Bayesian Inference in Erlang Single Server Queueing Model Based on Queue Length [*]

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Abstract

A major interest of researchers in queueing theory is to study the behavior of queues. Particularly of interest is the determination of the traffic intensity, or the fraction of time the queue is empty, defined as the ratio between the arrival rate and the service rate. How we can estimate this parameter using some inferential method is the mathematical problem treated here. The article presents techniques for the parameter estimation from Bayesian perspective. We deal with the $M/E_r/1$ queuing model. Several closed form expressions on posterior inference and prediction are presented. Interval estimates and tests of hypothesis on performance measures are also presented. Samples are obtained through a discrete event simulation algorithm and the performance of the proposed estimators are analyzed. It is observed that the Bayesian estimators are numerically feasible and even superior to the maximum likelihood estimator for high traffic intensities.

Keywords: $M/G/1$ queue; $M/E_r/1$ queue; Bayesian inference; Gauss hypergeometric function; predictive distribution; credible region; Bayes factor.