Journal of Acoustical Engineering Society of Iran, Vol. 11, No. 1, 2023

(Research Article)
Comparing the performance of artificial neural networks, hybrid genetic algorithm and hybrid imperialist competitive algorithm in acoustical classification of vessels based on their weight

A.A. Abniki[1], H. Sayyaadi[*2], M.S. Seif[2]
1. Faculty of Mechanical Engineering, Sharif University of Technology
2. Scientific Center of Hydrodynamics and Dynamics of Marine Vehicles, Faculty of Mechanical Engineering, Sharif University of Technology

Received: 2022/12/20, Accepted: 2023/01/21

Abstract

Accurate and correct identification of vessels moving in the waters from a distance is important in many ways. Having information type of vessels more correct decisions on how to deal with them. The sounds emitted by the vessels can be distinguished from each other and it is possible to identify the vessels by their sound. Therefore, in this study, the vessels have been classified based on their weight and the sound emitted by them. In the present study, the characteristics of each of the sounds recorded the vessels were extracted using the Mel-Frequency Cepstrum Coefficients (MFCC) method, and the ability of the artificial neural network and its hybrids with the Genetic Algorithm (ANN-GA) and the Imperialist Competitive Algorithm (ANN-ICA) The results showed that artificial neural network feed forward back propagation (BP-FF) with learning functions Levenberg-Marquardt (LM), Bayesian (BR) and Resilient Backpropagation (RP) has an accuracy of 86, 96 and 82 percent respectively in assigning the features of each vessels to them. Also, ANN-GA and ANN-ICA networks showed classification accuracy equal to 94% and 77%, respectively. Finally, it can be concluded that the Artificial Neural Network with the Bayesian learning function has the ability to acceptably classify the sounds emitted the vessels and can be used in marine and military applications.

Keywords: Vessel, Sound, Artificial neural network, Genetic algorithm, Imperialist competitive algorithm.

pp. 13-24 (In Persian)

[*] Corresponding author E-mail: sayyaadi@sharif.edu

[Downloaded from joasi.ir on 2026-11-17]