Abstract

Advances in wireless technology and hand-held computing devices have brought revolution in the area of mobile communication. The increasing mobility of humans across the globe generated demand for infrastructure-less and quickly deployable mobile networks. Such networks are referred to as Mobile Ad hoc Networks (MANET). Mobile ad hoc networks consist of nodes equipped with wireless communication and computing facilities. MANET inherits the limitations of wireless networks such as bandwidth, battery power, etc. In addition, multi-hop routing in MANET is one of the most challenging task due to frequently changing topology.

A number of routing protocols have been proposed by researchers to deal with the problems of multi-hop routing. Most of the protocols proposed initially required knowledge of the network topology for routing. These protocols involve communication overheads of route maintenance and route discovery. Later, position based protocols were proposed to eliminate these overheads.

Present work focuses on exploring position based routing and geocasting approaches that use the position of nodes to construct a route from source to destination. These algorithms are localized and distributive in nature and are more robust to find a route. We assume that each node knows its position.

In this work we have evaluated the performance of various position based routing protocols both in static and mobile environment. Percentage of successful deliveries, average minimum hop counts, and flooding ratio have been measured for performance evaluation. The position-based algorithms studied in the work include SP, DREAM, LAR, GEDIR, MFR, DIR, VD-GEDIR, CH-MFR, R-DIR, DIR-16, VD and CH algorithms.

We proposed VD-GEDIR, and CH-MFR algorithms as a modification of GEDIR and MFR, respectively by taking 16 equally spaced points on the boundary of an expected
zone. Similarly, a modified version of DIR has been proposed by taking equally spaced 16 points on the boundary of an expected zone and the proposed algorithm is called as DIR-16. We have also modified the definition of request zone of DREAM and new algorithm is called R-DIR. VD and CH algorithms have been proposed by introducing the concept of voronoi diagram, and convex hull with MFR. All above algorithms have been modified to incorporate the concept of dominating sets to reduce the flooding ratio.

We have implemented the algorithms in VC++. Further, algorithms are simulated for both static and mobile network of 200 nodes spread over an area of 640 X 480 square units. To evaluate the performance, we have varied network degree as 5, 7, 10, 15, 20, 25 and 50. The transmission range of a node is made as function of network size, area, and average degree of the network. Random walk mobility pattern is introduced for mobility in the network. Here, we have considered that each node moves with same speed of 2 units / clock tick. Three types of location update schemes have been implemented for mobile network – time based, link based and route search based.

The experiments were conducted for both static and mobile environment. For each experiment we have taken 100 pairs of source and destination for static network. The experiment is repeated 20 times to compute the averages of performance parameters for different value of network degree. In mobile environment, experiment is performed for 1000 pairs of source and destination. Experiment is repeated 10 times for computing the averages.

Simulation results show that the new proposed algorithms VD, CH, R-DIR, VD-GEDIR, CH-MFR, and DIR-16 have performed better than existing DREAM and LAR algorithms. VD and CH are best suited for routing whereas they perform slightly lower than VD-GEDIR, CH-MFR, and DIR-16 for geocasting. VD-GEDIR followed by DIR-16 and CH-MFR are the best among all compared algorithms for geocasting. Dominating sets have proved very effective in reducing flooding ratio especially in dense network with marginally affecting the success rate in the new proposed algorithms.