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# Gossiping with interference in radio chain networks (upper bound algorithms)

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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, and therefore, 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, 5]. 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 the transmission at  $s$ . 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** Within this model, the problem has been studied in general in [4] where approximation results are given in particular for ring and chain networks (see also the survey [3]). We solved completely the gossiping problem in radio ring networks (work presented at JCDCG<sup>3</sup> 2017), and presented partial results for radio chain networks (work presented at JCDCG<sup>3</sup> 2018).

In this talk, we present new gossiping algorithms for chain networks which meet the lower bounds enabling us to prove the following theorem:

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

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

## References

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