

Numerical Analysis of Finite Source Markov Retrial System with Non-Reliable Server, Collision, and Impatient Customers

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Abstract

A retrial queuing system with single server is investigated in this paper. The server is subject to random breakdowns. The number of customers is finite and collision may take place. A collision occurs when a customer arrives to the busy server. In case of collision both customers involved in the collision are sent back to the orbit. From the orbit the customers retry their requests after a random waiting time. The server can be down due to a failure. During the failed period the arriving customers are sent to the orbit, as well. The novelty of this analysis is the impatient behaviour of the customers. A customer waiting in the orbit may leave it after a random waiting time. The requests of these customers will not be served. All the random variables included in the model construction are assumed to be exponentially distributed and independent from each other.

The impatient property makes the model more complex, so the derivation of a direct algorithmic solution (which was provided for the non-impatient case) is difficult. For numerical calculations the MOSEL-2 tool can be used. This tool solves the Kolmogorov system equations, and from the resulting steady-state probabilities various system characteristics and performance measures can be calculated, i.e mean response time, mean waiting time in the

orbit, utilization of the server, probability of the unserved impatient requests. Principally the effect of the impatient property is investigated in these results, which are presented graphically, as well.

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