

Performance analysis of two-way communication retrial queueing systems with non-reliable server and impatient customers in the orbit*

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Many models of two-way communication queueing systems have been studied in recent years, they can be utilized in many fields of life like in [2], [6], [7]. Customers have always been characterized by the phenomena of impatience due to the long wait for being served ([1], [3], [4], [5]). In this paper, we consider two-way communication systems with a non-reliable server where primary customers may decide to leave the system after spending a considerable amount of time in the system before getting its proper service. The service unit can break down during its operation or in an idle state, too. Whenever the server becomes idle it may generate requests towards the customers residing in an infinite source. These requests the so-called secondary customers can enter the system after a random time if the service unit is available and functional upon their arrivals. Otherwise, they return to the source without coming into the system. Every primary customer has a property of impatience meaning that an arbitrary request has the ability to quit the system after some time while its demand remains unsatisfied. During server failure, every individual may generate requests but these will be forwarded immediately towards the orbit. The source, service, retrial, impatience, operation, and repair times are supposed to be independent of each other.

The novelty of the present paper is to achieve a sensitivity analysis using various distributions of impatient time of customers on the performance measures like the mean response time of a primary customer, the utilization of the service unit occupying just primary or secondary customers, the probability of abandonment, etc. To compare the effect of the different distributions on distinct metrics a stochastic simulation program is developed based on SimPack. The obtained results demonstrate the importance of utilized distribution under different parameter settings represented by numerous figures and highlight some interesting specialties of these types of systems.

Keywords: queueing, impatience, two-way communication system, finite-source, abandonment, stochastic simulation, sensitivity analysis

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