A Greedy Post-processing Strategy for Multi-objective Performance Optimization of General Single-server Finite Queueing Networks *

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Abstract

Several real-life problems are comprised of finite single-server acyclic queueing networks. The performance optimization of these queueing networks has been the subject of several studies. The present study extends the minimization of the total buffer area and overall service rates in the network simultaneously with the maximization of throughput. It is well-known that these three objectives are conflicting. This fact leads to a multi-objective approach that the literature in the area has already addressed. Nevertheless, this study aims to demonstrate that there are algorithms with low computational costs that can produce solutions more efficiently than those obtained previously. Furthermore, the provided solutions can enhance throughput by solving a stochastic knapsack problem. The greedy procedure utilizes a technique of redistributing buffers between the queues, ensuring that the overall capacity is less than or equal to the previous overall capacity; thus, one objective is improved (the throughput) without compromising the other objective (total buffer allocation). Several computational experiments attest to the quality of this proposition. Additionally, we provide a comparison with previously proposed solutions.

Keywords: Buffer allocation; queueing networks; conflicting objectives; genetic algorithm; greedy algorithm.

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