FIRST HITTING TIMES AND POSITIONS OF CONCENTRIC SPHERES FOR TESTING THE DRIFT OF A DIFFUSION PROCESS

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Abstract: Consider X_t a diffusion process on R^m, $m \geq 2$, with drift vector $\theta b(u)$ depending of an unknown real parameter θ with small known variance matrix $\varepsilon \sigma(u)$. The aim of this paper is testing $\theta = \theta_0$ vs $\theta > \theta_0$ with $\theta_0 \geq 0$ from the observation of the first hitting times and positions of concentric spheres centered at $x = X_0$ with radii $r \leq R$ for given R. We obtain the asymptotic behaviour of this process as $\varepsilon \to 0$ when the trajectory of the corresponding dynamical system leaves any sphere centered at x within finite time. We then construct a test on θ and study its asymptotic properties by means of contiguity. When $\theta_0 > 0$, the test is locally asymptotically most powerful (LAMP). We also consider a test based on the first hitting times of spheres only.

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