

Review of: "Counting Processes with Multiple Randomness: Examples in Queuing Theory"

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Some remarks to Qeios manuscript "Counting Processes with Multiple Randomness: Examples in Queuing Theory"

This manuscript is based on quite interesting reflection, that pure observation of a counting process does not sometimes satisfy to its full description. It is shown on examples of simple queuing systems. In fact the problem arises due rather insufficient choice of basal probability space (a space of departure processes). The models of queues are standardly analyzed in the framework of random walks, where the main characteristics is the number of items in the system (including the served item). Such a description is richer and based on transition probabilities (or intensities) of both arrivals and departures. Hence, from this point of view, the notion of "counting process with multiple randomness" is interesting from, say, a formal point of view, however has no high significance (in my opinion) from the points of view of modeling and analysis.

One can consider also a case when the arrival process is neither observed nor known, just the departures are available. I expect that there exists a number of works dealing with such cases, solving the problem of system identification at least in certain special cases (as $M|M|1$).

Some other remarks:

- In Lemma 2.1., point b) does not hold in the case of exponential arrivals.
- The discussion regarding the Burke's Theorem seems to me rather superficial.

Resulting variable - the inter-departures time, is really a mixture of two cases, however with such weights that the mean time is $1/\lambda$. And the basic observation, also formulated in Burke's Theorem, saying that "At time t the number of customers in the queue is independent of the departure process prior to time t ", leads to the conclusion on Poisson process of departures.

Extremely easy it is seen in a discrete time version, using geometric distribution instead exponential.

- The discussion concerning the Jackson network suffers from the same defect.
- What about references, are there some more recent papers dealing with similar or connected questions?
