Bee Colony Optimization

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Natural systems have become significant sources of ideas and models for development of various artificial systems. Swarm behavior is one of the main characteristics of many species in the nature. Herds of land animals, fish schools and flocks of birds are created as a result of biological needs to stay together. Swarm behavior is also one of the main characteristics of social insects. Swarm intelligence is based on investigation of actions of individuals in different decentralized systems.

There have been substantial advances in the theory and applications of Swarm Intelligence in last decade. The BCO metaheuristic (Bee Colony Optimization) that will be presented in the lecture belongs to the class of Swarm Intelligence algorithms. The BCO uses an analogy between the way in which bees in nature look for a food, and the way in which optimization algorithms search for an optimum of a given combinatorial optimization problem. The BCO is a stochastic, random-search technique that belongs to the class of population-based algorithms. The BCO represents an artifcial system composed of a number of precisely defined agents (individuals, artificial bees). Population of agents (artificial bees) collaboratively searches for the optimal solution.

The intention of this lecture is to provide an overview of the BCO principles and applications, to evaluate the current state-of-the-art in the subject, and to underline topics which seem promising for future research.