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Improved moth flame optimization algorithm to optimize cost-oriented two-sided assembly line balancing

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Abstract

Purpose
This paper aims to propose an improved Moth Flame Optimization (I-MFO) algorithm to optimize the cost-oriented two-sided assembly line balancing (2S-ALB). Prior to the decision to assemble a new product, the manufacturer will carefully study and optimize the related cost to set up and run the assembly line. For the first time in ALB, the power cost is modeled together with the equipment, set up and labor costs.

Design/methodology/approach
I-MFO was proposed by introducing a global reference flame mechanism to guide the global search direction. A set of benchmark problems was used to test the I-MFO performance. Apart from the benchmark problems, a case study from a body shop assembly was also presented.

Findings
The computational experiment indicated that the I-MFO obtained promising results compared to comparison algorithms, which included the particle swarm optimization, Cuckoo Search and ant colony optimization. Meanwhile, the results from the case study showed that the proposed cost-oriented 2S-ALB model was able to assist the manufacturer in making better decisions for different planning periods.

Originality/value
The main contribution of this work is the global reference flame mechanism for MFO algorithm. Furthermore, this research introduced a new cost-oriented model that considered power consumption in the assembly line design.

Keywords
Decision-making; Two-sided assembly line; Moth flame optimization; Cost-oriented