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Geo/G/1 **discrete time retrial queue with Bernoulli schedule.** (English) Zbl 0948.90043
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Summary: This paper studies discrete time $Geo/G/1$ retrial queues with Bernoulli schedule in which the blocked customers either join the infinite waiting space with probability α or leave the server and enter the retrial orbit with probability $\overline{\alpha}(= 1 - \alpha)$. The customers in the retrial orbit will retry their service after a random amount of time. First, the analytic formula for the generating function of the joint distribution of the numbers of customers in the waiting space and the retrial orbit in steady state is derived. It is shown that a stochastic decomposition law holds for the retrial queues under study. That is, the total number of customers in system is distributed as a sum of two independent random variables. Second, recursive formulas for the marginal steady state probabilities of the numbers of customers in the waiting space and in the retrial orbit was developed. Since a regular two-level priority $Geo/G/1$ queue (one without retrials) with Bernoulli schedule and head-of-line priority discipline is a special case of the studied retrial systems, the recursive formulas developed can be used to compute the marginal steady state probabilities of numbers of customers in the priority and non-priority groups for this case. Furthermore, a relationship between a continuous time $M/G/1$ retrial queue with Bernoulli schedule and its discrete time counterpart is established so that the recursive formulas can also be applied to a continuous time system. Last, several special cases are studied and some numerical examples are presented to demonstrate the use of the recursive formulas.

MSC:

90B22 Queues and service in operations research
90B36 Stochastic scheduling theory in operations research
60K25 Queueing theory (aspects of probability theory)

Keywords:

discrete-time queues; generating functions; Bernoulli schedule; retrial queues; priority queues; recursive computation; stochastic decomposition

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