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An improved multi-objective firefly algorithm for integrated scheduling approach in manufacturing and assembly considering time-sharing step tariff

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A B S T R A C T

Today, energy conservation and reduction of consumption are crucial concerns for manufacturing companies. Current research on integrated scheduling of processing and assembly typically focuses only on equipment resources and processing and assembly processes. A new method for energy-saving integrated scheduling in workshops has been proposed, which incorporates the recently introduced time-of-use tiered electricity prices into the scheduling optimization model. This method also introduces an operation strategy of turning equipment on and off during idle periods. A multi-objective mathematical model was developed to minimize energy consumption and assembly delay time in the processing and assembly processes. Due to the complexity of the model, the standard firefly algorithm was improved when used to solve the model. This involved designing a three-layer encoding method and two decoding methods, and providing detailed steps of the algorithm. Using a mixed flow production line as an example, the final scheduling solutions were obtained through model construction and algorithm solving, taking into account the tiered electricity price. The results of the example demonstrate that parallel processing and assembly effectively reduce assembly delay costs, and the implementation of the on/off strategy reduces power consumption during the machining process.

A R T I C L E   I N F O

Keywords:
Energy saving;
Integrated scheduling;
Manufacturing and assembly;
Time-sharing step tariff;
Switch strategy;
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