Improvements in Post-processing Performance in Multi-objective Problem for General Finite Single-Server Queueing Networks *

Gabriel L. Souza [1], Anderson R. Duarte [2],
Frederico R. B. Cruz [3], Gladston J. P. Moreira [1]

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

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

[3]*Departamento de Estatística*
Universidade Federal de Minas Gerais
31270-901 - Belo Horizonte - MG, Brazil

gabriel.souza65@gmail.com, anderson.duarte@ufop.edu.br,
fcruz@est.ufmg.br, gladston@ufop.edu.br

Abstract

An alternative 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. An analysis in the design space for the solutions is presented. Insights obtained from the analysis of complex queue networks may assist in the planning of these types of queueing networks.

Keywords: Queueing networks; conflicting objectives; buffer allocation; particle swarm optimization.

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