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# A multiple objective optimization used in maintenance system

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## *Abstract*

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In this paper, a simulation based optimization method is introduced. The considered model comes from a maintenance system. This method uses the technique of coupling simulation software with a multi objective optimizer based on a Non-dominated Sorting Genetic Algorithm (NSGA -II). This coupling is used to optimize the performances of a simulation model representing a maintenance facility by choosing the best queues' scheduling policy. Our results show that coupling is adapted to our problem and can be extended to cover other domains than sequencing rules and other types of simulation models.

**Keywords:** Modeling, simulation based optimization, genetic algorithms, multi-objective optimization.

*Key words:* maintenance, simulation, multiple objective programming

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## **1 Introduction**

In production systems, machine breakdown is common for machines running for long periods without maintenance. Such breakdowns make shop behavior hard to predict, and reduce the efficiency of systems. Maintenance can reduce the breakdown rate with minor sacrifices in production time. The importance of maintenance has been gradually recognized by the decision maker. Therefore, planning maintenance in a manufacturing system is a common practice in many companies. When maintenance is performed, the job being processed must be stopped.

In many production systems, periodic inspection, periodic repair and preventive maintenance are usually conducted in the shops. These maintenance works are scheduled regularly or periodically. Therefore, it is hard to organize a maintenance system when the systems have some perturbations with not regular works. For example in the case of accident for maintenance in transportation system. Due to the high cost of physical reorganization, and in order to insure its efficiency on the global performance, manufacturers are interested in techniques involving process modeling and simulation.

Simulation is usually used in industry in order to evaluate the performance of production system. Previous researches have used simulation in different industry areas. Iannoni and Morabito [9] studied the reception area