



Probabilistic Analysis of a Robot System with Redundant Safety Units and Common-Cause Failures

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ABSTRACT

This paper presents reliability and availability analyses of a model representing a system having one robot and n-redundant safety units with common-cause failures. At least k safety units must function successfully for the robot system success. The robot and other failure rates and the partially failed system repair rates are assumed constant and the failed robot-safety system repair time is assumed arbitrarily distributed. Markov and supplementary variable methods were used to perform mathematical analysis of this model. Generalized expressions for state probabilities, system availabilities, reliability, mean time to failure, and variance of time to failure are developed. Plots of some resulting expressions are shown.

KEYWORDS

robot, safety, availability, reliability, common-cause failures, failure, repair, redundancy

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