Quantitative
Modeling
In
Parallel
Systems

On the Role of Rouché's Theorem in Queueing Analysis

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Abstract In analytic queueing theory, Rouché's theorem is frequently used, and when it can be applied, leads quickly to tangible results concerning ergodicity and performance analysis. For more complicated models, it is sometimes difficult to verify the conditions needed to apply the theorem. The natural question is: can one dispense with this theorem, in particular when the ergodicity conditions are known? In the present study, we consider an $M/G/1$-type queueing problem which can be modelled by N coupled random walks. It is shown that it can be fully analysed without using Rouché's theorem, once it is known that the relevant functional equation has a unique solution with prescribed regularity properties.

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