

Game-theoretic Network Creation for Multi-hop Broadcast in Ad Hoc Networks

Ad Hoc networks do not need any infrastructure and communication in such networks is possible without relying on an external unit. The nodes mostly communicate in a multi-hop manner such that the data from a transmitter may be sent to a receiver by the help of some intermediate nodes that forward the message toward receiver. Transmitting the same data from a source node to all the nodes of a network is called multi-hop broadcast, see Fig. 1. Multi-hop broadcast can increase the quality of service for mobile users, for instance by using such networks for file sharing or video streaming.

An important question is how an Ad Hoc network should be formed? The structure of the network, called network topology, determines the performance of the network in terms of energy consumption or delay. In most situations, these parameters are conflicting and improving one parameter may worsen the other one.

The process of finding a suitable topology is called network creation. It is preferred to create an Ad Hoc network by decentralized algorithms so that an external unit will not be required for setting a network up. In this regard, game theory is a powerful tool for modeling the behavior of independent nodes when the nodes, here users, have conflicting interests. It can also help us in designing decentralized algorithms for network performance optimization.

This thesis is intended to design a decentralized algorithm by using game theory for network creation, considering the performance metric in terms of energy consumption, time and bandwidth required for data dissemination.

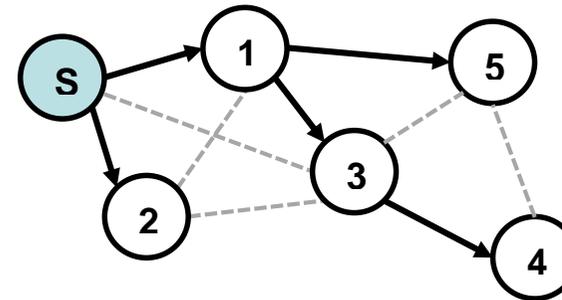


Fig. 1: A sample connection among the nodes for Multi-hop broadcast in an Ad Hoc network

Tasks:

- Understanding the basics of game theory
- Reviewing the related works, for instance see [this](#) or [this](#)
- Designing new algorithm considering the mentioned parameters
- Evaluating the performance of the algorithm by simulation

Requirements:

- High motivation in doing research in the field of communications
- Basic knowledge about principals of communications
- Programming skills, for example with MATLAB