IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

Geographic Routing In Mobile Ad Hoc Networks Using Adaptive Position Update

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Abstract

In geographic routing, nodes need to maintain latest positions of their direct neighbors for making with effect forwarding decisions. Continuing broadcasting of beacon packets that control the geographic location coordinates of the nodes is a popular method used by most geographic routing protocols to maintain neighbor positions. Validate the periodic beaconing regardless of the node mobility and a traffic pattern in the network is not attractive from both update cost and routing performance points of view. The system proposes the Adaptive Position Update (APU) strategy for geographic routing, which energetically adjusts the frequency of position updates based on the mobility dynamics of the nodes and the forwarding patterns in the network. APU is based on two simple principles: nodes whose movements are harder to predict update their positions more frequently (and vice versa), and Nodes closer to forwarding paths update their positions more frequently (and vice versa). The analysis, which is implemented by Dot net framework of a famous geographic route-planning protocol, Greedy Perimeter Stateless Routing Protocol (GPSR), acts that APU can significantly reduce the update cost and improve the routing performance in terms of packet delivery ratio and average end-to-end delay in comparison with periodic beaconing and other recently proposed briefing schemes. The benefits of APU are further confirmed by undertaking evaluations in realistic network states, which account for localization error, realistic radio reproduction, and sparse network.

Keywords: Wireless communication, algorithm/protocol design and analysis, routing protocols.

Introduction

The field of wireless and mobile communications has experienced an unprecedented growth during the past decade. Current second-generation (2G) cellular systems have reached a high diffusion rate, enabling worldwide mobile connectivity. Mobile users can use their cell phone to check their email and browse the Internet. Recently, an increasing number of wireless local area network (LAN) hot spots is emerging, allowing travelers with portable computers to surf the Internet from airports, railways, hotels and other public places. Broadband Internet access is driving wireless LAN solutions in the home for sharing access between computers. In the meantime, 2G cellular networks are developing to 3G, offering higher data rates, infotainment and location-based or personalized services. MANETS can be used for facilitating the collection of sensor data for data mining for a variety of applications such as air pollution monitoring and different types of architectures can be used for such applications. The growth of laptops and 802.11/Wi-Fi wireless networking have formed MANETs a popular research topic since the mid-1990s.However, all these networks are normal wireless networks, established in the sense that as prerequisites, a static network infrastructure with centralized administration is required for their operation, possibly consuming a lot of time and money for set-up and maintenance. Increasing number of devices such as laptops, personal digital assistants (PDAs), pocket PCs, tablet PCs, smart phones, MP3 players, ordinal cameras, etc. are provided with short-range wireless interfaces. In extra, these devices are getting smaller, cheaper, more user friendly and more powerful. This evolution is driving a new alternative way for mobile interaction, in which mobile devices form a self-creating, self-regulation and self-administering wireless network, called a mobile ad hoc network. This paper discusses the characteristics, potential applications and network layer challenges of this promising type of network.

With the growing popularity of positioning devices (e.g., GPS) and other localization methods, geographic routing protocols are becoming an attractive choice for use in mobile ad hoc networks. The original principle used in these protocols involves selecting the next routing hop from among a node's neighbors, which is geographically closest to the end.

Since the forwarding decision is based entirely on local information, it obviates the need to create and maintain routes for each end. By virtue of these characteristics, position-based routing protocols are very much scalable and particularly robust to frequent changes in the network topology. Moreover, since the forwarding decision is made on the fly, each node continuously selects the optimal next hop based on the most current topology.

Several studies have shown that these routing protocols offer significant performance improvements over topology-based routing protocols such as DSR and AODV .The forwarding strategy employed in the aforementioned geographic routing protocols requires the following information: the position of the final destination of the packet and the position of a node's neighbors. The previous can be obtained by querying a location service such as the Grid Location System (GLS) or Quorum.

To obtain the latter, each node exchanges its own location information (obtained using GPS or the localization schemes discussed) with its neighboring nodes. They allows each node to build a local map of the nodes within its vicinity, often referred to as the neighborhood topology. However, in situations where nodes are mobile or when nodes often switch off and on, the neighborhood topology rarely remains static. Hence, it is needed that each node broadcasts its updated location information to all of its neighbors. These position update packets are usually referred to as beacons. The most geographic routing protocols beacons are broadcast periodically for maintaining an accurate neighbor list at each node. Location updates are costly in many ways. Each update consumes node power, wireless bandwidth, and increases the risk of packet collision at the medium access control (MAC) layer. Packet collisions cause packet loss which in turn affects the routing performance due to decreased accuracy in determining the correct local topology (a lost beacon broadcast is not retransmitted).

A lost data packet does get retransmitted, but at the overhead of increased end-to-end delay. Clearly, given the cost linked with transmitting beacons, it makes view to adapt the frequency of beacon updates to the node mobility and the traffic conditions within the network, rather than employing a fixed periodic update policy. For example, if certain nodes are regularly changing their mobility characteristics (speed and/or heading), it makes sense to for nodes that do not exhibit significant dynamism, periodic broadcasting of beacons is inefficient. Further, if only a small percentage of the nodes are involved in forwarding packets, it is needless for nodes which are located far away from the forwarding path to employ periodic beaconing because these updates are not useful for forwarding the current traffic. To propose a novel beaconing strategy for geographic routing protocols called Adaptive Position Updates strategy (APU).

The scheme eliminates the drawbacks of periodic beaconing by adapting to the system changes. APU incorporates two rules for triggering the beacon update method. The first rule, referred as Mobility Prediction (MP), uses a simple mobility prediction scheme to estimate when the location information broadcast in the previous beacon becomes incorrect. The next beacon is broadcast only if the predicted error in the location estimate is greater than a certain threshold, thus tuning the update rate to the dynamism inherent in the node's motion.

The second rule, referred as On-Demand Learning (ODL), aims at improving the accuracy of the topology along the routing paths between the communicating nodes. ODL uses an on-demand learning tactic, whereby a node broadcasts beacons when it overhears the transmission of a data packet from a new neighbor in its vicinity. They ensures that nodes involved in forwarding data packets maintain a more up-to date view of the local topology. On the conflicting, nodes that are not in the vicinity of the forwarding path are unaffected by the rule and do not broadcast beacons very frequently. The model APU to quantify the beacon overhead and the local topology accuracy. The extensive simulation results confirm the superiority of the proposed scheme over other schemes.

Existing System
- In the Existing system several simple optimizations that adapt beacon interval to node mobility or traffic load, including distance-based beaconing (DB), speed-based beaconing and reactive beaconing.
- In the distance-based beaconing, a meeting point transmits a beacon when it has moved a given distance d. The node removes an obsolete neighbor if the node does not hear any beacons from the neighbor while the node has moved more than k-times the distance d, or after a largest time out of 5 s.

- In the speed-based beaconing, the beacon interval is dependent on the node speed. Position updates are costly in many ways.
- Each devours consumes node energy, wireless bandwidth, and increases the risk of packet collision at the medium access control (MAC) layer.

Drawbacks of an Existing System

- Chance of spoofing attacks
- The existing system didn't follow any sustained position updation.
- Security level is low
- Communication and computation cost was too high.

Proposed System

- In proposed identified the need to adapt the beacon update policy employed in geographic routing protocols to the node mobility dynamics and the traffic load.
- To proposed the Adaptive Position Update strategy to address these difficulties. The APU scheme employs two mutually complete rules. The MP rule uses mobility prediction to estimate the accuracy of the location estimate and adapts the beacon update in its place accordingly, instead of using periodic beaconing.
- The ODL rule allows nodes along the data forwarding path to maintain an accurate view of the local topology by exchanging beacons in response to data packets that are overheard from new neighbors.
- Mathematically evaluated the beacon overhead and local topology accuracy of APU and validated the analytical model with the simulation results.

Advantages of Proposed System

- Accuracy
- Verify the locations of their neighbors, so as to detect adversarial nodes announcing false locations.

System Architecture

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and more views of a system. It serves as a model to describe/analyze a system.
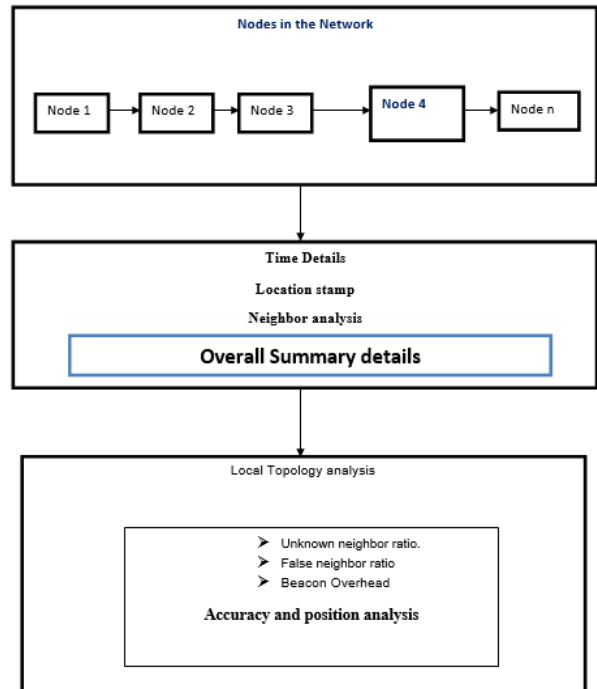
Fig 3.1.System Architecture

Stages in Adaptive Position Update

A. Node creation.
B. Path construction.
C. Routing Table position updation.
D. Position verification with beacon accuracy
E. Message Transmission

A. Node Creation

Client-server computing or networking is a distributed application architecture that partitions tasks or workloads between service providers (servers) and maintenance requesters, called clients. Often clients and servers operate over a computer network on individual hardware. A server machine is a high-performance host that is running one or more server programs which share its resources with clients. A client also dividends any of its resources; Clients therefore initiate communication sessions with servers which await (listen to) inbound requests. The followings are the parameters to construct a network.

- Node Name
- Host Number
- IP Address

The node name is nothing but the system name, which can be given by the user. The next value is host number which can be get from our network configuration details. The next one is the IP address of the system. These can be identified by a simple command on DOS environment. The command 'net

stat' helps to get all details about the network configuration.

- Create many nodes.
- Users enter the IpAddress, port number and position of the node to   register in the Database.
- While entering the next node the user must check the database for that node exists or new one.

B.   Path Construction

Here it uses mesh topology because of its formless nature. Topology is constructed by getting the names of the nodes and   the connections among the nodes as input commencing the user. While getting each of the nodes, their linked port and ip address is also attained. For successive nodes, the node to which it should be connected is also accepted from the user. While adding nodes, evaluation will be done so that there would be no node duplication. Then it identifies the source and the destinations.

The node information consists of node names and the weight between them.

- To construct a more paths for a given source.
- The path construction fully based on the destination.
- Construct a path from the database.

C.   Routing Table Position Updation

- To update the details about Status, Life Time and Down Time of the Node.
- Life Time means how much amount of time the node is in Activation and Down Time means how much amount of time the node is in Deactivation.
- Then how many time the node is in Switch off condition, they also update in Routing Table

D.   Position Verification with Accuracy

- The positions are updated in the format of the beacon messages.
- The beacon messages are in the form of received Signal Strength. For accuracy verification the approximate location is verified with the updated location.
- The signals are converted into readable data after that the location is compared with the default map. If the approximation is wrong then the updation could be done a wrong node.

E.   Message Transmission

- In that module transmit the message between sender and destination using many intermediate nodes.
- Type the message or choose the any text files from sender nodes. That is user can browse the any files from sender node.
- The Message Transmission can be based On Downtime of the path.
- The Source can choose initially which path have the minimum Downtime

Algorithm
Adaptive Position Update

- All nodes are aware of their own location and velocity,
- All links are bidirectional,
- The beacon updates include the current location and velocity of the nodes, and
- Data packets can piggyback position and speed updates and all one-hop neighbors operate

Analysis Of Adaptive Position Update

In this section, analyze the performance of the proposed beaconing strategy, APU. Focus on two key performance measures: update cost and local topology accuracy. The former is measured as the total number of beacon broadcast packets transmitted in the network. The latter is collectively measured by the following two metrics:

Unknown Neighbor Ratio

- It is defined as the ratio of the new neighbors a node is not aware of, but that are within the radio range of the node to the total number of neighbors.

False Neighbor Ratio

- It is defined as the ratio of obsolete neighbors that are in the neighbor list of a node, but have already moved out of the node's radio range to the total number of neighbors.
- The unknown neighbors of a node are the new neighbors that have moved in to the radio range of this node but have not yet been discovered and are hence absent from the node's neighbor table. Consider the Fig.6.1, which illustrates the local topology of a node X at two consecutive time instants. Observe that nodes A and B are not within the radio range R of node X at time t.
- However, in the next time instant (i.e., after a certain period _t), both these nodes have

moved into the radio range of X. If these nodes do not transmit any beacons, then node X will be unaware of their existence. Hence, Nodes A and B are examples of unknown neighbors. On the other hand, false neighbors of a node are the neighbors that exist in the node's neighbor table but have actually moved out from the node's radio range (i.e., these nodes are no longer reachable).
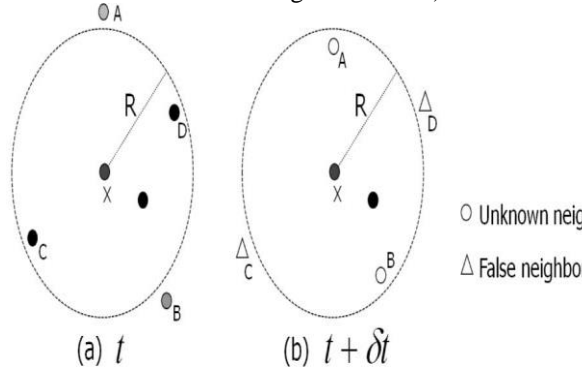
Fig.6.1 Unknown and False Neighbors

Consider the same Fig.6.2. Nodes C and D are legitimate neighbors of node X at time t. However, both these nodes have moved out of the radio range of node X in the next time movement. But, node X would still list both nodes in its neighbor table. Consequently, nodes C and D are examples of false neighbors. Note that, the existence of both unknown and false neighbors adversely impacts the performance of the geographic routing protocol. Unknown neighbors are ignored by a node when it makes the forwarding decision. This may lead to suboptimal routing decisions, for example, when one of the unknown neighbors is located closer to the destination than the chosen next-hop node. If a false neighbor is chosen as the next hop node, the transmitting node will repeatedly retransmit the packet wanting success, before realizing that the chosen node is unreachable. Eventually, an alternate node would be chosen, but the retransmission attempts waste bandwidth and increase the delay.

Conclusion

They identified the need to adapt the beacon update policy employed in geographic routing protocols to the node mobility dynamics and the traffic load. To proposed the Adaptive Position Update strategy to address these problems. The APU scheme employs two commonly exclusive rules. The MP rule uses mobility expectation to estimate the accuracy of the location estimate and adapts the beacon update wait accordingly, instead of using broken beaconing. The ODL rule allows nodes along the data forwarding path to maintain an accurate view of the local topology

by exchanging beacons in response to data packets that are overheard from latest neighbors. Mathematically analyzed the beacon overhead and local topology accuracy of APU and validated the analytical model with the simulation results. They have embedded APU within GPSR and have compared it with other related beaconing strategies using extensive NS-2 simulations for varying node speeds and traffic load. Our results indicate that the APU strategy generates less or more.

Future Enhancement

In this paper proposed system they only concentrate on the position updates in the MANET. There is a chance to make spoofing attacks in the network. So the future implementation is based on the security. That is the true neighbor nodes are identified from the spoofers by giving time based updation.

- The proposed system is based on reactive nature which is realistic, robust and natural.
- This overcomes the NPV problem. So the proposed system will be more lightweight
- The proposed system does not rely on priori trustworthy nodes.
- Overcomes the following type of attacks.
  1. Sybil attacks
  2. Relay attacks
  3. colluding attackers
  4. jamming attacks

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