UPDATING AND DOWNDATING TECHNIQUES FOR OPTIMIZING NETWORK COMMUNICABILITY

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The total communicability of a network (or graph) is defined as the sum of the entries in the exponential of the adjacency matrix of the network, possibly normalized by the number of nodes. This quantity, introduced in [2], offers a good measure of how easily information spreads across the network and can be useful in the design of networks having certain desirable properties. The total communicability can be computed quickly even for large networks using techniques based on the Lanczos algorithm, e.g., using S. Güttel's funm_kryl toolbox for Matlab [3].

In this talk we describe some heuristics that are based on edge centrality measures and can be used to construct undirected networks that are highly sparse, and yet have a large total communicability. These methods are based on updating, downdating and rewiring techniques that take into account the change in total communicability resulting from the addition or deletion of an edge.

Moreover, we show experimentally that the total communicability provides an effective and easily computable measure of how "well-connected" a sparse network is.

References

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