

QUEUES WITH CHOICE FROM A SYMMETRY PERSPECTIVE

Juancho A. Collera

Department of Mathematics and Computer Science
University of the Philippines Baguio
jacollera@up.edu.ph

ABSTRACT

Recently, a queueing model where in customers are given an opportunity to choose between two queues was introduced [4]. The queue length information provided to the customers is not up-to-date. Instead, customers were given the queue length some time units in the past. This time delay impacts the dynamical behavior of the queues and hence the decision-making process of the customers. We revisit this queues-with-choice model from a symmetry perspective [3]. We show, using similar techniques used in [1, 2], that the symmetric structure of the model can be used to classify the types and kinds of solutions that can occur. In particular, our results explain why only asynchronous periodic solutions and symmetric equilibrium solutions arise in such model, while synchronous periodic solutions and asymmetric equilibrium solutions do not occur. These additional insights on the dynamical behavior of queues will help companies to be more aware of the consequences of providing delayed queue length information to their customers.

References

- [1] P-L. Buono and J.A. Collera. Symmetry-breaking bifurcations in rings of delay-coupled semiconductor lasers, *SIAM Journal on Applied Dynamical Systems*, 14(4), 1868–1898, 2015.
- [2] J.A. Collera. Symmetry-breaking bifurcations in two mutually delay-coupled lasers, *International Journal of Philippine Science and Technology*, 8(1), 17–21, 2015.
- [3] M. Golubitsky, I. Stewart and D.G. Schaeffer. *Singularities and Groups in Bifurcation Theory II*. Springer-Verlag, New York, 1988.
- [4] J. Pender, R.H. Rand and E. Wesson. Queues with choice via delay differential equations, *International Journal of Bifurcation and Chaos*, 27(04), 1730016, 2017.

Note:

The paper was presented as a contributed talk at the 20th European Conference on Mathematics for Industry held at Budapest, Hungary from 18-22 June 2018.