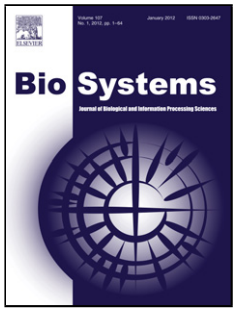

Title: A novel bio-inspired optimization model based on Yellow Saddle Goatfish behavior

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A novel bio-inspired optimization model based on Yellow Saddle Goatfish behavior

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Abstract

Several species of fish live in groups to increase their foraging efficiency and reproduction rates. Such groups are considered self-organized since they can adopt different cooperative actions without the presence of an apparent leader. One of their most interesting collaborative behaviors found in fish is the hunting strategy presented by the Yellow Saddle Goatfish (parupeneus cyclostomus). In this strategy, the complete group of fish is distributed in sub-populations to cover the whole hunting region. In each sub-population, all fish participate collectively in the hunt considering two different roles: chaser and blocker. In the hunt, a chaser fish actively tries to find the prey in a certain area whereas a blocker fish moves spatially to avoid the scape of the prey. In this paper, we develop the hunting model of Yellow Saddle Goatfish, which at some abstraction level can be characterized as a search strategy for optimization proposes. In the approach, different computational operators are designed in order to emulate this peculiar hunting behavior. With the use of this biological model, the new search strategy improves the optimization results in terms of accuracy and convergence in comparison to other popular optimization techniques. The performance of this method is tested by analyzing its results with other related evolutionary computation techniques. Several standard benchmark functions commonly used in the literature were considered to obtain optimization results. Furthermore, the proposed model is applied to solve certain engineering optimization problems. Analysis of the experimental results exhibits the efficiency, accuracy, and robustness of the proposed algorithm.

Keywords: Bio-inspired model, self-organized systems, evolutionary computation, optimization

1 Introduction