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Recurrence of the Simple Random Walk Path

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A simple random walk (SRW) on a graph is a random sequence of vertices such that if the n -th vertex is v , then the $n + 1$ -th vertex is chosen to be a neighbor of v , each with equal probability. A graph is called recurrent if a SRW on it returns to the starting vertex with probability 1, and called transient otherwise. The path of a walk on a graph is simply the set of edges this walk has traversed.

Our main result is that the path of a SRW on any graph is itself a recurrent graph, with probability 1. The proof uses the electrical network interpretation of random walks, which will be explained in the talk.

Based on joint works with Itai Benjamini, Russell Lyons and Oded Schramm.