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On the Superdiffusive Behavior of the True Self-avoiding Walk in $d = 2$

BENEDEK VALKÓ

Department of Mathematics
University of Wisconsin-Madison
480 Lincoln Drive
Madison, WI 53706
USA

valko@math.wisc.edu

The true self-avoiding walk (TSAW) is a discrete time nearest neighbor random walk on Z^n driven by the negative gradient of its occupation time measure. Non-rigorous renormalization arguments suggest that it scales diffusively for $d > 2$, there is a logarithmic correction for $d = 2$ and a scaling exponent $\frac{2}{3}$ for $d = 1$. The $d = 1$ case was settled by B. Toth in 1995. He proved a limit theorem for the one-dimensional TSAW with the appropriate scaling. Recently, together with I. Horvath and B. Veto, he proved diffusive bounds in $d > 2$ for a variant of the TSAW. In this talk we consider the $d = 2$ case. We present logarithmic upper and lower bounds on the diffusivity. The results rely on the fact that with a suitable initialization the environment seen from the random walker has a stationary distribution. The proof uses the variational formula and resolvent method.

This is joint work (*in progress*) *with J. Quastel and B. Toth*.