

Performance Analysis of Power Allocation and Relay Location in a Cooperative Relay Network

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Abstract—Transmission using cooperative relays is a new paradigm in wireless communication. The cooperating relays facilitate the process of communication by performing the operations like data transmission and data processing in a distributed manner. In this wireless system every node is an active element and can act as a relay node. So when a group of these cooperating nodes are involved in a communication stream, a virtual multiple input multiple output (MIMO) system is formed which provides the networks with additional benefits of spectral efficiency and error reduction. Since this system is based on the traditional wireless sensor network (WSN) in which each node has a limited power and computational resource. Therefore, energy efficiency achieved by employing cooperating relays is not sufficient enough. Some extra measures need to be taken to decrease the power consumption of the network. This paper is an effort in this direction, as a power efficient allocation algorithm has been proposed which allocates transmission power optimally to the source node and the involved relay nodes. In the first part of the paper mathematical expressions have been derived for various phases in a cooperative relay transmission. The performance efficiency of the system has been presented using average bit error rate (ABER) as a performance criteria. In the second part, a power allocation algorithm has been derived and employed in a multi-hop cooperative relay network having 4-nodes, with amplify and forward (AF) protocol as its relaying technique. The efficiency of the power allocation algorithm (OPA) has been further investigated with respect to relay location in a network. Simulation results validate the performance efficiency of OPA in different transmission scenarios.

Keyword—Power Allocation, Cooperative Relay Network, Multi-hop Transmission, Relaying Technique, Multiple Input Multiple Output and Diversity Combining.



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