CONDITIONS FOR CONVERGENCE OF NUMBER OF CROSSINGS TO THE LOCAL TIME
APPLICATION TO STABLE PROCESSES WITH INDEPENDENT INCREMENTS AND TO GAUSSIAN PROCESSES

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Abstract: Let \( X(t), t \in R \), be a real valued stochastic process admitting a local time and let \( X_\varepsilon(t), \varepsilon \in R^+ \), be a family of smooth processes which converge in some sense to \( X(t) \). We exhibit sufficient conditions for \( L^2 \)-convergence of the number of crossings of \( X_\varepsilon(t) \) to the local time of \( X(t) \), after normalization.

Two main cases are considered for \( X(t) \), stable processes and Gaussian processes.

Two main cases are considered for \( X_\varepsilon(t) \) : \( X_\varepsilon(t) \) being the convolution of \( X(t) \) with a size \( \varepsilon \) approximate identity and \( X_\varepsilon(t) \) being the size \( \varepsilon \) polygonal approximation of \( X(t) \).

Such a convergence is shown to hold for both approximations when \( X(t) \) is a stable process with independent increments with index \( \alpha > 1 \).

Convergence of crossings of the polygonal approximation is shown to hold for a Gaussian process under technical conditions.

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