A Novel Clustering Strategy for Efficient Routing in Adhoc Networks

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Summary

An adhoc network is a dynamic multi hop wireless network established by a group of mobile nodes on a shared wireless channel without any infrastructure. Efficient clustering and routing in adhoc networks has been a topic of research in the past few years. The literature that deals with adhoc routing identifies two types of networks viz. hierarchical routed networks and flat routed networks. While the former creates a hierarchy among the nodes the latter treats all nodes equally. Most hierarchical clustering architectures for mobile radio networks are based on the concept of *clusterhead* [1,2,3]. In most of the proposed methods in hierarchical (clustered) networks, much thought has not been given for the selection of the *clusterhead*. In order to design a stable network, we need to look after features that clusters should suffice.

We consider a system in which all nodes have a prior information of their location. This is valid for adhoc networks as we can append nodes with devices like GPS [8]. We propose a novel location aware voting based clustering strategy which leads to a network with spatial and temporal stability. The clustering strategy tries to find an optimal location of the *clusterhead* in a cluster using *Voting Algorithm*. Each node in a cluster periodically evaluates the best possible location of the *clusterhead* for itself and convey this information to the *clusterhead* as a vote. The *clusterhead* receives votes from all the cluster nodes and estimates the optimal position for the *clusterhead*. The *clusterhead* retains or passes on its role to some other node depending upon the proximity to the above calculated position and certain other factors like node's battery power. The *clusterhead* chosen in this way is in confirmation with the cluster on the whole. We address different issues that may arise in management of a cluster and present algorithms to deal with such issues in presence of various network events.

After a stable cluster framework has been established, the routing strategy has to take care of both intra and inter cluster routing. We implemented DSDV for intra cluster routing and AODV for inter cluster routing. We have used Carrier Sensing Multiple Access (CSMA) as MAC protocol in our analysis. Also, standard models were used for the channel state and the mobility of the nodes. The simulation has been done to carry out a detailed comparison of performance of

DSDV and AODV routing protocols when implemented with our Novel clustering strategy and existing Fixed clustering strategy. We have carried out the simulation by varying the number of clusters in both the strategies. This is done in order to have the routing overheads same in both the clustering strategies. The performance parameters chosen are Throughput and Power spent per packet transmitted successfully. The packet arrival process was taken as Poisson for varying values of load in Erlang's. These parameters are evaluated for various load values in both the strategies.

It was observed during the simulation that number of *clusterhead* swapping's required were very less in Novel clustering than in Fixed, which is due to temporal and spatial stability achieved. Our strategy outperforms existing and conventional clustering approaches in terms of power consumption, at a little cost of overhead during topology updates. The throughput performance is almost same in both the strategies. The strategy performs very well when density of nodes is very high, thus suitable for dense mobile ad-hoc networks.

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