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Bounding the Locality of Distributed Routing Algorithms

We examine theoretical bounds on the locality of routing. A local routing algorithm $\mathcal{A}$ at a network node v receives a packet P and selects one of its neighbours to which to forward P using only local information. Specifically, in addition to knowing the node for which P is destined, algorithm $\mathcal{A}$ may also know the node from which P originated, the neighbour from which node v received P, and the graph corresponding to all nodes within k hops of node v. Our objective is to determine which of these parameters are necessary and/or sufficient to permit local routing as k varies, where the network is modelled by an undirected graph. In particular, we establish tight bounds on k for the feasibility of deterministic k-local routing for various combinations of these parameters. Although motivated by applications in networks, our results involve combinatorial and graph-theoretic arguments.

This is joint work with Prosenjit Bose and Paz Carmi.