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Modelling and Simulation for Efficiency Factor Evaluation of Maintenance Strategies in a Computer System

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Abstract

An efficient maintenance allows extension of operating life of system, thus contributing to increase system performance. Computer systems like other systems must operate without interruption and applied strategies of maintenance must be efficiency. This paper proposes to define a maintenance strategy of computer system subjected both to corrective and preventive maintenance. These aspects are modelled by competing risks concept and the Alert-delay model, which are generally used in industrial systems. The approach is applied on real data from computer system, localized in an industrial company and different scenarios are generated following various maintenance strategies. These policies are evaluated through minimal, perfect and imperfect models of maintenance for corrective and preventive maintenance. Simulation results give failure intensity assessment and efficiency factor value. Final outcomes are validated by dependability measures to select best strategies of maintenance.

Keywords: maintenance, efficiency factor, competing risks, computer system, dependability measures.

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1. Introduction

To ensure dependability of any system [1], maintenance has become a fundamental process, leading to an optimal functioning. Computer networks like other systems must operate without interruption and applied policies of maintenance must be efficiency. Hence, a good maintenance management through definition of an appropriate and efficient strategy will have a positive impact on system performance.

Generally, systems are subjected to two kinds of maintenance action: Corrective (CM) and Preventive Maintenance (PM). *Corrective maintenance* is performed after a failure and is intended to put the system in working condition but that will not avoid failure consequences. A more defensive approach is to implement a preventive maintenance which is carried out when the system is operating and is intended to reduce and prevent these failures. *Preventive maintenance* can be performed at predetermined intervals or according to prescribed criteria for assessing the system degradation state and decide on an intervention when a certain threshold is reached [2, 3]. In practice, these two types coexist and the simple way of modelling this situation is competing risks theory, introduced in the context of maintenance in [4].

Modelling effect of performed maintenance is necessary, in order to be able to assess maintenance efficiency. Maintenance efficiency can be a perfect repair maintenance where the system is renewed; it can be minimal repair maintenance where the system is restored to state it was before maintenance. However, reality is between these two extreme cases: maintenance reduces failures intensity but does not leave the system as good as new. This is known as imperfect maintenance [3].