Da Silva Soares, Ana; Latouche, Guy
Fluid queues with level dependent evolution. (English) Zbl 1176.90117
Eur. J. Oper. Res. 196, No. 3, 1041-1048 (2009).

Summary: A fluid queue is a two-dimensional Markov process, of which the first component, or level, varies linearly according to the second component, the phase, which is the state of a finite state space Markov process evolving in the background.In this paper, we construct various models of fluid queues, with a level dependency component: the behavior of the phase process changes when the level crosses certain thresholds, as well as the rate at which fluid increases or decreases; this adds the possibility of having attractive and repellent states at the threshold levels. We derive expressions for the stationary distribution of such processes.

MSC:

90B22 Queues and service in operations research

Keywords:

fluid queues; level dependent behavior; matrix-analytic methods; Markov-renewal approach

Full Text: DOI

References:

[1] Ahn, S.; Ramaswami, V., Fluid flow models and queues – a connection by stochastic coupling, Communications in statistics-stochastic models, 19, 3, 325-348, (2003) · Zbl 1021.60073

[2] Bean, N.; O'Reilly, M.; Taylor, P., Algorithms for return probabilities for stochastic fluid flows, Stochastic models, 21, 1, 149-184, (2005) · Zbl 1064.60162

[3] Chen, D.; Hong, Y.; Trivedi, K.S., Second-order stochastic fluid models with fluid-dependent flow rates, Performance evaluation, 49, 341-358, (2002) · Zbl 1043.68031

[4] da Silva Soares, A.; Latouche, G., Further results on the similarity between fluid queues and qbds, (), 89-106 · Zbl 1162.90407

[5] da Silva Soares, A.; Latouche, G., A matrix-analytic approach to fluid queues with feedback control, International journal of simulation: systems, science and technology, 6, 1-2, 4-12, (2005)

[6] da Silva Soares, A.; Latouche, G., Matrix-analytic methods for fluid queues with finite buffers, Performance evaluation, 63, 295-314, (2006)

[7] Elwalid, A.I.; Mitra, D., Fluid models for the analysis and design of statistical multiplexing with loss priorities on multiple classes of bursty traffic, Ieee infocom, 415-425, (1992)

[8] Gribaudo, M.; Telek, M., Stationary analysis of fluid level dependent bounded fluid models, Performance evaluation, 65, 3-4, 241-261, (2008)

[9] Guo, C.-H., Nonsymmetric algebraic Riccati equations and Wiener-Hopf factorization for M-matrices, SIAM journal on matrix analysis and applications, 23, 1, 225-242, (2001) · Zbl 0996.65047

[10] Mandjes, M.; Mitra, D.; Scheinhardt, W., Models of network access using feedback fluid queues, Queueing systems, 44, 4, 365-398, (2003) · Zbl 1030.60089

[11] Mandjes, M.; Mitra, D.; Scheinhardt, W., Simple models of network access, with applications to the design of joint rate and admission control, Computer networks, 41, 4, 489-504, (2003) · Zbl 1035.68010

[12] Ramaswami, V., Matrix analytic methods for stochastic fluid flows, (), 1019-1030

[13] Rogers, L.C.G., Fluid models in queueing theory and Wiener-Hopf factorization of Markov chains, Annals of applied probability, 4, 2, 390-413, (1994) · Zbl 0806.60052

[14] van Foreest, N.; Mandjes, M.; Scheinhardt, W., Analysis of a feedback fluid model for heterogeneous TCP sources, Communications in statistics-stochastic models, 19, 299-324, (2003) · Zbl 1024.60040