Abstract

Cooperative communication is a technique to use nodes in the wireless network as relays to forward information to the destination. Cooperative communication technique relies on the relay selection and power allocation process to optimize its performance since not all available nodes are beneficial to use for forwarding. Game theory is a branch of mathematics theory which tries to model the behavior of a player in strategic situation, or games, when dealing with other players' choices. In the cooperative communication networks, the game theoretical approach has been shown to be a good means to solve the relay selection and resource allocation problems which have multiple objectives.

In this thesis we analyze the relay selection and resource allocation using pricing game in a cooperative wireless communication network with interference. Using simulation results we show that interference affects the relay selection and resource allocation process. From the relay selection result we also find that the number of selected relay nodes influences the optimization process and when the number of selected nodes is large, the source node significantly suffers from payment to relay nodes. We propose an algorithm to limit the number of selected relay nodes and to keep the benefit of the source node.

We also propose an evolutionary game approach for resource allocation in cooperative wireless networks. The method has flexibility in optimizing the system based on preferred objectives. The evolutionary game approach is based on evolutionary programming, where the behavior of each node is modeled to mimic the biological evolution process.

Results of this study can be used in a wide range of wireless sensor networks where power, bandwidth, and other resource constraints are present. The proposed scheme provides a flexible relay node selection given the resource constraints of the wireless network.