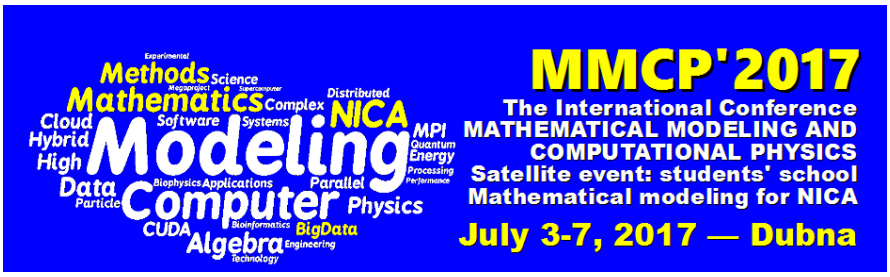

Contribution ID: **155** Type: **not specified**

Adaptation of swarm optimization algorithms to the swarm robotics control problems

Monday 3 July 2017 17:00 (30 minutes)

The work is devoted to the development of algorithms for control of robot swarms. The complexity of this problem lies in the fact that we should program the behavior (identical) of the individual robot, and the programming goal is the collective behavior of the entire swarm. At the same time, there are a number of search-type problems, for example, the problem of finding the source of pollution, which can be considered as optimization problems. To solve such problems, there is a well-designed class of algorithms called swarm optimization algorithms (particle swarm optimization algorithm, bacterial foraging optimization algorithm), which were originally designed on the basis of swarm behavior. However, direct application of such algorithms in swarm robotics is impossible due to the use of mechanisms that can not be supported by real robots (instantaneous movement of robots to any point in the decision space, reproduction and selection). In addition, the very task of searching for a particular object inside given area can limit even the usual behavior of robots - for example, the presence of obstacles (walls) prevents the movement of robots even a short distance. Such limitations in optimization problems are usually absent. The purpose of our research is to adapt the algorithms of swarm optimization to solving search problems by swarm robots. We consider the model problem of searching for the source of a certain signal, describe the adapted versions of several classical algorithms of swarm optimization, and present the results of a numerical study of the efficiency of the developed algorithms. We use NetLogo integrated environment as a modeling tool.

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Session Classification: Poster Session