Rejoinder on: Polling : past, present, and perspective

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Rejoinder on: Polling: past, present, and perspective

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We are grateful to Dieter Fiems, Sergey Foss, and Jeongsim Kim and Bara Kim for their kind and valuable comments on our survey paper. Below we briefly reflect on some of their observations. While some of their comments apply to specific facets covered in the survey, quite a few other remarks touch on a variety of threads beyond the central scope that we focused on, illustrating the amazing breadth and depth of the polling literature.

In Section 3 of his contribution, Fiems discusses possible research topics in polling.

- He concurs with us that asymptotics is an important research direction, but points out that essential characteristics of polling systems might thus be lost. That is indeed possible. However, in some highly relevant asymptotic regimes, the effect of certain model assumptions (e.g., regarding service time distributions or service disciplines) may be shown to disappear, which is in our view important insight provided by the asymptotic analysis.
- Fiems makes an important comment regarding the gap in complexity between moment results and generating function results in polling systems; indeed, even for branching-type models, those generating function results are quite involved. The semi-linear processes of Altman (his reference 1), which allow one to obtain linear moment expressions, form a very interesting concept which deserves further exploration in the setting of polling systems.
- Finally, Fiems points at two research avenues which indeed could be explored further: to use moments for approximating tail probabilities, and to use efficient simulation techniques.

Foss mentions four interesting topics which bespeak the tremendous wealth of polling results beyond the basic framework treated in the survey.

This rejoinder refers to the comments available at <https://doi.org/10.1007/s11750-018-0485-4>, <https://doi.org/10.1007/s11750-018-0487-2>, and <https://doi.org/10.1007/s11750-018-0489-0>.

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- Topic 1 is the stability of polling systems with infinitely many stations. We discuss stability issues at the end of Section 2, but only briefly; in Subsection 8.1, we devote some attention to polling systems with infinitely many queues, but we have chosen to point to [146] (reference 10 of Foss) for further references.
- Topic 2 is the fluid approximation approach to analyze stability and performance of polling models. This is indeed an important technique, and reference 8 of Foss contains a fascinating stability result for a polling model, that is quite rare in any queueing context: the stability region depends on the whole service time distribution, not just on its mean.
- Topic 3 concerns polling systems in a general stationary-ergodic framework, which is somewhat unexplored in the polling literature, and may deserve greater attention.
- Finally, Topic 4 is polling in which the server follows a greedy policy, choosing the closest customer to serve next. We have restricted ourselves throughout the paper to a cyclically moving server (Assumption 5 in Section 2). Foss convincingly shows though that greedy server polling is a fascinating topic, and it is wonderful that the Coffman–Gilbert conjecture, in its original form, has recently been proven by Rolla and Sidoravicius.

Jeongsim Kim and Bara Kim provide the following valuable observations.

- In heavy-traffic asymptotics, the moments of the limits of the scaled delay distribution are not the same as the limits of the moments of the scaled delay distribution. They expect a similar phenomenon to hold in another asymptotic setting, viz. switchover times growing to infinity.
- Strategic behavior of customers in polling systems is indeed an interesting and hitherto hardly explored research area. We briefly refer to this topic in Remark 9.1, focusing on customers who decide to join a particular queue based on information regarding either queue lengths or the server position. We agree that game-theoretic considerations—like to join or not to join, or individually/socially optimal routing procedures under different scenarios regarding the available information—could form relevant and interesting research topics in polling systems.