Prediction of Aerodynamic Performance for Multiple Flettner Rotors on the Oil Tanker using Deep Learning Methodology

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ABSTRACT

The Flettner rotor is one of the wind-assisted propulsion devices for eco-friendly ships. To verify the efficiency of the rotor system, assessment of the performance of rotors considering the interaction of multiple rotors is essentially required. In the present study, aerodynamic performance of drag and lift coefficients for four rotors on the oil tanker were estimated using computational fluid dynamics. And the flow field around rotors was derived to examine the interaction of the rotors. Locations and rotating speeds of rotors were varied to assess their effects to the performance of multiple rotors. In addition, deep learning model was established to reduce the time and cost of numerical simulation. Dataset was composed of design parameters and aerodynamic performances for rotors as input data and output label, respectively. Deep learning model was trained and effect of hyperparameters was reviewed. Prediction of aerodynamic performance was compared with the results of analysis and error was quite reasonable. The deep learning approach will be useful to design the multiple Flettner rotors by quickly predicting the aerodynamic performances.

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