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Position Update Efficient Methods for Geographic Routing In Mobile Adhoc Networks

Sarang S Kadam [1], Prof. Ashok M Kanthe [2]

Sinhgad Institute of Technology, Lonavala, Pune, India [1, 2]

Abstract: In geographic routing of MANETS, its essential for nodes to maintain up-to-date positions of their immediate neighbors for effective forwarding decisions. Periodic broadcasting of beacon that contain the location coordinates of the nodes is a popular method used by most geographic routing protocols to maintain neighbor positions. But Periodic beaconing is not convenient as due to node mobility and update cost. Adaptive Position Update (APU) 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. Update cost is reduced and routing performance in terms of packet delivery ratio and average end-to-end delay is improved. But network efficiency is to be considered to improve network lifetime. So In proposed system we use E-Heed and leach algorithms for increased energy of sensors and provide security by using a set of cellular automata based security algorithms which consist of CAKD.

Keywords: adaptive position update, cellular automata key distribution, hybrid energy efficient distributed, wireless sensor network,low energy adaptive clustering hierarchy.

I. Introduction

In mobile adhoc networks geographic routing protocol are good options for routing. The underlying principle used in these protocols is choosing next hop node close to the destination. As forwarding decision is based on local knowledge of nodes it is need to create and maintain route information and node information. So position based protocols are not of great use, while geographic routing protocols such DSR and AODV have made significant routing improvement in Manets. These protocols require position of final destination and position of node's neighbors. Local topology by each node is built to maintain information of route,but in case of mobile nodes they move frequently creating it difficult for nodes to keep updated information.Here comes the need for each node to broadcasts the location information in form of beacons. Some Protocols like Aodv frequently update beacons in network leading to problems like bandwidth consumption, packet collision and importantly node energy consumption.

In this paper geographical routing protocol APU eliminating the drawbacks. APU beacons to trigger the update process incorporates two rules.[1] The first rule, referencing as Mobility prediction(MP),is applied if location in previous beacons is inaccurate and location is predicted if inaccuracy is above threshold value. The second rule, as On-demand learning (ODL), objective communication with the routing paths between nodes to improve the accuracy of the topology on demand. ODL is an on-demand learning strategy, when a new neighbor in the vicinity of a data packet transmission overhears whereby a node uses broadcast beacons. This ensures that the data in the packet forwarding is not and nodes maintain local topology. On the contrary, the nodes that are not on forwarding paths are unaffected by this rule and beacons broadcasting is limited to certain extent to increase the packet delivery ratio, reduces end to end delay. But still issue of nodes power consumption was not considered in any of these routing protocols to increase efficiency of network and likewise increase the network lifetime .Here We consider the node energy in process of packet forwarding and beacon updates. We work on to reduce the power consumed by each node and also security to forwarded data is given to improve liability of protocol.

II. Literature Survey

Routing Performance in Mobile Ad-hoc network is the most important concern for the basic functionality of the network. Along with different routing protocols the issue for routing deals with forwarding decisions of nodes and security. But the issue of netwok lifetime is not considered

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to large extent to improve the performance of protocol. In paper we see how the routing has evolved during years.

In J. Hightower and G. Borriell [2] To serve us well, emerging mobile computing applications will need to know the physical location of things so that they can record them and report them to us is considered Indeed, many systems over the years have addressed the problem of automatic location sensing. Because each approach solves a slightly different problem or supports different applications, they vary in many parameters, such as the physical phenomena used for location determination, the form factor of the sensing apparatus, power requirements, infrastructure versus portable elements, and resolution in time and space. To make sense of this domain, they have developed a taxonomy to help developers of location-aware applications better evaluate their options when choosing a location-sensing system.

In B. Karp and H.T. Kung [3] they present Greedy Perimeter Stateless Routing (GPSR),a routing protocol for wireless datagram networks that uses the positions of routers and a packet's destination to make packet forwarding decisions. GPSR makes greedy forwarding decisions using only information about a router's immediate neighbors in the network topology. When a packet reaches a region where greedy forwarding is impossible, the algorithm recovers by routing around the perimeter of the region. By keeping state only about the local topology, GPSR scales better in per-router state than shortest-path and ad-hoc routing protocols as the number of network destinations increases. Under mobility's frequent topology changes, GPSR goes underperformed.

In Y. Ko and N.H. Vaidya [4] A mobile ad hoc network consists of wireless hosts that may move often. Movement of hosts results in a change in routes, requiring some mechanism for determining new routes. Several routing protocols have already been proposed for ad hoc networks. This paper 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. By using location information, the proposed Location-Aided Routing (LAR) protocols limit the search for a new route to a smaller "request zone" of the ad hoc network. This results in a significant reduction in the number of routing messages..

Erfan. Arbab, Vahe. Aghazarian [5] Proposed in LEACH algorithm, some of the nodes have to select cluster heads that, in comparison to them, have a longer distance to the BS. These nodes send their data to a further location and then their data has to go through a long distance to reach the BS. Such transmissions waste the network's energy and are called extra transmissions. These causes great overhead over the network lifetime increasing consumption power of nodes.

III. ADAPTIVE POSITION UPDATE

APU beacons to trigger the update process incorporates two rules.[1] The first rule, referencing as Mobility prediction(MP),is applied if location in previous beacons is inaccurate and location is predicted if inaccuracy is above threshold value. The second rule, as On-demand learning (ODL), objective communication with the routing paths between nodes to improve the accuracy of the topology on demand. ODL is an on-demand learning strategy, when a new neighbor in the vicinity of a data packet transmission overhears whereby a node uses broadcast beacons.

(X^i_l, Y^i_l): The coordinate of node i at time Tl (included in the previous beacon),(V^i_x, V^i_y) The velocity of node i along the direction of the x and y axes at time Tl (included in the previous beacon)

Ti : The time of the last beacon broadcast, Tc : The current time

(X^i_p, Y^i_p)The predicted position of node i at the current time given the position of node I and its velocity along the x and y axes at time Tl, its neighbors can estimate the current position of i, by using the following equations:

$$X^i_p = X^i_l + (T_C - T_l) * V^i_x$$
$$Y^i_p = Y^i_l + (T_C - T_l) * V^i_y$$

Note that, (X^i_l, Y^i_l) (V^i_x, V^i_y) refers to the location and velocity information that was broadcast 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 **(Xa, Ya)**, denote the actual location of node i, obtained via GPS or other localization techniques. Node i then computes the deviation Di devi as follows:

$$D^i_{devi} = \sqrt{(X^i_a - X^i_p)^2 + (Y^i_a - Y^i_p)^2}$$

Analysis of the Beacon Overhead

The two rules employed in APU are mutually exclusive. Thus, the beacons generated due to each rule can be summed up to obtain the total beacon overhead. Let the beacons triggered by the MP rule and the ODL rule over the network operating period be represented by OMP and

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OODL, respectively. The total beacon overhead of APU, OAPU, is given by,

OAPU = OMP + OODL

These overall working of APU shows the idea behind its routing and analysis of beacon overhead tells us there are number of beacons transmitted in network for effective forwarding decisions. In these process the nodes in network though along the forwarding path are in active mode. These nodes have limited power, so are needed to be used distributively. Hence there power is needed to be consumed to ensure long network lifetime.

IV. E-HEED

HEED was designed to select different cluster heads in a field according to the amount of energy that is distributed in relation to a neighboring node. The Goals of HEED are 1) prolonging network life-time by distributing energy consumption 2) terminating the clustering process within a constant number of iterations/steps 3) minimizing control overhead 4) producing well-distributed cluster heads and compact clusters.

Cluster head selection hybrid of residual energy (primary) and communication cost (secondary) such as node proximity Number of rounds of iterations Tentative CHs formed Final CH until $CH_{prob}=1$

Same or different power levels used for intra cluster communication

$B_t \leq B_0$, the node has made efficient use of the energy it has harvested. Since satisfying the ENO-Max condition requires satisfying both of these objectives, the node must satisfy $(B_t \geq B_0) \wedge (B_t \leq B_0)\ \forall t > 0$, which is satisfied when $B_t = B_0\ \forall t > 0$. This is our formal definition of the ENO-Max condition

$$\lim_{N \to \infty} \frac{1}{N} \sum_{t=1}^{N} (B_t - B_0)^2.$$

V. IMPLEMENTATION DETAILS

A. Architectural Design

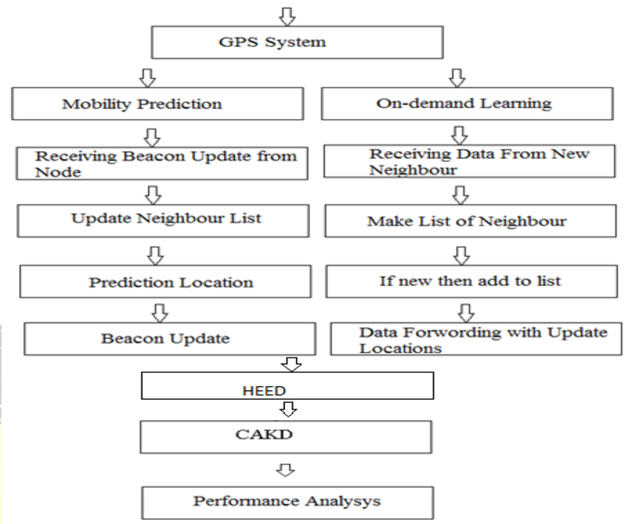

FIG 1 : ARCHITECTURAL DESIGN

B. Algorithm

PART 1: ADAPTIVE POSITION UPDATE PHASE

Step 1: Nodes in network discovers the neighbouring nodes by broadcasting.

Step 2: Gabriel Graph is constructed locally.

Step 3: This phase where the secret key is established for a newly deployed sensor node is known as "Key pre-distribution". But the sensor resource constraints like limited power, limited computation ability or low memory make this process very difficult.

Step 4: Mobility Prediction is performed on position of direction vectors (X^i_1, Y^i_1) (V^i_x, V^i_y).

Step 5: On demand learning is used and reduced topology is constructed.

PART 2: E-HEED PHASE

STEP 6 : Set-up phase: The main goal of this phase is to create clusters and find cluster nodes. During the set-up phase, the BS collects the information of the position and energy level from all sensor nodes in the networks.

STEP 7: Steady phase: Once the clusters are created and the schedule is fixed, data transmission can begin.

VI. RESULTS

The first set of simulations, we have loads of traffic mobility and APU performance evaluation. The simulation

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results that can adapt to the dynamics of APU and show traffic load. Each dynamic case, generates low to APU or the same amount as other beaconing overhead beacon schemes but packet delivery ratio, Average end-to-end delay achieve better performance. In the second set of simulations we check the energy efficiency saved by HEED and security implemented by CAKD.

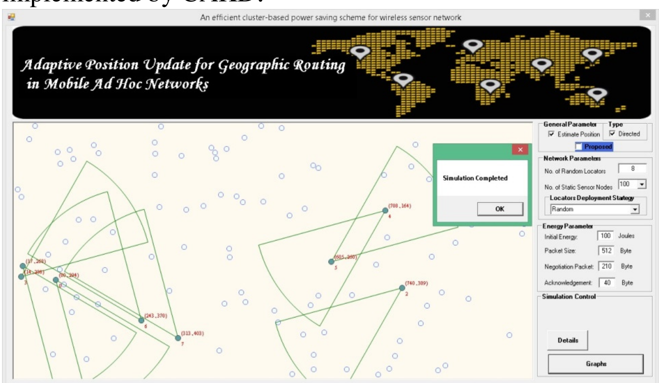

FIG 2: Simulation Result

In Fig 2, it is shown how various nodes simulate in network.

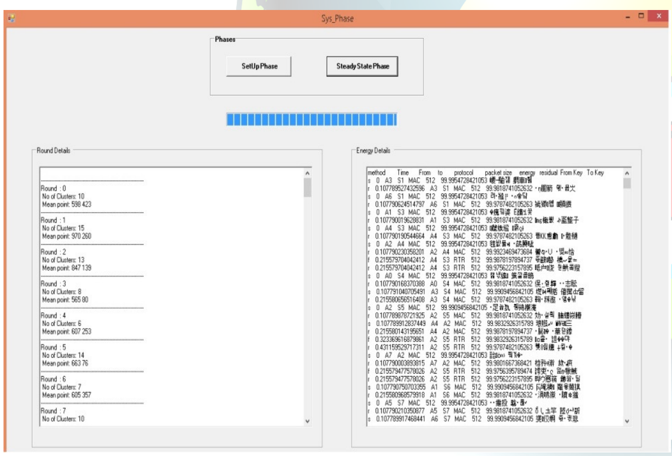

Fig 3: Communication details

In Fig 3, it is shown how set-up phase and steady phase are created and cluster are formed and algorithms are implemented in these stage to generate various results on different parameters.

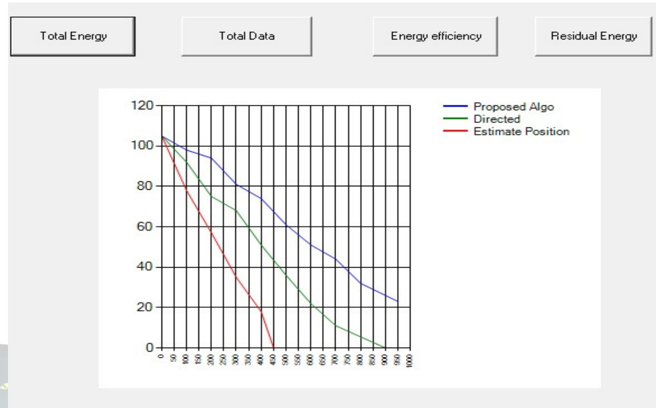

Fig 4: Total Energy graph

In Fig 4,the amount of energy consumed by network during simulation is shown with respect other existing protocols. It is shown how our proposed system gives better performance over rest system.

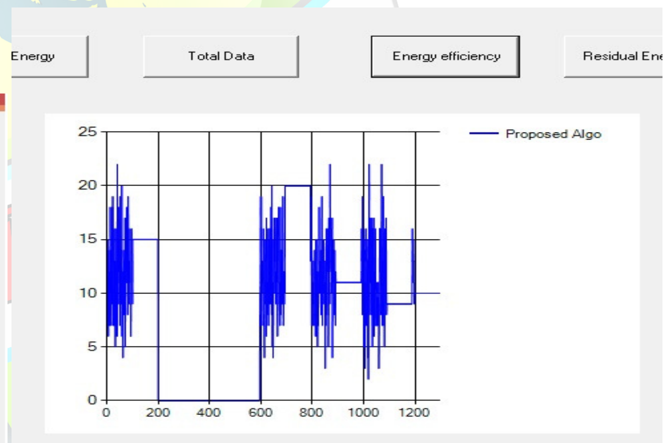

Fig 5: Energy Efficiency graph

VII. CONCLUSION

In modified proposed system APU strategy generated Does less or the same amount as other beaconing overhead beacon plans but better end-to-end packet delivery ratio, average delay and to achieve energy consumption, we use E-HEED. It was designed to select different cluster heads in a field according to the amount of energy that is distributed in relation to a neighboring node. LEACH is one of the most well known energy efficient clustering algorithms for WSNs. The proposed algorithm solves the

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extra transmissions problem that can occurs in LEACH algorithm. The essential requirement for secure data communication is a pair of secret keys. After the initial deployment of a sensor node, the secret key is required to communicate with the neighboring nodes. Proposed approach uses effective way of providing increased network lifetime by energy efficiency and security to nodes.

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