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Jean-Claude Bermond
Université Côte d'Azur, CNRS, Inria, I3S, France,
jean-claude.bermond@inria.fr
Takako Kodate
Department of Information and Sciences,
Tokyo Woman's Christian University, Japan,
kodate@lab.twcu.ac.jp
Joseph Yu
Department of Mathematics,
University of the Fraser Valley, B.C., Canada,
joseph.yu@ufv.ca

In this paper, we study the problem of gossiping with interference constraint in radio chain networks. Gossiping (or total exchange information) is a protocol where each node in the network has a message and wants to distribute its own message to every other node in the network. The gossiping problem consists in finding the minimum running time (makespan) of a gossiping protocol and efficient algorithms that attain this makespan.

Transmission model The radio chain network is modeled as a symmetric dipath P_n, where the vertices represent the nodes and the arcs represent the possible communications. A call (s, r) is defined as the transmission from the node s to the node r, in which s is the *sender* and r is the *receiver* and (s, r) is an arc of the dipath. The network is assumed to be synchronous and the time is slotted into *steps*. We suppose that each device is equipped with a half duplex interface; so, a node cannot both receive and transmit during a step.

Interference model Furthermore, communication is subject to interference constraints. We use a binary asymmetric model of interference based on the distance in the communication digraph like the ones used in [1, 2, 6]. Let $d(s, r)$ denote the distance, that is the length of a shortest directed path, from s to r in P_n and d_I be a non negative integer. We assume that when a node s transmits, all nodes v such that $d(s, v) \leq d_I$ are subject to the interference from s transmission. So two calls (s, r) and (s', r') do not interfere if $d(s, r') > d_I$ and $d(s', r) > d_I$. During a given step only non interfering (or compatible) calls can be done and we will define a round as a set of such compatible calls. We focus here on the case where $d_I = 1$.

Main result This problem has been studied in general in [5] where approximation results are given (see also the survey [4]). In [3] we solved completely the gossiping problem in radio ring networks within this model. Here we determine exactly the minimum number of rounds R needed to achieve a gossiping when transmission network is a dipath P_n on n nodes and the interference distance is $d_I = 1$. We first prove the lower bound and then give gossiping algorithms which meet this lower bound.

Theorem 1 *The minimum number of rounds R needed to achieve a gossiping in a chain network P_n $(n \geq 3)$, with the interference model $d_I = 1$ is :*

$$R = \begin{cases} 3n - 5 & n \geq 4 \\ 5 & n = 3 \end{cases}$$

References

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