Comparison of Different Neural Networks Performances on Motorboat Datasets

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Abstract. Calculation of the required engine power and displacement takes an important place in the initial design of motorboats. Recently, several calculation methods with fewer parameters and with a possible gain of time compared to classical methods have been proposed. This study introduces a novel calculation method based on neural networks. The method requires less data input and hence is more easily applicable than classical methods. In this study several different neural network methods have been conducted on data sets which have principal parameters of motorboats and the respective performances have been presented. From the results obtained, displacement and engine power prediction for motor boats can be used at a suitable level for ship building industry.

1 Introduction

At the predesign stage, the necessary information to calculate ship displacement and engine power is usually obtained by testing similar ship models in the towing tank. These data are converted into characteristic curves, tables and empiric equations via principal dimensions of ship. Moreover, with the developing computer technology, today it is also possible to calculate engine power and displacement using specific computer programs for the dimensions of the ship as inputs.

Recently, calculating design parameters with neural network is found to be much better than the traditional calculation methods in terms of time and costs. In the literature there are some applications of neural networks into naval architecture: neural network applications in naval architecture and marine engineering
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Design of a robust neural network structure for determining initial stability particulars of fishing vessels [2], modeling and simulation of ship main engine based on neural network [3], determination of approximate main engine power for chemical cargo ships using radial basis function neural network [4] can be given as examples.

In this study, different neural network models are applied for determining the engine power and displacement based on principal parameters of current motorboats which have a length of 8 to 25 meters. Input data for the model are used ship length, breadth, draught and speed as principal parameters. System output is the engine power and displacement to be predicted and then the results of these methods are compared to examine which method gives better results.

A motorboat’s profile and upper view are given below in Figure 1. Main dimensions and related parameters in the illustrations are defined below.

Fig. 1. A motorboat’s profile and upper view

**(BL) Baseline:** The horizontal line parallel to the design waterline (DWL), which cuts the midship section at the lowest point of ship. The vertical heights are usually measured from the baseline.

**(LOA) Length Overall:** The total length of the ship from one end to the other, including bow and stern overhangs.

**(T) Draught:** The vertical distance from the waterline at any point on the hull to the bottom of the ship.

**(B) Breadth:** The distance from the inside of plating on one side to a similar point on the other side measured at the broadest part of the ship.

**(V) Ship speed (Knot):** The distance in miles taken in an hour.

**(∇) Water Displacement (m$^3$):** The water displacement equals the volume of the part of the ship below the waterline including the shell plating, propeller and rudder.

**(Δ) Displacement (ton):** The displacement is weight of the volume of water displaced by the ship.