ICM 1998, Berlin, Aug. 18–27

Abstracts of Short Communications and Posters

Section:

12. Probability and Statistics

1991 MS Classification: 60

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Distributions of functionals of a particular non-Markov process

Let $w(s), s \geq 0$, be the Brownian motion process,

$$\ell(t,x) = \lim_{\varepsilon \downarrow 0} \frac{1}{\varepsilon} \int_0^t 1_{[x,x+\varepsilon)}\big(w(s)\big)\, ds, \quad t \geq 0, \quad x \in R^1,$$

be its local time. For arbitrary fixed $\alpha_k, r_k \in R^1$, $k = 1, 2, \ldots, m$, the non-Markov process

$$\xi(s) = w(s) + \sum_{k=1}^{m} \alpha_k \ell(s, r_k),$$

is considered. The talk deals with the method of calculation of distributions of integral functionals, infimum and supremum functionals, and local times of the process $\xi(s)$. This method is based on the solution of a family differential problems depending on the varying gluing conditions. Some examples of applications are considered.