

## [P26] First Passage Times and Role of spectral dimension in scale-free networks

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In the information era, the number of web pages increases drastically, and thus it becomes a central issue to develop more efficient search algorithm. Recently developed search engines are mostly based on the notion of random walks. Physical quantities used in random walks such as the probability of return to the origin (RTO), the mean first passage time (FPT) and so on, are mainly concerned to design and test search engines. Here, we study the probability of RTO, the mean FPT, and the distribution of FTP in scale-free networks analytically. While those quantities had been investigated previously in some limited cases, for example, the RTO in the long time limit, and the mean FPT between fixed two nodes, here, we investigate them in more general cases such as the probability of RTO *at a finite time step*, and the mean FPT to arrive *at a fixed destination page but from an arbitrary web page*. The analytic results for those quantities turn out to be nontrivial and expressed in terms of the spectral dimension of random walks and the degree exponent of the complex networks. We find that a random walker can be effectively trapped at the hub and the mean FPT over starting positions to a target page is independent of the degree of the target in the World-Wide Web.