Particle Swarm Optimization Based Method for Minimum Initial Marking in Labeled Petri Nets

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Abstract : The estimation of the initial marking minimum (MIM) is a crucial problem in labeled Petri nets. In the case of multiple choices, the search for the initial marking leads to a problem of optimization of the minimum allocation of resources with two constraints. The first concerns the firing sequence that could be legal on the initial marking with respect to the firing vector. The second deals with the total number of tokens that can be minimal. In this article, the MIM problem is solved by the meta-heuristic particle swarm optimization (PSO). The proposed approach presents the advantages of PSO to satisfy the two previous constraints and find all possible combinations of minimum initial marking with the best computing time. This method, more efficient than conventional ones, has an excellent impact on the resolution of the MIM problem. We prove through a set of definitions, lemmas, and examples, the effectiveness of our approach.

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Keywords : marking, production system, labeled Petri nets, particle swarm optimization

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