

## **An Efficient Hybrid Approach Based on Multi-Agent System and Emergence Method for the Integration of Systematic Preventive Maintenance Policies**

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**Abstract :** This paper proposes a hybrid algorithm for the integration of systematic preventive maintenance policies in hybrid flow shop scheduling to minimize makespan. We have implemented a problem-solving approach for optimizing the processing time, methods based on metaheuristics. The proposed approach is inspired by the behavior of the human body. This hybridization is between a multi-agent system and inspirations of the human body, especially genetics. The effectiveness of our approach has been demonstrated repeatedly in this paper. To solve such a complex problem, we proposed an approach which we have used advanced operators such as uniform crossover set and single point mutation. The proposed approach is applied to three preventive maintenance policies. These policies are intended to maximize the availability or to maintain a minimum level of reliability during the production chain. The results show that our algorithm outperforms existing algorithms. We assumed that the machines might be unavailable periodically during the production scheduling.

**Keywords :** multi-agent systems, emergence, genetic algorithm, makespan, systematic maintenance, scheduling, hybrid flow shop scheduling

**Conference Title :** ICISA 2016 : International Conference on Intelligent Systems and Applications

**Conference Location :** Venice, Italy

**Conference Dates :** April 11-12, 2016