Guest Editorial Preface

Special Issue on Advances in Swarm Intelligence: Theories, Algorithms and Applications

Ying Tan, Department of Machine Intelligence, School of Electronics Engineering and Computer Science, Peking University, Beijing, China

Yuhui Shi, Department of Electrical and Electronic Engineering, Xi'an-Jiaotong Liverpool University, Suzhou, China

INTRODUCTION

In the past two decades, regarded as a class of population-based metaheuristic stochastic algorithms, each swarm intelligence algorithm is generally inspired by the collective behavior in a decentralized and self-organized system. Even though a swarm is usually made up of a population of simple individuals who interact locally with each other and with their environment, its collective behavior is capable of performing complex tasks in a dynamic environment without external guidance and central coordination. Due to its simplicity and effectiveness, there has been an extremely growing interest in studying novel swarm intelligence algorithms and applying swarm intelligence algorithms to a variety of scientific and engineering problems for surprisingly better solutions. Till now, there are a lot of novel swarm intelligence algorithms to have been being continually proposed, which are inspired by different heuristic mechanisms from natural swarms, process and social phenomenon. Since 2010, many new findings and applications in swarm intelligence were/are reported and published yearly in the series conferences of International Conference on Swarm Intelligence (ICSI) (http://www.ic-si.org) which now becomes one of important academic events in the community of swarm intelligence in the world. In the effort of the technical committees of ICSI event, several high-quality papers published in International Conference on Swarm Intelligence (ICSI) 2010-2012 (Beijing event, Chongqing event and Shenzhen event) are selected for possible publication in this special issue. All papers are thoroughly extended and rewritten by the authors to include their latest results and completed experiments. Evaluated through two rounds of double-blind peer reviews, four papers are finally recommended to this special issue. The scope of this special issue includes theoretic analyses, algorithmic improvements, and applications of state-of-art swarm intelligence algorithms.

IN THIS ISSUE

The first paper by Shi Cheng, Yuhui Shi, and Quande Qin studied the normalized population diversity in Particle swarm optimization (PSO). In this paper, the values and velocities of PSO algorithm can be recorded as series of matrices and its population diversity can be regarded as an observation of the distribution of matrix elements. Based on the analysis of the relationship between pairs of vectors in PSO solution matrix, authors utilized different normalization strategies for dimension-wise and element-wise population diversity. Experiments on ten benchmark functions are conducted to show the properties of normalized population diversities.

In the second paper by Komla A. Folly, a Population-Based Incremental Learning (PBIL) with adapting learning rate is proposed. The Adaptive PBIL (APBIL) is able to thoroughly explore the search space at the start of the run and maintain the diversity consistently during the run longer than the standard PBIL. The proposed algorithm is applied to parameters optimization in a power system controller. In the third paper by George M. Cavalcanti-Júnior, Fernando B. Lima-Neto, and Carmelo J. A. Bastos-Filho, the authors analyzed Heterogeneous PSO (HPSO) Improvement by use of the Volitive Operator of Fish School Search. The authors investigated hybridizations in line with the Volitive PSO approach and used the Heterogeneous PSO instead of the PSO, named as Volitive HPSO. They also investigated the influence of the collective volitive operator of Fish School Search in the HPSO further. The results show that this operator significantly improves HPSO performance when compared to the non-hybrid approaches of PSO and its variations in dynamic environments. The fourth paper by Wenjing Gao, Bo Xing, and Tshilidzi Marwala deals with the application of computational intelligence in used products retrieval and reproduction. Right now, remanufacturing has become a superior option for product recovery management system. It mainly consists of three stages: retrieval, reproduction, and redistribution. The authors utilized different computational intelligence methods including artificial neural network (ANN), ant colony optimization (ACO), biogeography-based optimization (BBO), cuckoo search (CS) and fuzzy logic (FL) to solve the problems involved in retrieval and reproduction stages for remanufacturing.

ACKNOWLEDGMENT

We would like to take this opportunity to express our heartfelt thanks to all reviewers for their timely and in-depth reviews of these papers. We also like to thank all the authors who worked hard in rewriting their papers with their up-to-date results and revising their papers according to the comments timely.

Ying Tan
Guest Editor
Yuhui Shi
Editor-in-Chief
IJSIR

Ying Tan received the BS degree and the MS degree in Electronic Engineering in 1985 and 1988, and the PhD degree in Signal and Information Processing from Southeast University, Nanjing, China, in 1997. He is currently a Full Professor and an advisor of PhD candidates with the Key Laboratory of Machine Perception (Ministry of Education) and the Department of Machine Intelligence, School of Electronics Engineering and Computer Science, Peking University, Beijing. He is also the Head of the Computational Intelligence Laboratory, Peking University. He has authored or coauthored more than 200 academic papers in refereed journals and conferences and several books and chapters. His current research interests include computational intelligence, swarm intelligence, artificial immune systems, intelligent information processing, pattern recognition, bioinformatics, statistical learning theory, and their applications. He is an Associate Editor of IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics *and an Associate Editor of the* International Journal of Swarm Intelligence Research *and the* IES Journal B: Intelligent Devices and Systems*. He is a member of the Advisory Board of the* International Journal of Knowledge-Based and Intelligent Engineering Systems *and of the Editorial Board of the* Journal of Computer Science and Systems Biology *and* Applied Mathematical and Computational Sciences*. He is also the Editor of* Springer Lecture Notes on Computer Science*, LNCS 5263, 5264, 6145, 6146, 7331 and 7332, and the Guest Editor of several referred journals, including* Information Science, Softcomputing, Neurocomputing*, and the* International Journal of Artificial Intelligence*. He was/is the General Chair of ICSI 2010, ICSI 2011, ICSI 2012 and ICSI 2013. He was the recipient of a number of academic and research achievement awards from his country, including the 2009 National Natural Science Prize of China.*

Yuhui Shi received the PhD degree in electronic engineering from Southeast University, Nanjing, China, in 1992. He is a Professor in the Department of Electrical and Electronic Engineering, Xi'an Jiaotong-Liverpool University, Suzhou, China. Before joining Xi'an Jiaotong-Liverpool University, he was with Electronic Data Systems Corporation, Indianapolis, IN. His main research interests include computational intelligence techniques (including swarm intelligence) and their applications. Shi is the Editor-in-Chief of the International Journal of Swarm Intelligence Research*, and an Associate Editor of the* IEEE Transactions on Evolutionary Computation*.*