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A Novel Approach for Location Update in Wireless Sensor Network

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***Abstract*—In geographic routing, nodes need to maintain up-to-date positions of their immediate neighbors for making effective forwarding decisions. Periodic broadcasting of beacon packets that contain the geographic location coordinates of the nodes is a popular method used by most geographic routing protocols to maintain neighbor positions.In this paperwe propose the Adaptive Location Update strategy for geographic routing, which dynamically adjusts the frequency of position updates based on the mobility dynamics of the nodes and the forwarding patterns in the network, with the Unknown node problem resolution when it exist to increase the efficiency of this method by introducing the phenomenon of selecting node from existing ones or unknown node.**

***Keywords*—Wireless Communication; Beacon; Broadcast; Geographic Routing**

I. INTRODUCTION

Geographical routing has been commonly addressed as the greatest hopeful method to mostly accessible wireless routing. It has been a great experiment to improve a routing protocol that can see changed request requirements and enhance routing routes giving to the topology variations in mobile ad hoc networks. But, there is a shortage of complete strategy for geographical routing to be extra effective and tough within a dynamic situation. Incorrect resident and target location info can principal to incompetent geographical sending and equal routing disaster. The usage of preemptive constant intermission beaconing to allocate limited places leads high above while there is no traffic and cannot detention the topology variations in great mobility.

Ad-hoc wireless sensor networks are being develop for use in observing a host of conservational features through the region of distribution, such as light, temperature, sound, and several others. Most of these data have the mutual characteristic that they are beneficial only when measured in the situation of where the data were measured, and so maximum sensor data will be impressed using location information. As these are ad-hoc networks, however, obtaining this location data can be reasonably inspiring.

In a mobile ad hoc network (MANET), wireless strategies could self-configure and usage a network through random topology. The network's topologies can modification quickly and changeably. Such a network can activate in a stand-alone method, or may be related to the bigger Internet. The topology of a Mobile Ad Hoc Network is same dynamic, which is creates the scheme of routing protocol other stimulating than that for a bound network.

II. ISSUES AND CHALLENGES

A. *Hidden Terminal Problem*

Suppose that X wants to send data to Y and also Z wants to send data Y then X is hidden for Z. In hidden terminal problem there is collision occur at receiver side. Challenge of hidden terminal problem is collision of the packets occurs.

B. *Expose Terminal Problem*

Suppose X is busy doing transmission with W. At the same time Y wants to start the transmission with another node Z but Y is not able to start the transmission because W incorrectly sense medium is busy. Challenges of hidden terminal problem are collision of the packets occurs because of interference and throughput needs to be maximized.

C. *Selection of transmission rate*

Wireless ad-hoc network is infrastructure less where nodes are mobile in nature. So it is very difficult to select the transmission rate i.e. problem is that in which transmission rate node has been send the data to other node without interfere by other node.

D. *Power Control*

Power management is very critical in MAC protocol due to collision and packet loses. Challenge of the power control is throughput needs to be maximized and how to select transmission rate of the nodes so that the collision should not occur and also energy management of the nodes too.

E. *Nodes Mobility*

In wireless ad-hoc network topology is dynamically changed, so connection between nodes frequently disconnected as a result it waste energy to reconnect the network. So challenges in mobility of the nodes are frequently changed network or routes and system or applications are not aware of this type of mobility.

F. ***Real time traffic support***

Wireless ad-hoc network has no infrastructure so reservation of resources is very difficult because of frequent disconnection or partitions of the network. So it could not support for real time traffic where nodes are mobile in nature

G. ***Energy Balance***

In wireless ad-hoc network energy balancing is big issue because all the packets in IEEE 802.11 mac protocol packets are sends at maximum power level. So challenge in energy balancing is that how we balancing the energy to send the packets by which we can save energy.

III. RELATED WORK

Beacons [6] are primarily radio, ultrasonic, optical, laser or other types of signals that indicate the proximity or location of a device or its readiness to perform a task. Beacon signals also carry several critical, constantly changing parameters, such as power-supply information, relative address, location, timestamp, signal strength, available bandwidth resources, temperature and pressure. Although transparent to the user community, beacon signals have made wireless systems more intelligent and human-like. They are an integral part of numerous scientific and commercial applications, ranging from mobile networks to search-and-rescue operations and location-tracking systems. Beacon signals help synchronize, coordinate and manage electronic resources using miniscule bandwidth. Researchers continue to improve their functionality by increasing signal coverage while optimizing energy consumption. Beacon signals' imperceptibility and usefulness in minimizing communication delays and interference are spurring exploratory efforts in many domains, ranging from the home to outer space.

In periodic beaconing technique nodes (signal routing devices) periodically update their position to their neighbor nodes by sending beacon message even if they don't change their location or there is no further transmission of data. This lead to loss of node energy and wireless bandwidth, due to which the network cost was high

The motivation behind Q. Chen concept [7] was that the Adaptive Position Update strategy to address location problems. The APU scheme employs two mutually exclusive rules. The MP rule usage mobility estimate for evaluating the accuracy of the position estimation and adapts the beacon updating intermission consequently, in its place of usage periodic beaconing. The ODL rule permits nodes beside the data sending paths to preserve a correct observation of the local topology using replacing beacons in answered to data packets that are overheard from new neighbors. This method's result specified that the APU approach produces few same quantity of beacon above as further beaconing patterns then completes improved packet sending ratio, average end-to-end delay and energy consumption.

In this approach author did not focus on the unknown node problem, if it exist then there is no criteria defined to select which node take part in the transmission route, existing node or unknown node.

So, we propose an approach that updates the location of node and unknown node problem for the effective data transmission and communication in wireless network. In this approach, adaptive location update approach for topographical routing which dynamically sets the occurrence of location update information based on the mobility dynamics and the furthering outlines of the nodes in the network.

IV. PROPOSED WORK

In this approach, we propose a position update structure that uses geographical coordinate and velocity of node to update their neighbor current positions. We assume the following parameters in our work.

- All nodes are aware of their own position and velocity,
- All links are tri-directional.
- The beacon updates include the current location and velocity of the nodes.
- Data packets can piggyback position and velocity updates and all one-hop neighbors operate in the promiscuous mode and hence can overhear the data packets.

The position of node i and its velocity along the x, y and z axes at time T_1, its neighbors can estimate the current position of i, by using the following equations:

$$X_p^i = X_l^i + T_c - T_l * V_x^i \text{ Eq.1}$$

$$Y_p^i = Y_l^i + T_c - T_l * V_y^i \text{ Eq.2}$$

$$Z_p^i = Z_l^i + T_c - T_l * V_z^i \text{ Eq.3}$$

Here (X_l^i, Y_l^i, Z_l^i) and (V_x^i, V_y^i, V_z^i) refers to the location and velocity information that was broadcasted in the previous beacon from node i. Node i uses the same prediction scheme to keep track of its predicted location among its neighbors. Let (X_a, $Y_a$and Z_a), denote the actual location of node i, obtained via GPS or other localization techniques. Node i then compute the deviation D_{devi}^i as follows:

$$D_{devi}^i = \sqrt{(X_a^i - X_p^i)^2 + (Y_a^i - Y_p^i)^2 + (Z_a^i - Z_p^i)} \text{ Eq.4}$$

If the deviation is greater than a certain threshold, known as the Acceptable Error Range (AER), it acts as a trigger for node i to broadcast its current location and velocity as a new beacon.

Now we consider the unknown node problem, basically unknown node is the node of network that does their localization information. Here the unknown node is the node previously which is not in the active network but now it is ready to take part in the transmitted network.

Suppose U is the unknown node and E is the existing node and U_p and $E_p$are the initial power of node respectively. In MANET we consider a node as a dead node if it has less than 20% of its initial power. So, to increase the effectiveness of the network we consider the best node. To identify the best node we assume three scenarios.

1st Scenario:
The node which has more than 20% power of its initial power is considered best node.
If U_{pc}> 20% of U_p (here U_{pc} and U_p is the current power and initial power of unknown node) is consider a best node.

2nd Scenario:
If both nodes have the less than 20% of its initial power; in this case we focus the stability issues (the node which has more stable comparative to other node) i.e. in this case existing node E is the best node for transmission.

3rd Scenario:
If both nodes have the more power of its initial power then we consider the maximum power node. If U_{pc}> 27 % of U_p and E_{pc}> 25 % of E_p then we consider the U node for further transmission.

V. Result Analysis

In this section, we have discussed comparison between above approaches based on different parameters. We have focused on techniques in corresponding approach and advantage, limitation as shown accordingly in table.1.

For quantitative result, the proposed approach is tested on three scenarios and two parameters are used for this: usability and stability.

For performance comparison, the result of proposed work is compared with existing work based on APU. The results explain that the proposed work helps in increasing the overall life of the network. Therefore the proposed work has higher usability and stability than the existing work. The comparison of the Adaptive Position Update routing based on ODL and prediction rule and proposed work on the basis of usability and stability is depicted in table 1.

Table.1 Performance Comparison of Adaptive Position Update and proposed work on the basis of usability

Scenarios	**APU**	**Proposed**
U_p>20% and E_p<20%	Existing node used	Unknown node used
U_p<20% and E_p>20%	Existing node used	Existing node used
U_p>20% and E_p>20%	Existing node used	Depend which node has the maximum power
U_p<20% and E_p<20%	Existing node used	Existing node used

It can be clearly seen from the table.1 that proposed work increases the usability of node. The value of usability is greater than the existing approach. It may be possible that the value of usability is equal to the existing approach when unknown node has the less power.

In the above table if an unknown node is considered than usability increases otherwise no change with respect to the existing approach. We consider increased usability as 1 and for no change its 0. In scenario 3rd the usability may be increased or not so in this case the value of usability is ½=0.5.

The comparison of enhanced form existing and proposed work in terms of usability of unknown node which is shown in graphical form also as in figure.1. The graph shown in figure.1 explains that the proposed approach has higher usability than APU. Hence, the proposed approach is better than the Adaptive Position Update terms of usability and stability.

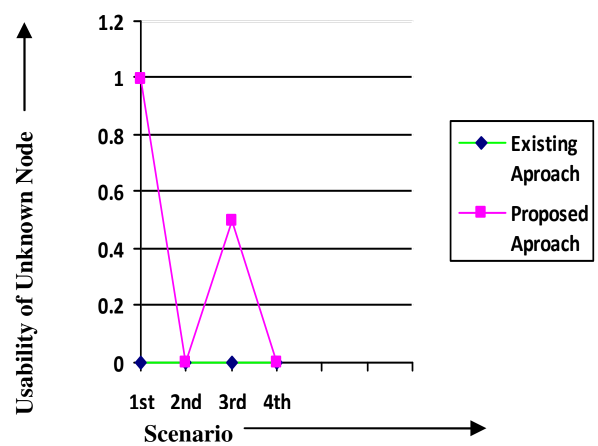

Figure.1 Graphical comparisons between existing approach Adaptive Position Updation and proposed work in terms of usability of Unknown node

From above evaluation and comparison analysis, it can be seen that the proposed approach provides better result than the existing approach i.e. adaptive position routing. As the position update helps in providing location coordinate about the nodes in network. Hence, the proposed approach helps in increasing the value of usability and stability helps in providing the better results.

VI. CONCLUSION

In this dissertation an Adaptive Location Update in Wireless network communication; it provides the meaningful information or geographical location about the node in 3 dimensional formats in network as well as with the information about the unknown node for better transmission of data. In this approach, the Adaptive Location Update approach for topographical routing, which dynamically sets the occurrence of location update information based on the mobility dynamics and the furthering outlines of the nodes in the network with the Unknown node problem resolution when it exist to increase the efficiency of this method . When an unknown node problem exist, in our approach we select the best node for the route discovery or data transmission in the given network to increase the efficiency of existing approach based on adaptive position in Ad-hoc network.

The proposed model can be further extendedto develop a location update, which is cohesive with the unknown as well as false node problem. Thus, the concerned areas make effective through the some other parameter such as distance as well as power consumption parameters.

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