Simulation by Petri net for the one machine problem with temporal functions of polynomial type[*]

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Abstract

This paper deals with the use of Petri nets in a specific class of scheduling issues. Indeed, in a specific type of one machine problems, the execution times of the tasks on the machine are not any more constants but depend on time. When the temporal functions representing the evolution of duration of the tasks are polynomial functions, the problems are difficult to solve in certain cases. We propose an algorithm which is validated by a Petri net model to give a feasible solution.

Key words: Scheduling, Petri Nets, Simulation

1   Introduction

Modeling of sequential processes is used in many important fields such as operational research, industrial engineering or data processing. We also meet this kind of problems in the fields of scheduling and planning. These fields gather difficult problems with various approaches of resolution resulting in particular from operational research [1] or simulation [2]. In the traditional problems of scheduling, the durations of the tasks are constants. However, in many real cases, the execution time of the tasks depends on their date of beginning of execution. For example, we can meet this type of problems in management of the medical urgencies, management of forest fires or in metallurgical industry. We suppose that the reader is familiarized with the traditional notations of the problems of scheduling. For more details on this subject, please to refer to [3] and [4]. Our study relates to one machine problems in which the execution times of the tasks are not any more constants but depend on time. For more details on this subject, please refer to [5], [6] and [7]. The complexity of this kind of problems depends in other on nature on the mathematical function representing the evolution on the durations on the tasks. In the case of difficult problems, within the meaning of the problems complexity, a method of resolution consists in using the metaheuristics. These metaheuristics is all the more powerful since the initial solution found of the problem is of good quality. In this article, we propose a mixed step simulation-operations research to determine an initial solution. For a given problem, we initially will determine a simple temporal graph on which we will build a Petri net. A layer of simulation on this Petri net will give us a realizable solution.

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