Performance Evaluation of different Routing Algorithm in Wireless Ad hoc Networks

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Abstract-
A mobile ad hoc network consists of wireless hosts and the movement of hosts results in a change in routes. There are many routing protocols proposed by different researchers but to determine which one work efficiently is a little difficult task. In this paper we have performed some simulation and try to compare the algorithm like flooding, LAR scheme1 and LAR scheme 2. We suggests an approach to utilize location information (for instance, obtained using the global positioning system) to improve performance of routing protocols for ad hoc networks. This paper gives an idea of optimizing the route searching methods in Wireless ad hoc networks.

Key word- host, LAR, Flooding, Optimization

I. Introduction-
An ad hoc network is a group of wireless mobile computers which cooperate by forwarding packets for each other to allow them to communicate beyond direct wireless transmission range. Ad hoc networks require no centralized administration or fixed network infrastructure such as base stations or access points, and can be quickly and inexpensively set up as needed. They can be used in military exercises, disaster relief, and mine site operation, but secure and reliable communication is a necessary prerequisite for such applications.

Routes between two hosts in a Mobile Ad hoc NETwork (MANET) may consist of hops through other hosts in the network [1,2]. Host mobility can cause frequent unpredictable topology changes. Therefore, the task of finding and maintaining routes in MANET is nontrivial. Many protocols have been proposed for mobile ad hoc networks, with the goal of achieving efficient routing [3,4,5,6,7,8,9]. These algorithms differ in the approach used for searching a new route and/or modifying a known route, when hosts move.

Routing protocols in conventional wired networks generally use either distance vector or link state routing algorithms, both of which require periodic routing advertisements to be broadcast by each router. In distance vector routing [10], each router broadcasts to each of its neighbor routers its view of the distance to all hosts, and each router computes the shortest path to each host based on the information advertised by each of its neighbors. In link state routing [10], each router instead broadcasts to all other routers in the network its view of the status of each of its adjacent network links, and each router then computes the shortest distance to each host based on the complete picture of the network formed from the most recent link information from all routers. In addition to its use in wired networks, the basic distance vector algorithm has also been adapted for routing in wireless ad hoc networks, essentially treating each mobile host as a router [1].

Design of routing protocols is a crucial problem in mobile ad hoc networks [5], and several routing algorithms have been. One desirable qualitative property of a routing protocol is that it should adapt to the traffic patterns [7]. In [7,8] point out that conventional routing protocols are insufficient for ad hoc networks, since the amount of routing related traffic may waste a large portion of the wireless bandwidth, especially for protocols that use periodic updates of routing tables. They proposed using Dynamic Source Routing (DSR), which is based on on-demand route discovery. A number of protocol optimizations are also proposed to reduce the route discovery overhead. Perkins and Royer [3] present the AODV (Ad hoc On demand Distance Vector routing) protocol that also uses a demand-driven
route establishment procedure. TORA (Temporally-Ordered Routing Algorithm) [2] is designed to minimize reaction to topological changes by localizing routing-related messages to a small set of nodes near the change. Hass and Pearlman [3] attempt to combine proactive and reactive approaches in the Zone Routing Protocol (ZRP), by initiating route discovery phase on demand, but limiting the scope of the proactive procedure only to the initiator’s local neighborhood. Recent papers present comparative performance evaluation of several routing protocols [4,8].

In this paper, we suggest an approach to decrease overhead of route discovery by utilizing location information for mobile hosts. Such location information may be obtained using the global positioning system (GPS) [10]. We demonstrate how location information may be used by means of two Location-Aided Routing (LAR) protocols LAR Scheme 1 and 2 for route discovery. The LAR protocols use location information to reduce the search space for a desired route. Limiting the search space results in fewer route discovery messages we have considered the flooding algorithm also.

II. Location-Aided Routing (LAR) protocols

1. Flooding

In this paper, we explore the possibility of using location information to improve performance of routing protocols for MANET. We show how a route discovery protocol based on flooding can be improved. When a node S needs to find a route to node D, node S broadcasts a route request message to all its neighbors – hereafter, node S will be referred to as the sender and node D as the destination. A node, say X, on receiving a route request message, compares the desired destination with its own identifier. If there is a match, it means that the request is for a route to itself (i.e., node X).

Otherwise, node X broadcasts the request to its neighbors – to avoid redundant transmissions of route requests, a node X only broadcasts a particular route request once (repeated reception of a route request is detected using sequence numbers). Figure 1 illustrates this algorithm. In this figure, node S needs to determine a route to node D. Therefore, node S broadcasts a route request to its neighbors. When nodes Band C receive the route request, they forward it to all their neighbors. When node F receives the route request from B, it forwards the request to its neighbors. However, when node F receives the same route request from C, node F simply discards the route request.

2. LAR Scheme 1

It uses a request zone that is rectangular in shape fig. 2. Assume that node S knows that node D was at location \((X_d, Y_d)\) at time \(t_0\). At time \(t\), node S initiates a new route discovery for destination D. We assume that node S also knows the average speed \(v\) with which D can move. Using this, node S defines the expected zone at time \(t\) to be the circle of radius \(R = v \cdot (t - t_0)\) centered at location \((X_d, Y_d)\). (As stated before, instead of the average speed, \(v\) may be chosen to be the maximum speed or some other function of the speed distribution.)

Fig-2-Expected request zone for flooding

Fig-3- Source node outside the expected zone
In fig-3, the request zone is the rectangle whose corners are S, A, B and C, and current location of node S is denoted as \((X_s, Y_s)\).

3. LAR Scheme-II

In LAR scheme 1, source S explicitly specifies the request zone in its route request message. In scheme 2, node S includes two pieces of information with its route request:

Assume that node S knows the location \((X_d, Y_d)\) of node D at some time \(t_0\) - the time at which route discovery is initiated by node S is \(t_0\) where \(t > t_0\). Node S calculates its distance from location \((X_d, Y_d)\), denoted as \(DIST_{sd}\), and includes this distance with the route request message.

The coordinates \((X_d, Y_d)\) are also included with the route request. When a node I receives the route request from sender node S, node I calculates its distance from location \((X_d, Y_d)\), denoted as \(DIST_{sd}\).

III. Simulation Result

We compare the results from LAR scheme 1 and LAR scheme 2 with those from the flooding algorithm. In each run, one input parameter (e.g., average speed, number of nodes, or transmission range) was varied while the other parameters were kept constant. Our simulation results are averaged over 30 runs, each with a different mobility pattern (different mobility patterns were obtained by choosing different seeds for a random number generator).

Figure 6 shows the effect of varying the transmission range. Typically, the routing overhead decreases with increasing transmission range. With a larger transmission range, the frequency of route discovery should be smaller, as wireless links will break less frequently. This factor contributes to a decrease in routing overhead for all three schemes. Our schemes continue to perform better than flooding. However, with a smaller transmission range (200 units in figure 7), performance of our schemes is not much better than flooding. In figure 7, LAR scheme 1 performs even worse than flooding. When a node forwards a route request, it broadcasts the request to all its neighbors.

With a smaller transmission range, number of neighbors for each node decreases. This factor decreases the probability of a route discovery within the timeout interval, using the initial request zone. Recall that, in this case, our schemes allow the sender to initiate a new route discovery using the flooding algorithm. We believe that this is the reason why LAR schemes do not perform too well when transmission range is small. The different request
zones used in the two LAR schemes result in different routing overhead for the two schemes.

Fig-6 The number of RPs per DP versus transmission range (with 30 nodes). 4.5 units/sec

Fig-7, The number of RPs per DP versus transmission range (with 30 nodes). Avg speed 22.5 units/sec

IV. Conclusion

This paper describes how location information may be used to reduce the routing overhead in ad hoc networks. We present two location-aided routing (LAR) protocols. These protocols limit the search for a route to the so-called request zone, determined based on the expected location of the destination node at the time of route discovery. Simulation results indicate that using location information results in significantly lower routing overhead, as compared to an algorithm that does not use location information. We also suggest several optimizations on the basic LAR schemes which may improve performance.

References


He is working in GIET, Gunupur, as an Assistant professor in IT. He has done his B.Tech and M.Tech from BPUT,Orissa. His research interest is Ad-hoc network and network security.