GPS Aided GEO Augmented Navigation Enabled Energy Efficient Routing for Mobile Ad-hoc Wireless Networks

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ABSTRACT
Energy is a critical issue in Mobile Ad-hoc Network. Nodes in Network are working in presence of limited or less energy due to dynamic nature of nodes or infrastructure less network. MANET has no infrastructure so nodes in MANET work on dynamic routing. In this way, energy proficient routing is required for reducing energy utilization. Energy proficient routing plans can extraordinarily reduce energy utilization and augments the lifetime of the networks. Scalability of Ad Hoc Networks can be enhanced by using land data, for example, in LAR, GPSR etc. They utilize physical area data; regularly from GPS (Global Positioning System).GPS empowers a gadget to decide their position as in longitude, Latitude and Altitude by getting this data from the satellites. There has been significant effort in proposing energy efficient routing protocols with the help of GAGAN (GPS Aided GEO Augmented Navigation) which have accuracy to approx One meter in India or its neighbor countries. GAGAN is a route framework which is helped by both GPS and nearby telemetry information to possibly give quicker and more exact situating and navigational information.

Keywords
Manet, GPS, GAGAN, DSR, ZRP.

1. INTRODUCTION
Foundation less wireless network is a system of mobile nodes without having any focal controller. In wireless communication frameworks, there is an interest for the fast organization of independent mobile users [1]. Various examples of Mobile Ad-hoc Network incorporate setting up survivable, efficient, dynamic communication at any situation, rescue operations, and military networks. Such Network system situations can't depend on brought together and composed network [1], and can be imagined as uses of Mobile Ad-Hoc Networks. The use of physical locations of the nodes can impressively enhance the efficiency of routing methods for mobile Ad-hoc Networks. This essentially prompts a quite decreased routing overhead, an expanded Packet Delivery rate [3] and Energy related issues. Position-Based Routing is conceivable through the accessibility of little reasonable GPS recipients and methods for finding the relative directions in view of Signal Strength.

The Global Positioning System (GPS), initially a space-based radio navigation framework claimed by the United States government and worked by the United States Air Force. It is a worldwide route satellite framework that gives geo location and time data to a GPS recipient anywhere on or close to the Earth where there is an unhindered viewable pathway to at least four GPS satellites. Whereas the GPS Aided GEO Augmented Navigation (GAGAN) is an implementation of a regional [2] Satellite based augmentation System (SBAS) by the Indian government. GAGAN is based on WAAS (Wide-Area Augmentation System). When GAGAN is accessible, clients who have WAAS-good collectors will have the capacity to get GPS position with exactness of approximately 1 meter or better. GAGAN is not a trade for the GPS framework but rather an expansion that will make US's GPS more exact over India and in this manner can be utilized for some high-accuracy applications. Many research has been done in GPS based routing, mainly GPS detect the location of mobile users in terms of Latitude and Longitude. In this research paper all the activities which are performed by GPS in MANET replaced by GAGAN and analyze the difference.

2. CONCEPT OF GAGAN
Route specialists worldwide have been talking about for a long time about the idea of one navigational framework that is accessible wherever on the globe, at all the time with extraordinary precision, trusted and simple to utilize, which defeats the constraints of the current ordinary navigational guides. The idea is Global Route Satellite System (GNSS). Such a framework could be utilized as the sole methods for a route framework and could eventually replace most, if not all, of the exorbitant ground based frameworks. Satellite route and situating frameworks speak to the most imperative mechanical achievement in common avionics route, reconnaissance, and air activity administration since radar was presented over a large portion [2] of a century prior. The GPS, created by the United States is at present endorsed for supplemental use in all climate conditions amid on the way, terminal air route furthermore, for non-exactness approaches. For the common aviation group whose necessities are stringent, GPS/GLONASS star groupings alone neglect to meet such prerequisites. In this manner, the requirement for enlarging these star groupings emerges to meet the required route execution for aviation use as navigational framework.

Every GPS satellite transmits a signal that incorporates pseudo-arbitrary code and the state vector of the satellite. A similar signal is produced by the GPS collector. At the point when the two signals are looked at, the one from the satellite will be found to linger behind the one of the collector on

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account of the time it took for the signal to make a trip from the satellite to the beneficiary.

So having gotten 3 satellite signals ought to zero down recipient's position. Be that as it may, that is not the situation [4]. Utilizing 3 satellite signals to decide collector's position, beneficiary's clock ought to be synchronized to satellite's clock. So extra satellite is utilized to locate this variable. So in all out 4 satellites are required to discover recipient area on earth. So this demonstrates collector will lie some place in circle around satellite with span of separation gone by signal in postpone time recorded. Yet, things are not this basic. There are numerous error sources in delay estimation. Some of them incorporate [1].

- Ionospheric delay
- Tropospheric delay
- RF obstruction
- Multi-way appearance in urban spaces
- Brutal climate conditions

In light of mistake in defer estimation, user’s position will be precise to around 5 m in open spaces and to around 10-20 m in urban spaces [5] in the middle of buildings (remember multi-way impacts). GPS is basic for common avionics. Yet, precision of 10m is not adequate for all periods of flight, common aeronautics applications and top notch Air Traffic Management.

In GAGAN 8 Ground reference stations are introduced at pre-studied vital areas crosswise over India situated in Delhi, Guwahati, Kolkata, Ahmadabad, Thiruvananthapuram, Bangalore [5], Jammu and Port Blair, and an ace control focus at Bangalore. They persistently screen signals gotten from GPS satellites. These reference stations send every one of the information to control focuses. Control focuses demonstrate ionospheric conduct, RF impedance and satellite's position every once in a while and screen different elements contributing for incorrect collector's restriction.

This data is exchanged to two candidly created Geo-Stationary satellites positioned above earth. Geo-Stationary satellites communicate [5] SBAS signals. SBAS signs are utilized via Aircrafts to get their position inside 3m precision.

GAGAN is a navigation system which is assisted by both GPS and local telemetry data to potentially give faster and more accurate positioning and navigational data.

3. PROPOSED WORK

The GPS technology has been used to find the position of mobile nodes in the network. It has been assumed that each node will get its geographical position from GAGAN. Each routing table comprises of all neighboring node. In conventional AODV, fundamental routing component is the point at which a source node S needs to send packets to Destination node D; it will communicate Route Request (RREQ) to its neighbor. At that point each intermediate node advances their RREQ and furthermore they record reverse route back to Source S. In this way, route is set up however the connection quality between nodes is extremely unusual. Link quality relies on upon the Signal to Interference Ratio (SIR). When this SIR dips under the framework's SIR limit Value, connection is broken and route which has this broken connection is disabled. By setting this Threshold value ideally, the portable hosts are shielded from depleting their energy by transmitting information over a poor connection.

The idea proposes that only those nodes whose energy is in dynamic mode can partake in the network way. Interface breakage is identified by physical layer. In the event that a node has SIR not as much as framework Threshold value then data about this connection breakage is given to network layer by the physical layer so arrange layer will refresh the routing table. Here, transmission is uni-cast; an affirmation will be gotten if there is fruitful transmission. If an affirmation is not gotten then node will pick another neighboring node. In this way, any mistake in the routing table because of stale information won't adversely influence the execution of the protocol.

Node to partake in route selection must be in active mode. It can continue transmission till it is in Active mode and can't take part on the off chance that it moves into danger mode. For this situation to productively apply control work schedules can't be made to turn nodes not taking an interest in route to rest mode to monitor energy as it to utilize GAGAN framework. A node can be out of idle mode however not in rest mode. All nodes of the topology communicate these entries after fixed intervals to all nodes and every node refreshes its routing table. To repair the connection break, the node increases the sequence number for the destination and afterward communicates a REQ for that destination. Two central points have been considered for repair portrayal. One is battery status and other is threshold value set for SIR. In first case battery status has been assessed and two territories have been set which can be arranged as in Equation-1.

On the off chance that BS >30%, then it is Active mode else it is in Danger mode. ""
Where Bs is battery status and Percentage element is for completely charged or decaying. 100% is completely charged battery range. For practical purposes, the battery decay rate is roughly 6 hours for decay from 100% to 30%.

The Signal to Interference ratio has additionally been separated into two parametric assessments in light of Threshold value. Equation -2 generalizes the theory.

In the event that SIR > Tv implies SIR is great and message is transmitted to neighbor node

Else there might be connection break. ---------2

From these two parameters another threshold called lifetime of a node is figured as appeared in equation- 3.

\[ \text{Lifetime = BS+SIR} \]

This factor is transmitted as weight component to all nodes to choose best accessible way with most extreme power. The entry is done in route table and transmitted alongside hello packets. In this manner, neighborhood repair endeavors are regularly undetectable to the starting node. The node starting the repair waits for the discovery period to receive reply message in response to that request (REQ). During nearby repair, data packets are buffered at neighborhood originator. The plan has been depicted using Figures-2 and 3.

Packets are to be transferred from source S to Destination D. Position of each node is detected by GAGAN.

**Fig-2** Link breaks between node 2 and 3

Path selected initially utilizing RREQ is appeared as {S-1-2-3-D}. When a connection break happens as appeared in figure 2. Another way is to be made. Here neighborhood repair plan proposed is adopted. Weight factor is calculated, this factor is transmitted to all nodes. The typical determination would have been {2-6-3}, however according to proposed plan, new Path selected is {2-5-8-3} which is longer one. This is much steady way for rest of the transmission. Node 6 has not been incorporated as it is as of now in danger mode and can bring about link failure once more. The idea has been described in Fig-3.

**Fig-3 Local Repair Plan**

4. **ADVANTAGE OF USING GAGAN**

Global Positioning System is a satellite navigation system which provides instant information about the position, velocity and time information anywhere on the globe and within the vicinity. GAGAN using SBAS (Satellite Based Augmentation System) system, SBAS employs a ranging function to generate GPS-like signals and enable users to use the concerned geo-stationary satellite as one more GPS satellite for ranging purposes.

The basic functions of an SBAS system are as follows:

- **Ranging:** It provides additional ranging signals to improve availability, typically via geo-stationary satellites.
- **Integrity channel:** It provides transmission of GPS and integrity to Data to navigators. It is the ability to protect the user from inaccurate information in a timely manner. Integrity is not guaranteed as all GPS satellites are not monitored at all times [5]. In case of any fault, the time-to-alarm is from minutes to hours. The quality of the service is not indicated.

5. **CONCLUSION**

A new plan has been recommended that works away at a reactive approach and uses exchange ways by fulfilling an arrangement of energy and distance based threshold criteria. The plan can be incorporated into any ad-hoc on-demand routing protocol to reduce frequent route discoveries. Theoretical contemplate shows that the proposed plan will act superior to the current protocols. Efforts are on to simulate it using NS 2. Alterations have been made in NS2 to acknowledge GAGAN addresses. The plan is still under advance and results are expected very soon. It is previewed that the proposed plan will give strength to mobility and will upgrade protocol execution.

The delay may increment as it requires more estimation at first to set route and GAGAN may take some time at first. The proposed plot chooses the nodes based on their energy status, which may likewise help in taking care of the issue of asymmetric links. Exactness of GAGAN will also be considered. This concept used only in India or its Neighbor Countries.
6. REFERENCES


