

io-port 02080261**De Marco, Gianluca; Pelc, Andrzej****Deterministic broadcasting time with partial knowledge of the network.**

Lee, D. T. (ed.) et al., Algorithms and computation. 11th international conference, ISAAC 2000, Taipei, Taiwan, December 18–20, 2000. Proceedings. Berlin: Springer (ISBN 3-540-41255-7). Lect. Notes Comput. Sci. 1969, 374-385 (2000).

Summary: We consider the time of deterministic broadcasting in networks whose nodes have limited knowledge of network topology. Each node v knows only the part of the network within knowledge radius r from it, i.e., it knows the graph induced by all nodes at distance at most r from v . Apart from that, each node knows only the maximum degree Δ of the network and the number n of nodes. One node of the network, called the source, has a message which has to reach all other nodes. We adopt the widely studied communication model called the one-way model in which, in every round, each node can communicate with at most one neighbor, and in each pair of nodes communicating in a given round, one can only send a message while the other can only receive it. This is the weakest of all store-and-forward models for point-to-point networks, and hence our algorithms work for other models as well in at most the same time. We show tradeoffs between knowledge radius and time of deterministic broadcasting, when knowledge radius is small, i.e., when nodes are only aware of their close vicinity. While for knowledge radius 0, minimum broadcasting time is $\Theta(e)$, where e is the number of edges in the network, broadcasting can be usually completed faster for positive knowledge radius. Our main results concern knowledge radii 1 and 2. We develop fast broadcasting algorithms and analyze their execution time. We also prove lower bounds on broadcasting time, showing that our algorithms are close to optimal, for a given knowledge radius. For knowledge radius 1 we develop a broadcasting algorithm working in time $O(\min(n, D^2\Delta))$, where n is the number of nodes, D is the diameter of the network, and Δ is the maximum degree. We show that for bounded maximum degree Δ this algorithm is asymptotically optimal. For knowledge radius 2 we show how to broadcast in time $O(D\Delta \log n)$ and prove a lower bound $\Omega(D\Delta)$ on broadcasting time, when $D\Delta \in O(n)$. This lower bound is valid for any constant knowledge radius. For knowledge radius $\log^* n + 3$ we show how to broadcast in time $O(D\Delta)$. Finally, for any knowledge radius r , we show a broadcasting algorithm working in time $O(D^2\Delta/r)$.

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