

## **Rule-Based Multi-State Gravitational Search Algorithm for Discrete Optimization Problem**

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### **ABSTRACT**

Gravitational search algorithm swarm (GSA) is a metaheuristic optimization algorithm, which is based on the Newton's law of gravity and the law of motion, has been successfully applied to solve various optimization problems in real-value search space. Later, binary gravitational search algorithm (BGSA) is designed to solve discrete optimization problems. In this study, rule-based multi-state gravitational search algorithm (RBMSGSA) algorithm is proposed to solve discrete combinatorial optimization problems. The algorithm operates based on a simplified mechanism of transition between two states. The algorithm able to produce feasible solution in solving traveling salesman problem (TSP), one of the most intensively studied discrete combinatorial optimization problems. To evaluate the performances of the proposed algorithm and the BGSA, several experiments using six sets of selected benchmarks instances of traveling salesman problem (TSP) are conducted. The experimental results showed the newly introduced approach consistently outperformed the BGSA in all TSP benchmark instances used.

**KEYWORDS:** component; rule-based; multi-state; gravitational search algorithm; discrete combinatorial optimization problem; travelling salesman problem