Equilibrium Abandonment Profiles for Queues with Rational Customers

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Abandonments of waiting customers are an important factor in queueing systems, which affects both performance and customer satisfaction. The abandonment profile (or, equivalently, customer patience) is often taken as pre-specified in queueing modeling practice. However, customer patience may be significantly affected by the anticipated system performance, in particular the anticipated waiting time. In this talk, we consider the modeling of this inter-dependence, and its effect on the system operating point. We focus on queues which are invisible to their occupants, or tele-queues, which are typical in telephone call-centers and other remote service systems. We start by presenting some empirical evidence from banking call center indicating the dependence of customer patience on the average waiting time in the queue. We discuss several options for modeling this dependence, and focus on a rational model for customer abandonments. Here the abandonment time is chosen by each customer to optimize a personal utility function, that weights the service utility against the expected cost of the remaining waiting time. We then incorporate this abandonment model within an M/M/s queue, and proceed to characterize the (Nash) equilibrium of resulting system. We provide conditions for the existence and uniqueness of the equilibrium point, and suggest procedures for its computation. We also suggest some local notions of equilibrium which enjoy favorable analytical properties, and establish their uniqueness under fairly broad conditions. Some examples will illustrate the modeling flexibility offered by the proposed models. Time permitting, we shall discuss a dynamic learning model that describes the formation of customer expectations as a result of repeated visits in the system.

References

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