

Chee Peng Lim, Lakhmi C. Jain, and Satchidananda Dehuri (Eds.)

Innovations in Swarm Intelligence

Studies in Computational Intelligence, Volume 248

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Innovations in Swarm Intelligence



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Preface

In recent years, swarm intelligence has attracted a lot of researchers' attention. A variety of swarm intelligence models have been proposed and applied successfully to solve many real-world problems. In general, the concept of swarm intelligence is inspired by the social behaviour of gregarious insects and other animals. The emergent behaviour of multiple unsophisticated agents interacting among themselves and with their environment leads to a functional strategy that is useful to achieve complex goals in an efficient manner. For instance, ants, which are almost blind to their environment, are capable of finding the shortest path from their colony to their food sources and back. Bees perform waggle dances to convey useful information on nectar sources to their hive mates. A number of desirable properties also exist in swarm intelligence models, which include feedback and adaptation to changing environments, and multiple decentralized interactions among agents to work collaboratively as a group in completing complex tasks.

From the computational point of view, swarm intelligence models are largely stochastic search algorithms. They are useful for undertaking distributed and multi-modal optimization problems. The search process is robust and efficient in maintaining diversity. A mechanism to impose a form of forgetting is also adopted in some swarm intelligence algorithms such that the solution space can be explored in a comprehensive manner. Thus, the algorithms are able to avoid convergence to a locally optimal solution, and, at the same time, to arrive at a global optimized solution with a high probability.

In this research book, a small collection of recent innovations in swarm intelligence is presented. The swarm intelligence techniques covered include particle swarm optimization and hybrid methods, ant colony optimization and hybrid methods, bee colony optimization, glowworm swarm optimization, and complex social swarms. Applications of swarm intelligence to operational planning of energy plants, modelling and control of nanorobots, classification of documents, identification of disease biomarkers, and prediction of gene signals are described. The book is useful to researchers, practising professionals, and undergraduate as well as graduate students of all disciplines.

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