Effects of Community Structure on Search and Ranking in Information Networks HUAFENG XIE, New Media Lab, GC, CUNY; Brookhaven National Laboratory, KOON-KIU YAN, Stony Brook University; Brookhaven National Laboratory, SERGEI MASLOV, Brookhaven National Laboratory — The World-Wide Web (WWW) is characterized by a strong community structure in which communities of webpages (e.g. those sharing a common keyword) are densely interconnected by hyperlinks. We study how such network architecture affects the average Google ranking of individual webpages in the community. It is shown that the Google rank of community webpages could either increase or decrease with the density of inter-community links depending on the exact balance between average in- and out-degrees in the community. The magnitude of this effect is described by a simple analytical formula and subsequently verified by numerical simulations of random scale-free networks with a desired level of the community structure. A new algorithm allowing for generation of such networks is proposed and studied. The number of inter-community links in such networks is controlled by a temperature-like parameter with the strongest community structure realized in "low-temperature" networks.

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