A Comparative Study of Classical and Fuzzy Queueing Network Models Under Uncertainty

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Abstract: *Queuing theory is an essential instrument of the analysis of systems comprising of waiting lines, including communication networks, manufacturing systems, and service industries. Classical queueing models are developed in assumptions of specific probabilistic parameters, whereas real-life systems are mainly involved with ambiguity and imprecision in terms of uncertain service times, variability in arrival patterns, and incomplete information. Fuzzy queueing models are based on classical models, but they use the fuzzy set theory to explicitly model uncertainty. A detailed comparison of classical and fuzzy queueing network models in uncertain environment is given in this paper. We revise theoretical backgrounds, modeling, performance measures and put both methods to benchmark systems. The findings are presented in numerical form involving figures and tables to demonstrate the difference between performance evaluation under classical and fuzzy methods. The analysis reveals the strengths, weaknesses as well as areas of applications of each modeling paradigm hence insights to the system designers and researchers..*

Keywords: Queueing Networks, Classical Queueing Theory, Fuzzy Queueing, Uncertainty Modeling, Fuzzy Logic, Performance Evaluation, Defuzzification, M/M/1 Queue