

Local Limit Theorems and Recurrence for the Planar Lorentz Process

DOMOKOS SZASZ

Budapest University of Technology and Economics

Assuming the CLT, its local version is established for the periodic Lorentz process in $\mathbb{R}^d$. This result implies a.) the local CLT and b.) the recurrence for the planar Lorentz process with a finite horizon, thus improving earlier, so-called quasi-versions of the statements obtained by Krámli-Szász in 1985. For the proof of the local CLT, a Markov approximation technique is worked out to be applicable to L. S. Young's 1998 tower construction. For the Fourier transform of the Perron-Frobenius operator, the necessary analysis of the spectrum was carried out via Doeblin-Fortet inequalities generalizing the 2000 method of Aaronson-Denker. The challenging arithmeticity questions associated with the local CLT require particular treatment. It is worth noting that for the same case ($d = 2$, finite horizon), combining the global CLT with abstract ergodic theoretic ideas, K. Schmidt, 1998 and J.-P. Conze, 1999, could already establish recurrence. The results are joint with Tamás Varjú.