CENTRAL LIMIT THEOREM FOR DIFFUSION PROCESSES IN DISCONTINUOUS DRIFT WITH SMALL PERTURBATION

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Abstract. For the system of d-dim stochastic differential equations

$$dX^\epsilon = b(X^\epsilon)dt + \epsilon dW(t), \quad t\in[0,1]$$
$$X^\epsilon = x^0 \in R^d$$

where $b(.)$ is smooth except possibly along the hyperplane $x_1 = 0$ and satisfies the stability condition $b_1(x) < 0$ if $x_1 > 0$ and $b_1(x) > 0$ if $x_1 < 0$, we shall prove a central limit theorem for $X^\epsilon(t)$, i.e., we shall find a deterministic function $\phi(t)$ such that

$$\frac{1}{\epsilon}(X^\epsilon(t) - \phi(t)) = \xi(t) + R^\epsilon(t)$$

where $\xi(t)$ is an Orstein-Uhlenbeck process and $|R^\epsilon(t)|\to 0$ in L^1 as $\epsilon\to 0$ for each t. This extends our earlier work [1,2] on large deviation principle of such systems.

1. Chiang,T.S. and Sheu,S.J.,2000, *Large Deviations of Diffusion Processes with Discontinuous drift and their occupation times*, The Annals of Probability **28, No.1**, 140-165.
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