

Optimization of Multi-holes Drilling Path Using Particle Swarm Optimization



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Abstract In multi-holes drilling process, the tool movement and tool switching consumed on average 70% of the total machining time. Tool path optimization is able to reduce the time taken in machining process. This paper is focus on the modeling and optimization of multi-holes drilling path. The problem is modeled as traveling salesman problem (TSP) and optimized using Particle Swarm Optimization (PSO). To test the PSO performance, 15 test problems were created with different range of holes numbers. The optimization results from PSO were compared with other top algorithms such Genetic Algorithm and Ant Colony Optimization algorithm. PSO is also compared with another algorithm like Whale Optimization Algorithm, Ant Lion Optimizer, Dragonfly Algorithm, Grasshopper Optimization Algorithm, Moth-flame Optimization and Sine Cosine Algorithm. The result indicates that PSO algorithm is performed better than comparison algorithms. PSO algorithm gives the minimum value of fitness path and their CPU time compared to other algorithms. Hence, the smaller their value, the algorithm is better and more efficient. In future, researchers should more focus on environmental issues and energy consumption for sustainable manufacturing. Besides, need to explore other potential of new meta-heuristics algorithms to increase the hole drilling operation efficiencies.

Keywords Multi-holes drilling · Tool path · Particle swarm

1 Introduction

Multi-holes drilling is one of machining modes in Computer Numerical Control (CNC) milling for metal removal process [1]. Multi-holes drilling process takes a long time for manufactured part. Tool movement and tool switching time take 70%

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