

SWARM INTELLIGENCE ALGORITHMS IN THE TASKS OF MEDICAL DIAGNOSTICS

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A main feature of most scientific practical problems is the search of rational solutions in the multidimensional space of alternatives. At the same time, the quality indicators are described by nonlinear dependencies and evaluated using complex algorithms, which leads to high computational complexity. In this case, swarm intelligence optimizers should be applied. Swarm intelligence systems consist of a set of agents, that locally interact with each other and the environment, learn and find solutions to a specific problem.

The *aim* of the work is to describe two agent-based metaheuristics, which are successfully applied to solve complex problems on biomedical and healthcare, like optimization tasks, data clustering, classification, data mining [1, 2].

The firefly algorithm is based on the behavior of a flock of fireflies in nature and their interaction with the help of luminescence using a special substance – luciferin. All fireflies can attract each other regardless of their gender, using the brightness of the emitting. The firefly attractiveness to other individuals is proportional to its brightness, so a less bright firefly moves towards a brighter one. If the firefly does not see a firefly brighter than itself, then it moves randomly in the neighbourhood of the current positions [3].

The bat algorithm is based on the echolocation capabilities of bats, which are used to detect prey and obstacles. While flying at a certain speed from their current position, they emit frequency-modulated audio signals, that have a certain frequency and volume, and capture the echo reflected from surrounding objects. The frequency and intensity of the sound pulses varies depending on the proximity to the target. The volume of the sound signal changes from some large initial value to a predetermined small value. To determine the new positions of bats a local search is performed [4].

Swarm intelligence algorithms are used for doctor support to prognose of major diseases (different tumors, cardiovascular diseases etc.) and to define diagnosis and treatment. So, presented algorithms can be successfully used to solve complex problems due to their simplicity, flexibility and efficiency.

References:

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