Preface

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As a branch of meta-heuristic algorithms, swarm intelligence is to study the collective behavior of decentralized, self-organized and populated systems. Inspired by the behavior of biological swarms or artificial populations, researchers and practitioners have proposed many distributed models or algorithms for problem-solving in complex environments by means of observing, abstracting, modeling, and simulating the collaborative behavior in nature biological or artificial populations. Usually, the optimization process of a swarm intelligence algorithm is a heuristic and iterative search process by constantly generating, updating, and selecting solutions. The research objective of swarm intelligence algorithm is to design and develop optimization algorithms with the ability of problem-solving by taking inspiration from intelligent behaviors exhibited in biological communities and understanding the characteristics of the interaction mechanism in a swarm. Exploring the wisdom of collective behavior of swarm intelligence algorithms have achieved a great success in many practical problems, such as path planning, task scheduling, multi-robot systems, data mining and so on. Currently, swarm intelligence algorithms and their applications are very attractive and widely studied in the community of computational intelligence.

One of the most popular swarm intelligence algorithms is the Particle Swarm Optimization (PSO), which is inspired by the social behavior of bird flocking and has been widely used in real-number optimization problems. Very recently, many nature-inspired algorithms have been proposed, such as the fireworks algorithm which is inspired by the fireworks explosions in air. Besides the improvements of algorithms, a number of important applications of swarm intelligence algorithms have been reported in a variety of fields. The International Conference on Swarm Intelligence (ICSI) series is an important forum and high-reputation platform for researchers and practitioners all over the world to exchange latest advances in theories, technologies, and applications of swarm intelligence and related areas. The Eighth/Ninth International Conference on Swarm Intelligence and the Second/Third International Conference of Data Mining and Big Data (ICSI-DMBD'2017&2018) were successfully held in Fukuoka, Japan and Shanghai, China, respectively, with the goal of stimulating a combination of the swarm intelligence and computational intelligence studies globally. The theme of the conferences was "Serving Life with Intelligence and Data Science". This special issue aims at promoting research on swarm intelligence algorithms and applications by choosing some important highlighted advances. With the help of the technical committee of the joint events and through a vigorous peer-review reviewing process, eight papers from the ICSI-DMBD'2017&2018 reflecting the latest advances in swarm intelligence algorithms and their applications were recommended and included for this special issue.

The first paper entitled "A survey on traffic optimization problem using biologically inspired techniques" by Sweta Srivastava and Sudip Kumar Sahana presents an overview of some biologically inspired techniques which can be visual, conceptual or computational. Several biologically inspired techniques are implemented in various areas of research and development. Various implementations for traffic optimization with an objective to optimize congestion, minimize wait time, improve safety and reduce pollution.

The second paper is "Scheduling for airport baggage transport vehicles based on diversity enhancement genetic algorithm" by Weian Guo, Ping Xu, Zhen Zhao, Lei Wang, Lei Zhu and Qidi Wu. A novel genetic algorithm (GA) is

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proposed for the vehicles scheduling. The algorithm is improved by considering simultaneously both population diversity and population fitness. A cooperative mechanism is employed to design the selection operation for genetic algorithm, where both exploitation ability and exploration ability can be considered. To address the airport baggage transport vehicle scheduling problem, real data is adopted in the proposed algorithm for simulation.

The third paper is "Quantum ant colony optimization algorithm for AGVs path planning based on Bloch coordinates of pheromones" by Junjun Li, Bowei Xu, Yongsheng Yang and Huafeng Wu. A novel quantum ant colony optimization algorithm for automated guided vehicles (AGVs) path planning based on Bloch coordinates of pheromones is proposed. This approach combines the advantages of quantum theory and ant colony algorithm to obtain feasible, conflict-free, and optimal paths. Repulsions among AGVs are supposed to exist to avoid conflicts. A repulsion factor is employed in the state transition rule to increase the space–time distance among AGVs as much as possible. The performance of the proposed algorithm is compared to those of the other three methods in simulation of AGVs path planning at an automated container terminal.

The fourth paper entitled "A new multi-stage perturbed differential evolution with multi-parameter adaption and directional difference" by Guangzhi Xu, Rui Li, Junling Hao, Xinchao Zhao and Ying Tan proposes a new multi-stage perturbed differential evolution (MPDE). A new mutation strategy "multi-stage perturbation" is implemented with directivity difference information strategy and multiple parameters adaption. The multi-stage perturbation-based mutation operation utilizes the normal random distribution with adjustable variance to perturb the chosen solutions. Multiple parameters are adaptively adjusted to appropriate values to match the current search status of algorithm. Simulation results show that the proposed MPDE is better than or at least comparable to several algorithms in terms of optimization performance over CEC2015 benchmark functions.

The fifth paper entitled "Ensemble particle swarm optimization and differential evolution with alternative mutation method" by Hong Wang, Lulu Zuo, Jia Liu, Wenjie Yi and Ben Niu presents a new ensemble algorithm which combines two well-known algorithms particle swarm optimization (PSO) and differential evolution (DE). The population of the proposed algorithm consists of two groups which employ two independent updating methods. Each individual conducts the correspondent mutation and crossover strategies according to the parameter values randomly selected, and the parameter values of scaling factor and crossover probability are updated accordingly throughout the iterations. Numerous simulations on twenty-five benchmark functions have been conducted to show the proposed algorithm outperforms some well-exploited algorithms.

The sixth paper entitled "Multi-source, multi-object and multi-domain (M-SOD) electromagnetic interference system optimized by intelligent optimization approaches" by Yihua Hu, Minle Li, Xiangyu Liu and Ying Tan proposes a novel method to optimize the setting of parameters of a multi-source, multi-object and multi-domain (M-SOD) interference system based on intelligent optimization approaches. Furthermore, this study also builds an intelligent optimization model, which contains multiple transmitters and receivers involved many parameters include position, direction of space domain, frequency, bandwidth, and power. The extensive experiments and comparisons show that the proposed algorithm is an effective approach for setting the parameters of an M-SOD electromagnetic interference system and superior to the conventional method.

The seventh paper is "Optimal Shape Design of an Autonomous Underwater Vehicle Based on Multi-objective Particle Swarm Optimization" by Qirong Tang, Yinghao Li, Zhenqiang Deng, Di Chen, Ruiqin Guo and Hai Huang. In this paper, a novel strategy combining genetic expression programming and crowding distance based multi-objective particle swarm algorithm is presented to show the superiority of the GEP method. Then the resistance and surrounded volume are set as two optimized variables and Pareto optimal solutions are obtained by using multi-objective particle swarm algorithm. Finally, the optimization results are compared with the hydrodynamic calculations, and the comparison demonstrates that the method proposed in the paper can greatly reduce the cost of computation and improve the efficiency of optimal shape design for underwater vehicle.

The eighth paper is "Periodic motion generation for the impactless biped walking up slopes via genetic algorithm" by Lulu Gong, Ruowei Zhao, Jinye Liang, et. al. In this study, the ranges of angular positions of lower limb joints are confined and the velocity of swing foot is zero when it touches the grounds, which results in the construction of the impactless planar bipedal model. Motion/force control scheme combined with genetic algorithm (GA) are used to ensure stability and low energy cost of bipedal walking at different speeds. The optimized parameters of gaits are obtained by GA, which include walking speed, step length and the maximum height of swing ankle joint. The results show that the biped consumes more energy when the optimal walking speed increases for walking on slopes with the same gradient.

We are grateful to the Editor-in-Chief Prof. Joost N. Kok for giving us this opportunity to produce this special issue. Then, we would like to deliver our thanks to the ICSI-DMBD'2017&2018 international program committee and all reviewers for their in-depth reviews and efforts. Finally, we want to thank all authors for contributing to this special issue.