Comparative analysis of the application of different metaheuristic methods for determining the coefficients of empirical models for determining sound absorption

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Abstract. Metaheuristics are widely used in various fields due to their ability to solve complicated optimization problems. In acoustics, it is possible to apply metaheuristics to determine the optimal values of coefficients in empirical models of acoustic impedance. In this paper, different metaheuristic approaches (i.e. gray wolf optimization algorithm, marine predator algorithm, beluga whale optimization, sand cat swarm optimization) are presented for solving the above problem. They are based on different biological phenomena and with these methods no experience is required in determining the initial values of the variables as it is possible to set a wide range for the initial values of the variables. The applied methods provide a satisfactory prediction of the sound absorption coefficient of open-cell polyurethane foam, compared to the experimental results obtained in an impedance tube. The paper provides a comparative analysis of recent metaheuristics: gray wolf optimization algorithm, beluga whale optimization algorithm, marine predator algorithm and sand cat algorithm.

Keywords: biologically inspired algorithms, empirical model for sound impedance, polyurethane foams.