Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Control Capacity in Complex Networks TAO JIA, YANG-YU LIU, CCNR, Northeastern University, JEAN-JACQUES SLOTINE, Massachusetts Institute of Technology, ALBERT-LASZLO BARABASI, CCNR, Northeastern University — By combining tools from control theory and network science, an efficient methodology was proposed to identify the minimum sets of driver nodes, whose time-dependent control can guide the whole network to any desired final state. Yet, this minimum driver set (MDS) is usually not unique, but one can often achieve multiple potential control configurations with the same number of driver nodes. Given that some nodes may appear in some MDSs but not in other, a crucial question remain unanswered: what is the role of individual node in controlling a complex system? We first classify a node as critical, redundant, or ordinary if it appears in all, no, or some MDSs. Then we introduce the concept of control capacity as a measure of the frequency that a node is in the MDSs, which quantifies the importance of a given node in maintaining Controllability. To avoid impractical enumeration of all MDSs, we propose an algorithm that uniformly samples the MDS. We use it to explore the control capacity of nodes in complex networks and study how it is related to other characteristics of the network topology.

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Date submitted: 10 Nov 2011 Electronic form version 1.4