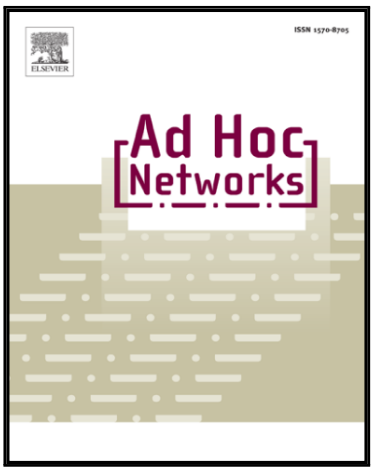

Broadcasting in Dense Linear Networks: to Cooperate or not to Cooperate?

Birsen Sirkeci-Mergen, Shiva Moballegh

PII: S1570-8705(18)30622-X
DOI: https://doi.org/10.1016/j.adhoc.2018.08.022
Reference: ADHOC 1752

To appear in: *Ad Hoc Networks*

Received date: 8 February 2018
Revised date: 16 August 2018
Accepted date: 29 August 2018

Please cite this article as: Birsen Sirkeci-Mergen, Shiva Moballegh, Broadcasting in Dense Linear Networks: to Cooperate or not to Cooperate?, *Ad Hoc Networks* (2018), doi: https://doi.org/10.1016/j.adhoc.2018.08.022

Broadcasting in Dense Linear Networks: to Cooperate or not to Cooperate?

Birsen Sirkeci-Mergen

Department of Electrical Engineering, San Jose State University, San Jose, CA, 95192.

Shiva Moballegh

Samsung Display America Lab. San Jose, CA, 95134.

Abstract

In this paper, the effectiveness of cooperative broadcast in high-density linear networks is studied. In the considered protocol, a single source sends messages continuously causing interference among messages and the goal is to reach to the entire network via cooperating relays. Sufficient conditions for successful broadcast are derived under two different transmission schemes: the unidirectional scheme and the bidirectional scheme. Our analysis shows that the broadcast behavior depends on the pathloss exponent γ and the type of transmission scheme even though the channel between two nodes are affected by small-scale fading. Unlike the noncooperative multihop broadcast, the cooperative broadcast propagates the message to the entire network successfully when $\gamma \leq 1$ provided that network parameters satisfy certain conditions. Furthermore, for $\gamma > 1$, cooperative scheme becomes optimal under the bidirectional transmission when the information rate is below a threshold; however if the transmissions are unidirectional, noncooperative scheme becomes optimal. When compared with 2D networks, we demonstrate that the advantages of cooperative broadcast in linear networks are limited.

Keywords: Broadcast, cooperative communication, continuum model, interference, linear networks, wireless networks.

[1]Major part of this work was done while Shiva Moballegh was a Master's student at San Jose State University, San Jose, CA.