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Hysteresis strategies for retrial queueing systems

Retrial queueing systems are widely used in computer networks design, in mobile networks and so on (see [1]). This paper deals with markovian retrial queues with unlimited number of repeated calls and a controlled intensity of input flow. Model under consideration can be described as follows. The system consists of two identical servers which work independently and service time has exponential distribution function with parameter μ. A customer who cannot get service immediately after arrival does not leave the system and tries to get service again after a random times with exponential distribution function with parameter ν. Such a customer becomes a source of repeated calls. The input flow is represented by a Poisson process which intensity λ depends on the number of repeated sources in the following way. Let $h_1 \leq h_2$ be two natural numbers which are called thresholds. If the number of repeated sources $j \leq h_1 - 1$, then $\lambda = \lambda_1(j)$ and if $j \geq h_2$, then $\lambda = \lambda_2(j)$. If $h_1 \leq j < h_2$, then the intensity of the Poisson process remains the same as in the previous moment of time. If $h_1 < h_2$, such a system is called the system with *hysteresis strategy*, whereas if $h_1 = h_2$ we say about system with *thresholds strategy*. The last systems were considered in [2]. For the model described the existence condition and explicit formulae for ergodic distribution of service process are obtained. These results essentially generalize the appropriate ones from [1] and they were used for solution of the optimization problem for the system with hysteresis strategy. The steady state profit was taken as a criterion function and the thresholds were treated as control parameters. Solution algorithm is realized in the package MATHEMATICA 5.1.

References

[1] G. I. Falin, J. G. C. Templeton, *Retrial Queues*, Chapman and Hall, 1997.
[2] Є. О. Лебєдєв, І. Я. Усар, *Про оптимальне керування вхідним потоком в системах з повторними викликами*, Доповіді Академії наук України, 2009, N. 5, 52–59.