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Real-time rescheduling metaheuristic algorithms applied to FMS with routing flexibility

Abstract

This paper presents the results of a simulation study of a typical flexible manufacturing system that consists of seven machining centres, a loading and an unloading area, and six different part types. Owing to the existence of identical machining centres, the part types have alternative routings (their number varies between two and eight). One of the objectives of this work is to show how the following metaheuristics: ant colony optimisation, genetic algorithms, simulated annealing, tabu search, particle swarm optimisation and electromagnetism-like method, are adapted for solving the alternative routing selection problem in real time in order to reduce the congestion in the system by selecting a routing for each part among its alternative routings. The other goal is to highlight the impact of the real-time rescheduling of parts contained in the loading station on system performances when these metaheuristics are applied. The simulation results jugged by the production rate, machines and material handling utilisation rate show that for an overloaded system, the real-time rescheduling outperforms the case without rescheduling, but it has a negative impact on the work in process.

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