Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Optimization of flow and cascading effects in weighted complex networks[1] ANDREA ASZTALOS, SAMEET SREENIVASAN, Dept. of Physics and Dept. of Computer Science, Rensselaer Polytechnic Institute, Troy NY, BOLESLAW SZYMANSKI, Dep. of Computer Science, Rensselaer Polytechnic Institute, Troy NY, GYORGY KORNISS, Dept. of Physics, Rensselaer Polytechnic Institute, Troy NY — We investigate the effect of edge weighting scheme $\sim(\mathrm{k}_i.\mathrm{k}_j)^\beta$ on the optimality of flow efficiency and robustness in complex networks. We achieve this by analyzing a simple distributed flow model: current flow in resistor networks. In this scenario the centrality measure of a node (edge) is given by the current-flow betweenness, that is the amount of current flowing through the node (edge), averaged over all source-target pairs, when unit current enters simultaneously at each node and flows towards a randomly chosen target. The largest loads formed on either the nodes or the edges set the maximum amount of input current for which the network is still congestion free. These two optimal values do not occur for the same value of β. As congestion may appear on nodes as well as on edges, we also study the cascading behavior of networks, triggered by the removal of one or more entities.

[1]Supported in part by DTRA

Andrea Asztalos
Dept. of Physics and Dept. of Computer Science,
Rensselaer Polytechnic Institute, Troy NY

Date submitted: 22 Nov 2010 Electronic form version 1.4