

## **An Assembly Sequence Planning Approach with a Multi-state Particle Swarm Optimization**

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### **ABSTRACT**

Assembly sequence planning (ASP) becomes one of the major challenges in the product design and manufacturing. A good assembly sequence leads in reducing the cost and time of the manufacturing process. However, assembly sequence planning is known as a classical hard combinatorial optimization problem. Assembly sequence planning with more product components becomes more difficult to be solved. In this paper, an approach based on a new variant of Particle Swarm Optimization Algorithm (PSO) called the multi-state of Particle Swarm Optimization (MSPSO) is used to solve the assembly sequence planning problem. As in of Particle Swarm Optimization Algorithm, MSPSO incorporates the swarming behaviour of animals and human social behaviour, the best previous experience of each individual member of swarm, the best previous experience of all other members of swarm, and a rule which makes each assembly component of each individual solution of each individual member is occurred once based on precedence constraints and the best feasible sequence of assembly is then can be determined. To verify the feasibility and performance of the proposed approach, a case study has been performed and comparison has been conducted against other three approaches based on Simulated Annealing (SA), Genetic Algorithm (GA), and Binary Particle Swarm Optimization (BPSO). The experimental results show that the proposed approach has achieved significant improvement.

**KEYWORDS:** Combinatorial optimization problem; Assembly sequence planning; Meta-heuristic; Multi-state particle swarm optimization algorithm

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