

# MULTITYPE BRANCHING PROCESSES IN RANDOM ENVIRONMENT AND POLLING SYSTEMS

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## **Abstract**

We consider a polling system consisting of a single server and  $m$  stations with infinite-buffer queues indexed by  $i \in \{0, \dots, m-1\}$ . Initially there are no customers in the system. When customers arrive to the system the server starts immediately the service by visiting the stations in cyclic order starting at station 0 according to a selected service policy (to be described later on). Two basic models are considered: polling systems with zero switchover times from station to station and polling systems with positive random switchover times from station to station. Assuming that the arrival and service policies meet the so-called branching and immigration conditions and allowing the arrival and service policies to change in a random manner we describe the tail distributions of various characteristics of the polling systems including busy periods and the total number of customers served within a busy period. The results obtained can be applied to a wide class of polling systems including systems subject to exhaustive, gated, exhaustive-gated and binomial gated disciplines. Our proofs are based on a connection between the polling systems under consideration and the multitype branching processes in random environment without immigration (for the case of zero switchover times) and with immigration (for the case of positive random switchover times).