Random Walks on Complex Networks

Jae Dong Noh\textsuperscript{1,*} and Heiko Rieger\textsuperscript{2,†}

\textsuperscript{1}Department of Physics, Chungnam National University, Deajeon 305-764, Korea

\textsuperscript{2}Theoretische Physik, Universität des Saarlandes, 66041 Saarbrücken, Germany

We investigate random walks on complex networks and derive an exact expression for the mean first passage time (MFPT) between two nodes. We introduce for each node the random walk centrality $C$, which is shown to determine essentially the MFPT. The centrality of a node determines the relative speed by which a node can receive and spread information over the network in a random process. Numerical simulations of an ensemble of random walkers moving on paradigmatic network models are performed to confirm the analytical prediction.

\textsuperscript{*}Electronic address: noh@cnu.ac.kr

\textsuperscript{†}Electronic address: h.rieger@mx.uni-saarland.de