

Scheduling of Flexible Manufacturing Systems Based on Basis Reachability Graphs

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Abstract—Flexible manufacturing systems are a typical class of discrete-event systems, which are characterized by dynamics, concurrency, and resource sharing, and can realize the discrete production process with multiple varieties and small batches. However, the number of states of the system grows geometrically as the size of the system increases, making it difficult to guarantee the accuracy of the intelligent algorithms based scheduling scheme. In this *work-in-progress* paper, we propose a novel searching approach based on a compact representation of the state space called basis reachability graphs. This method effectively handles issues such as the management of multiple resource copies and the selection of flexible processing route in the Petri net models of flexible manufacturing systems. Experimental results are conducted on several benchmark systems which show that the developed method improves the search efficiency while ensuring the quality of the solution compared with existing methods.

Index Terms—Flexible manufacturing system, Petri nets, scheduling, basis reachability graph, beam search.

I. INTRODUCTION

This *work-in-progress* paper is part of our submitted manuscript [1]. The full version is available at: <https://arxiv.org/abs/2505.12862>.

REFERENCES

- [1] Z. He, N. Li, N. Ran, and L. Li. “Scheduling of Flexible Manufacturing Systems Based on Place-Timed Petri Nets and Basis Reachability Graphs,” arXiv preprint arXiv:2505.12862, 2025.

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