Mathematics > Probability

Time Reversal of Some Stationary Jump-Diffusion Processes from Population Genetics

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We describe the processes obtained by time reversal of a class of stationary jump-diffusion processes that model the dynamics of genetic variation in populations subject to repeated bottlenecks. Assuming that only one lineage survives each bottleneck, the forward process is a diffusion on [0,1] that jumps to the boundary before diffusing back into the interior. We show that the behavior of the time-reversed process depends on whether the boundaries are accessible to the diffusive motion of the forward process. If a boundary point is inaccessible to the forward diffusion, then time reversal leads to a jump-diffusion that jumps immediately into the interior whenever it arrives at that point. If, instead, a boundary point is accessible, then the jumps off of that point are governed by a weighted local time of the time-reversed process.

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