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Malyshev's theory and JS-queues. Asymptotics of stationary probabilities. (English)

Zbl 1039.60082

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The paper considers a discrete-time nearest neighbor random walk (SHC random walk) in \mathbb{Z}_+^2 , whose jump probabilities are homogeneous in time and possess homogeneity relative to space shifts and symmetry relative to the reflection about the diagonal. These walks can describe the so-called join-the-shorter-queues (JS-queues). In JS-queues, tasks arrive within three independent Poisson processes Ξ_1 , Ξ_2 and Ξ' . Processes Ξ_1 and Ξ_2 are of rate λ and Ξ' of rate λ' . Tasks from Ξ_1 go to server 1, tasks from Ξ_2 go to server 2 and tasks from Ξ' choose the shortest queue. The service rates at each server are equal 1, and tasks are served according to a conservative discipline (say, FCFS), without interruption. The paper gives a criterion for positive recurrence of SHC random walk and analyzes geometric asymptotics of the stationary probabilities $\rho_{m+n,m}$ as $m, n \rightarrow \infty$, $(m+n)/n \sim \text{ctg } \gamma$.

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MSC:

- 60K25 Queueing theory (aspects of probability theory)
- 60G50 Sums of independent random variables; random walks
- 30D05 Functional equations in the complex plane, iteration and composition of analytic functions of one complex variable
- 30F10 Compact Riemann surfaces and uniformization

Cited in 12 Documents

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