Swarm intelligence (SI) is an artificial intelligence technique based on the study of behavior of simple individuals (e.g., ant colonies, bird flocking, animal herding, and honey bees), which has attracted much attention of researchers and has also been applied successfully to solve optimization problems in engineering. However, for large and complex problems, SI algorithms consume often much computation time due to stochastic feature of the search approaches. Therefore, there is a potential requirement to develop efficient algorithm to find solutions under the limited resources, time, and money in real-world applications.

Within this context, this special issue servers as a forum to highlight the most significant recent developments on the topics of SI and to apply SI algorithms in real-life scenario. The works in this issue contain new insights and findings in this field. A broad range of topics has been discussed, especially in the following areas, benchmarking and evaluation of new SI algorithms, convergence proof for SI algorithms, comparative theoretical and empirical studies on SI algorithms, and SI algorithms for real-world application.

Some works focus on the application of genetic algorithm in different area, for example, G. Ning et al.’s “Economic analysis on value chain of taxi fleet with battery-swapping mode using multiobjective genetic algorithm” presents an economic analysis model on value chain of taxi fleet with battery-swapping mode in a pilot city. A multiobjective genetic algorithm is used to solve the problem. The real data collected from the pilot city proves that the multiobjective genetic algorithm is tested as an effective method to solve this problem.

B. Zhenming et al. “Direct index method of beam damage location detection based on difference theory of strain modal shapes and the genetic algorithms application” applies direct index method SMSD and the Genetic Algorithms into structural damage identification. Numerical simulation shows that the criteria of damage location detection can be obtained by strain mode difference curve through cubic spline interpolation.

F. Zong et al.’s “Daily commute time prediction based on genetic algorithm” presents a joint discrete-continuous model for activity-travel time allocation by employing the ordered probit model for departure time choice and the hazard model for travel time prediction. Genetic algorithm (GA) is employed for optimizing the parameter in the hazard model. The results also show that the genetic algorithm contributes to the optimization and thus the high accuracy of the hazard model.

Qu et al.’s “The optimized transport scheme of empty and heavy containers with novel genetic algorithm” proposed a model with objective maximizing the route benefits to design the transport scheme of empty and heavy containers reasonably. A novel GA is developed to solve the model. The case study about China-Europe route proves that this model can improve the liner company’s benefits effectively.

W. Juan et al’s “Genetic algorithm for multiuser discrete network design problem under demand uncertainty” presents a bilevel model for discrete network design. An iterative approach including an improved genetic algorithm and a Frank-Wolfe algorithm is used to solve the bilevel model. The numerical results on the Nguyen Dupuis network show
that the model and the related algorithms were effective for
discrete network design.

Z. Yu et al’s “Dynamic route guidance using improved
genetic algorithms” presents an improved genetic algorithm
(IGA) for dynamic route guidance algorithm. The proposed
IGA designs a vicinity crossover technique and a greedy
backward mutation technique to increase the population
diversity and strengthen local search ability. The simulation
results show the effectiveness of the proposed algorithm.

Y. Li and Z. Sun’s “Articulated human motion tracking
using sequential immune genetic algorithm” proposed a
novel generative method for human motion tracking in the
framework of evolutionary computation. The paper designed
an IGA-based method to estimate human pose from static
images. It also proposed a sequential IGA (S-IGA) algorithm
by incorporating the temporal continuity information into
the traditional IGA. Experimental results show that our
IGA-based pose estimation method can achieve viewpoint
invariant 3D pose reconstruction, and the S-IGA-based
tracking method can achieve accurate and stable tracking of
3D human motion.

Some works present improved algorithm based on parti-
cle swarm optimization. J. Yao and D. Han “Improved bare-
bones particle swarm optimization with neighborhood search
and Its application on ship design” proposed a new BPSO
variant called BPSO with neighborhood search (NSBPSO)
to achieve a tradeoff between exploitation during the search
process. In the paper, experiments are conducted on twelve
benchmark functions and a real-world problem of ship
design. Simulation results show that NSBPSO outperforms
the standard PSO, BPSO, and six other improved PSO
algorithms.

I. Xi et al’s "A hybrid algorithm of traffic accident data min-
ing on cause analysis" puts forward an improved association
rule algorithm based on particle swarm optimization (PSO).
The new method is used to analyze the correlation between
traffic accident attributes and causes. T-test model and Delphi
method were deployed to test and verify the accuracy of the
improved algorithm, the result of which was ten times faster
speed for random traffic accident data sampling analyses
on average. And the final result proves that the improved
algorithm was accurate and stable.

Y. Lin’s "Particle swarm optimization algorithm for unre-
lated parallel machine scheduling with release dates" proposed
a heuristic and a very effective particle swarm optimization
(PSO) algorithm to tackle the problem of minimizing makespan for \( n \) jobs on \( m \) unrelated parallel machines with
release dates. Computational results show that the proposed
PSO is very accurate and that it outperforms the existing
metaheuristic.

A. Szabo and L. de Castro’s "A constructive data classifi-
cation version of the particle swarm optimization algorithm" introduced new particle swarm optimization algorithm
specifically designed to solve continuous parameter optimization
problems. The proposals were applied to wide range of
databases from the literature, and the results show that
they are competitive in relation to other approaches from
the literature, with the advantage of having a dynamically
constructed architecture.

Also, ant colony algorithm is discussed in some works.
Q. Xu et al’s "Simulated annealing-based ant colony algorithm
for tugboat scheduling optimization" presents a hybrid simu-
lated annealing-based ant colony algorithm to optimize the
tugboat scheduling. In this paper, experiments are conducted
to examine the effectiveness of the proposed algorithm for the
tugboat scheduling problem.

G. Yan and D. Feng’s “Escape-route planning of under-
ground coal mine based on improved ant algorithm” proposed
a new escape-route planning method of underground mines
based on the improved ant algorithm. A tunnel network
zoning method and max–min ant system method are used to
improve the performance of the ant algorithm. Experiments
show that the proposed method can find good escape routes
correctly and efficiently and can be used in the escape-route
planning of large and medium underground coal mines.

There are also some works discussing other algorithms
in this field. J. Wu’s "Solving unconstrained global opti-
mization problems via hybrid swarm intelligence approaches"
gives an overview of two efficient hybrid SGO approaches,
namely, a real-coded genetic algorithm-based PSO (RGA-
PSO) method and an artificial immune algorithm-based PSO
(AIA-PSO) method. Numerical results indicate that the RGA-
PSO and AIA-PSO approaches can be considered alternative
SGO approaches for solving standard-dimensional UGO
problems.

Z. Wei et al’s "Bus dispatching interval optimization based
on adaptive bacteria foraging algorithm" applied the improved
bacterial algorithm to schedule the bus departing interval.
Based on adaptive bacteria foraging algorithm (ABFA), a
model on one bus line in Hohhot city in China was estab-
lished and simulated. The final results showed that ABFA was
most feasible in optimizing variables.

S. TUO et al’s “An improved harmony search based
on teaching-learning strategy for unconstrained optimization
problems” presents an improved global harmony search algo-
rithm named harmony search based on teaching-learning
(HSTL) for high-dimensional complex optimization prob-
lems. The experimental results of 31 complex benchmark
functions demonstrate that the HSTL method has strong
convergence, robustness, and better balance capacity of space
exploration and local exploitation on high-dimensional com-
plex optimization problems.

Y. Xu et al’s “A simple and efficient artificial bee colony
algorithm” proposes a new artificial bee colony (NABC) algo-
rithm, which modifies the search pattern of both employed
and onlooker bees. Experiments are conducted on a set of
twelve benchmark functions. Simulation results show that
this approach is significantly better or at least comparable to
the original ABC and seven other stochastic algorithms.

S. Zhong et al’s "Guidance compliance behavior on VMS
based on SOAR cognitive architecture" introduced SOAR
to design the agent with the detailed description of the
working memory, long-term memory, decision cycle, and
learning mechanism based on the multiagent platform.
Experiments are simulated many times under given sim-
ulation network and conditions. The results, including the
comparison between guidance and no guidance, the state
transition times, and average chunking times, are analyzed to
further study the laws of guidance compliance and learning mechanism.

Cuevas's “A Swarm Optimization Algorithm for Multi-modal Functions and its Application in Multi-circle Detection” presents a new swarm multimodal optimization algorithm named as the Collective Animal Behavior (CAB). In the proposed algorithm, searcher agents emulate a group of animals which interact to each other based on simple biological laws that are modeled as evolutionary operators. Numerical experiments are conducted to compare the proposed method with the state-of-the-art methods on benchmark functions. The proposed algorithm has been also applied to the engineering problem of multi-circle detection, achieving satisfactory results.

G. Cabrera et al.'s "A hybrid approach using an artificial bee algorithm with mixed integer programming applied to a large-scale capacitated facility location problem" presents a hybridization of two different approaches applied to the well-known capacitated facility location problem (CFLP). The artificial bee algorithm (BA) is used to select a promising subset of locations (warehouses) which are solely included in the mixed integer programming (MIP) model. According to the results, combining the BA with a mathematical programming approach appears to be an interesting research area in the combinatorial optimization.

These articles demonstrate the advancement that swarm intelligence technologies have made for supporting problem solving in engineering. Developing the efficient algorithm to find solutions can provide solutions for large and complex problems under the limited resources, time, and money in real-world applications. We would like to express our gratitude to the many reviewers for their hard works. We would also like to thank the authors for their contributions to the special issue. This special issue could not have been completed without their dedication and support.

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