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Optimization of preventive maintenance through a combined maintenance-production simulation model ⋆

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Abstract

Maintenance problems are crucial aspect of nowadays industrial problems. However, the quest of the efficient periodicity of maintenance for all components of a system is far from an easy task to accomplish when considering all the antagonistic criteria of the maintenance and production views of a production system. Thus, the objective is to simultaneously ensure a low frequency of failures by an efficient periodic preventive maintenance and minimize the unavailability of the system due to preventive maintenance. This implies a minimum impact on the production. In this paper, several tools are combined to collaborate in order to optimize multi-component preventive maintenance problems. The structure of the maintenance-production system is modeled thanks to a framework inspired by our previous research projects. The dynamic aspects are modelled by a combination of timed petri-nets and PDEVS models and implemented in our VLE simulator. The parameters of the resulting simulation model are optimized via a Nelder-Mead (Simplex) Method.

Key words: Metaheuristics, simulation, decision-making, multi-modeling, Petri-nets, maintenance

1 Introduction

The present economical context requires from companies that they practice an optimal exploitation of their production tools. In this purpose, every decision maker is asked to assure a maximum availability of these production tools at minimal cost. The optimization consists in determining the best "parameters combination" which provides the best values of the technical and economical criteria. However, in most cases, it appears to be very difficult to use analytical approaches without formulating restrictive hypothesis. In order to evaluate these performance criteria, simulation is the best adapted solution. In this paper, we suggest an approach integrating optimization and simulation. This approach consists in generating solutions more and more efficient with an optimization tool and to evaluate them via a simulation model until a halt criterion is satisfied. This integration is illustrated in figure 1.

⋆ This paper was not presented at any other revue. Corresponding author M. O. ROUX.

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