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On Random Walk Centrality

We consider a notion of random walk centrality for undirected graphs that has been proposed in the literature on complex networks, and show how this notion is naturally related to an accessibility index for the states of a discrete-time, ergodic, homogenous Markov chain on a finite state space. We provide several characterisations of this accessibility index, and establish upper and lower bounds on the accessibility index in terms of the eigenvalues and eigenvectors of the transition matrix for the associated Markov chain. We also investigate the behaviour of the accessibility index under perturbation of the transition matrix, and describe some examples that exhibit counterintuitive behaviour.