

io-port 02135798**Kowalski, Dariusz R.; Pelc, Andrzej****Time of deterministic broadcasting in radio networks with local knowledge.**

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Summary: We consider broadcasting in radio networks, modeled as undirected graphs, whose nodes know only their own label and labels of their neighbors. In every step every node acts either as a transmitter or as a receiver. A node acting as a transmitter sends a message which can potentially reach all of its neighbors. A node acting as a receiver in a given step gets a message if and only if exactly one of its neighbors transmits in this step. *R. Bar-Yehuda, O. Goldreich, and A. Itai* [J. Comput. Syst. Sci. 45, 104–126 (1992; Zbl 0752.68009)] considered broadcasting in this model. They claimed a linear lower bound on the time of deterministic broadcasting in such radio networks of diameter 3. This claim turns out to be incorrect in this model (although it is valid in a more pessimistic model [*R. Bar-Yehuda, O. Goldreich, and A. Itai*, Errata regarding “On the time complexity of broadcast in radio networks: An exponential gap between determinism and randomization,” http://www.wisdom.weizmann.ac.il/mathusers/oded/p_bgi.html (2002)]). We construct an algorithm that broadcasts in logarithmic time on all graphs from the Bar-Yehuda, Goldreich, and Itai paper (BGI). Moreover, we show how to broadcast in sublinear time on all n -node graphs of diameter $o(\log \log n)$. On the other hand, we construct a class of graphs of diameter 4, such that every broadcasting algorithm requires time $\Omega(\sqrt[4]{n})$ on these graphs. In view of the randomized algorithm from BGI, running in expected time $\mathcal{O}(D \log n + \log^2 n)$ on all n -node graphs of diameter D (cf. also a recent $\mathcal{O}(D \log(n/D) + \log^2 n)$ -time algorithm from [*D. Kowalski and A. Pelc*, Proc. 22nd Annual ACM Symposium on Principles of Distributed Computing, Boston, 73–82 (2003); *A. Czumaj and W. Rytter*, Proc. 44th Annual IEEE Symposium on Foundations of Computer Science, Cambridge, MA, 492–501 (2003)]), our lower bound gives the first correct proof of an exponential gap between determinism and randomization in the time of radio broadcasting, under the considered model of radio communication.

Keywords: broadcasting; distributed; deterministic; radio network
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