A Novel Formulation for Multi-objective Optimization of General Finite Single-Server Queueing Networks *

G. L. Souza[1], A. R. Duarte[2], G. J. P. Moreira[1], F. R. B. Cruz[3]

[1] *Computing Department,*
Universidade Federal de Ouro Preto,
35400-000 - Ouro Preto - MG, Brazil

[2] *Department of Statistics,*
Universidade Federal de Ouro Preto,
35400-000 - Ouro Preto - MG, Brazil

[3] *Department of Statistics,*
Universidade Federal de Minas Gerais,
31270-901 - Belo Horizonte - MG, Brazil

gabriel.souza@ufop.edu.br, anderson@iceb.ufop.br,
gladston@ufop.edu.br, fcruz@est.ufmg.br

Abstract

A new mathematical programming formulation is proposed for an optimization problem in queueing networks. The sum of the blocking probabilities of a general service time, single server, finite, acyclic queueing network is minimized, as are the total buffer sizes and the overall service rates. A multi-objective genetic algorithm (MOGA) and a particle swarm optimization (MOPSO) algorithm are combined to solve this difficult stochastic problem. The derived algorithm produces a set of efficient solutions for multiple objectives in the objective function. The implementation of the optimization algorithms is dependent on the generalized expansion method (GEM), a classical tool used to evaluate the performance of finite queueing networks. A set of computational experiments is presented to attest to the efficacy and efficiency of the proposed approach. Insights obtained from the analysis of a complex network may assist in the planning of these types of queueing networks.

Keywords: Buffer allocation, queueing networks, conflicting objectives, particle swarm optimization.

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