual