Connectivity Management in Mobile Ad Hoc Networks: A Fuzzy Based Semi-Distributed Approach

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Abstract

The highly dynamic character of a Mobile Ad-Hoc Network (MANET) poses significant challenges on network communications. Previous work on MANET has resulted in numerous routing protocols aiming to maintain network connectivity among the active nodes. It is really a challenging task to provide a connected network during the movement of the whole network. This paper, presents a fuzzy based algorithm to maintain the connected topology of a MANET by suitably selecting 'Leader' among the nodes constituting the MANET. All the nodes are enabled with GPS receiver. The basic philosophy behind the algorithm is to select 'Leader' amongst the system based on positional data and the node's energy level. Once elected, the 'Leader' is entrusted with the responsibility to broadcast its positional information periodically while the other nodes will individually decide its movement depending on the fuzzy based analysis of positional data of the leader in order to maintain the connected topology. The algorithm is going to be formulated in such a way, that the entire network is going to move in one direction while each node can move freely. Both the 'Leader' election and the movement algorithm is fuzzy logic based. We have simulated the algorithm in a number of synthetically designed situations and the results we have obtained have been quite encouraging.