ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 5, May 2013

A Survey On Tying Data To Geographic Locations In Mobile-Disconnected Networks Using Boomerang Protocol

Pavan Mulgund[1], Gayathri. N[2]

4th Sem M.Tech, Computer Science and Engineering, MVJCE, Bangalore, India[1]

Associate Professor & H.O.D, Information Science and Engineering, MVJCE, Bangalore, India[2]

Abstract: We provide a protocol which retain content of information even in mobile disconnected networks without using infrastructure networks. As the mobile device keep the content information for a short period of time the boomerang protocol provide a efficient method to retain it and using a method called trajectory it records each geographical location while moving away from the sensing location. The performance result show that the trajectory algorithm is more efficient and Using this protocol, the holder can handoff the geo cache to other candidates preferably those traveling toward the anchor location.

Keywords- Geocache, GPS, Mobile, Location-aware information, Trajectory-based

1. INTRODUCTION

A Vehicular Ad-Hoc network is a form of Mobile ad-hoc Networks, to provide communication among nearby vehicles and between vehicles and nearby fixed equipment i.e. roadside equipment. The main goal of VANET is providing safety and comfort for passengers. Each vehicle equipped with VANET device will be a node in the Ad-hoc network and can receive & relay other messages through the wireless network. Collision warning, Road signal arms and in place traffic view will give the driver essential tool to decide the best path along the way. VANET or Intelligent Vehicular Ad-Hoc Networking provides an intelligent way of using vehicular Networking. Suppose if we lost/found an item, a common practice is to post a note around the area where it was lost/found, and later we refer back to the same location to check for further updates. Similarly, in the anytime-anywhere mobile sensing era, information is commonly tagged with location, thus encouraging location-based queries. To facilitate such location based queries, we advocate building “directories” around locations of interest by having nearby mobiles carry the data (or the metadata of these data) generated around these locations. We refer to the directory information as the Geo cache of the location1, and the location of interest as anchor location. By always having the node close to the anchor location carry the Geocache, we can tie the data around the location where they were generated, thus easily facilitate location-based queries by directing them to the corresponding anchor locations using any of the geo-routing [1] or geocasting [2] techniques. In this project, we study protocols that retain Geocache around the anchor location through inter-vehicle communication. Specifically, we address two major challenges: (i) Returning

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 5, May 2013

the Geocache to the anchor location with high probability if the carrier of the Geocache becomes temporarily disconnected; (ii) Minimizing the communication overhead for retaining the Geocache near an anchor location.

2. EXISTING TECHNOLOGY

A MobEyes, an efficient lightweight support for proactive urban monitoring based on the primary idea of exploiting vehicle mobility to opportunistically diffuse concise summaries describing sensed data. MobEyes harvests these summaries and builds a low cost distributed index of the autonomous mobile storage of sensed data. Since it is impossible to directly report the sheer amount of sensed data to the authority. The original protocols exploited by MobEyes nodes for summary diffusion/harvesting [3] exploit intrinsic vehicle mobility and single-hop communications among nodes. MDDV utilizes trajectory based forwarding by considering the vehicle traffic. On the other hand, VADD collects information within a bounded area through which a vehicle can find the direction (i.e., road selection at the intersection) to which it forwards a packet to reduce the delay. MobEyes applications are *delay tolerant* (e.g., urban monitoring), and thus, these techniques could be used to access actual data out of mobile nodes, yet to do so. Mobile device passing any physical location carries the information for a short while. When packet move far away from the sensing location, the packet is automatically disposed. Failure of centralized station disrupt the services. The key component used in the MobEyes is the MobEyes Diffusion/Harvesting Processor (MDHP). Design principle of MDHP protocols:

1. ***Disruption tolerance***: It is crucial that MDHP protocols must be able to operate even with disruptions (caused by sparse network connectivity, obstacles, and non-uniform vehicle distribution) and with arbitrary delays. High churning of vehicles must be considered; for robustness purposes, data replication is a must [6] .

2. ***Scalability*****:** MDHP protocols must be able to scale up to hundreds of thousands nodes (e.g., the number of vehicles potentially interworking in a large city).

3. ***Non-intrusiveness***. Intrusive protocols may cause severe contention with safety applications and could deter reliable propagation of important messages in a timely fashion. MDHP protocols should not disturb other safety applications; limiting the use of bandwidth below a certain threshold is imperative.

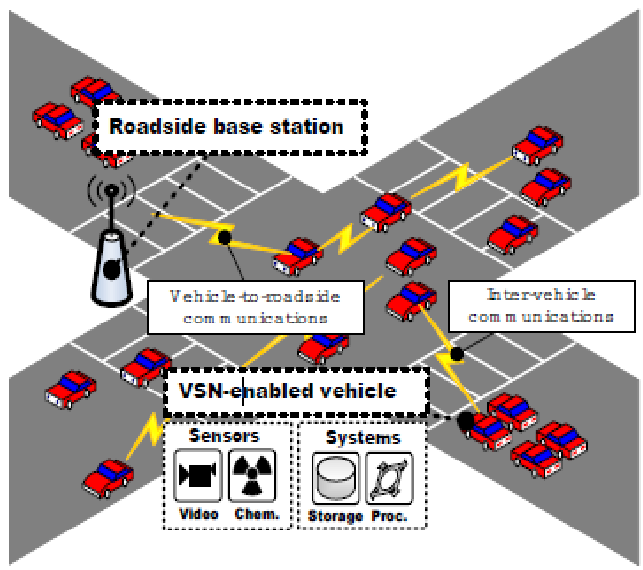

Fig. 2.1 Vehicular sensor networks

2.1 ROUTING PROTOCOLS

The characteristic of highly dynamic topology makes the design of efficient routing protocols for VANET is challenging. The routing protocol of VANET can be classified into two categories such as Topology based routing protocols & Position based routing protocols.

2.1.1 PROS & CONS OF TOPOLOGY BASED ROUTING PROTOCOL

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 5, May 2013

Topology based routing protocols use link's information within the network to send the data packets from source to destination. Topology based routing approach can be further categorized into proactive (table-driven) and reactive (on-demand) routing.

1) Proactive (table-driven)

Proactive routing protocols are mostly based on shortest path algorithms. They keep information of all connected nodes in form of tables because these protocols are table based. Furthermore, these tables are also shared with their neighbors. Whenever any change occurs in network topology, every node updates its routing table.

Pros

- No Route Discovery is required.
- Low Latency for real time applications.

Cons

- Unused paths occupy a significant part of the available bandwidth.

- **Fisheye State Routing**

FSR is a proactive or table driven routing protocol where the information of every node collects from the neighboring nodes. Then calculate the routing table. It is based on the link state routing & an improvement of Global State Routing.

Pros

- FSR reduces significantly the consumed bandwidth as it exchanges partial routing update information with neighbors only.
- Reduce routing overhead.
- Changing in the routing table will not occur even if there is any link failure because it doesn't trigger any control message for link failure.

Cons

-Very poor performance in small ad hoc networks.
-Less knowledge about distant nodes.
-The increase in network size the storage complexity and the processing overhead of routing table also increase.
- Insufficient information for route establishing.

2) Reactive (On Demand)

Reactive routing protocol is called on demand routing because it starts route discovery when a node needs to communicate with another node thus it reduces network traffic.

Pros

-To update routing table not require periodic flooding the network. Flooding requires when it is demanded.
-Beaconless so it saves the bandwidth.

Cons

- For route finding latency is high.
- Excessive flooding of the network causes disruption of nodes communication.

- **AODV**

Ad Hoc On Demand Distance Vector routing protocol is a reactive routing protocol which establish a route when a node requires to send data packets. It has the ability of unicast & multicast routing. It uses a destination sequence number (DestSeqNum) which makes it different from other on demand routing protocols.

Pros

- An up-to-date path to the destination because of using destination sequence number.

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 5, May 2013

- It reduces excessive memory requirements and the route redundancy.
- AODV responses to the link failure in the network.
- It can be applied to large scale adhoc network.

Cons

-More time is needed for connection setup & initial communication to establish a route compared to other approaches.

-If intermediate nodes contain old entries it can lead inconsistency in the route.

-For a single route reply packet if there has multiple route reply packets this will lead to heavy control overhead.

- Because of periodic beaconing it consume extra bandwidth.

2.1.2 PROS & CONS OF POSITION BASED ROUTING PROTOCOL

- **GSR(Geographic Source Routing)**

GSR routing was proposed for vehicular ad hoc networks in city environments which is the combination of position-based routing with topological knowledge.GSR uses greedy forwarding along a pre-selected shortest path & this path is calculated by using Dijkstra algorithm.

Pros

- Packet delivery ratio of GSR is better than AODV & DSR.
- GSR is scalable than AODV & DSR.

Cons

-This protocol neglects the situation like sparse network where there are not enough nodes for forwarding packets.

-GSR shows higher routing overhead than GyTAR because of using hello messages as control messages.

2.1.3 PROS & CONS OF GEOGRAPHIC ROUTING PROTOCOL

Geographic routing is a routing that each node knows it's own & neighbor node geographic position by position determining services like GPS. It doesn't maintain any routing table or exchange any link state information with neighbor nodes. Information from GPS device is used for routing decision.

Pros

- Route discovery & management is not required.
-Scalability.
-Suitable for high node mobility pattern.

Cons

-It requires position determining services.

-GPS device doesn't work in tunnel because satellite signal is absent there.

- **DTN**

Delay Tolerant Network (DTN)[6] uses carry & forward strategy to overcome frequent disconnection of nodes in the network. In carry & forward strategy when a node can't contact with other nodes it stores the packet & forwarding is done based on some metric of nodes neighbors.

- **Geographical Opportunistic Routing (GeOpps)**

Geographical Opportunistic Routing (GeOpps) protocol utilizes the navigation system suggested routes of vehicles for selecting the forwarding node which is closer to the destination. During this process if there is any node which has minimum arrival time the packet will be forwarded to that node.

Pros

-By comparing with the Location-Based Greedy routing and Move routing algorithm GeOpps has high delivery ratio.

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 5, May 2013

-To find a vehicle which is driving towards near the destination GeOpps need few encounters.

- The delivery ratio of GeOpps rely on the mobility patterns & the road topology but not dependent on high density of vehicles.

Cons

-Privacy is an issue because navigation information is disclosed to the network.

3. PROPOSED TECHNOLOGY

The Proposed scheme uses the protocol called boomerang which addresses these challenges by using a trajectory-based approach. It increases the successful return probability of the Geocache even in temporary disconnected scenarios. While the boomerang protocol is inspired by delay-tolerant geographic routing[1], it is unique in recording a node's trajectory as the node is moving away from the anchor location and using this trajectory as a guidance to carry back the Geocache.

Further, to reduce communication overhead, instead of each node sending the Geocache over the wireless link as soon as it was received, we have the node keep the Geocache until it drives off the original trajectory. Thus, it exploits an important characteristic of vehicular networks, which is: vehicles move on well-defined and usually bidirectional paths. A Geocache which can be used to make sensed data available at anchor locations, to support mobile sensing applications over a distributed network of mobile nodes. The protocol employs two alternative heuristics in selecting Geocache carriers, with the baseline approach based on a node's distance to the anchor location, and the improved approach based on a node's location relative to the Geocache's reverse trajectory.

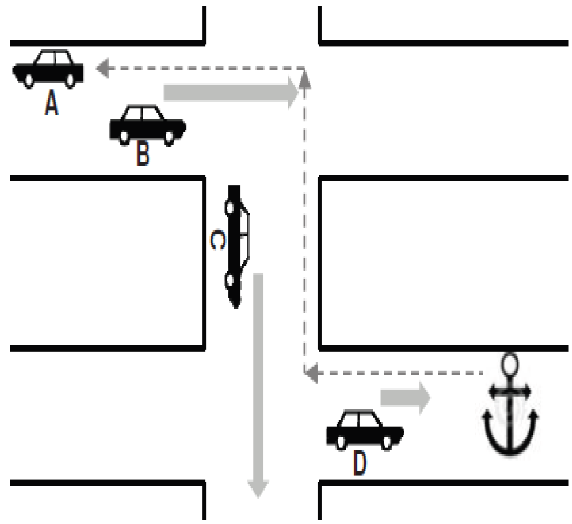

Fig 3.1 Trajectory based Approach

3.1 TRAJECTORY-BASED ROUTING

A trajectory based routing scheme is a hybrid scheme combining the ideas from source based routing and greedy routing. The source calculates the approximate trajectory and each intermediate node makes a greedy routing decision along the trajectory based on local position information. The idea is to deliver the message near the destination, according to the trajectory of the intermediate nodes. The trajectory based routing schemes have less data overhead than position based schemes due to the utilization of digital maps. However, the position based schemes are more robust in face of network disruption because even if there is no vehicle on the path, message can be routed via other paths and message delivery is not confined to a single trajectory.

3.2 HANDOFF CRITERIA

As shown in Fig. 3.1. In this case, a single carrier node may not be sufficient to bring back the data; instead, nodes *B*, *C*, and *D* all needed to be involved in this returning process. Efficiently choosing a set of suitable carriers is thus the key to the success of the boomerang protocol. A set of poorly-selected carriers may incur a long delay in bringing back the data (note that the data may lose its value after a long delay). The task of choosing appropriate carrier nodes is particularly daunting because at each handoff, neither the current carrier nor the nodes within the hand off range have knowledge beyond their current velocity and location, and the traversed trajectory.

3.3 CHARACTERISTICS

VANET has some unique characteristics which make it different from MANET as well as challenging for designing VANET applications.

a) High dynamic topology

The topology of VANET changes because of the movement of vehicles at high speed. Suppose two vehicles are moving at the speed of 20m/sec and the radio range between them is 160 m. Then the link between the two vehicles will last 160/20 = 8 sec.

b) Frequent disconnected network

From the highly dynamic topology results we observe that frequent disconnection occur between two vehicles when they are exchanging information. This disconnection will occur most in sparse network.

c) Mobility modeling

The mobility pattern of vehicles depends on traffic environment, roads structure, the speed of vehicles, driver's driving behavior and so on**.**

d) Battery power and storage capacity

In modern vehicles battery power and storage is unlimited. Thus it has enough computing power which is unavailable in MANET. It is helpful for effective communications & making routing decisions.

e) Communication environment

The communication environment between vehicles is different in sparse network & dense network. In dense network building, trees & other objects behave as obstacles and in sparse network like high-way this things are absent. So the routing approach of sparse & dense network will be different.

f) Interaction with onboard sensors

The current position & the movement of nodes can easily be sensed by onboard sensors like GPS device. It helps for effective communication & routing decisions.

4. CONCLUSION

We have presented the trajectory-based boomerang protocol to periodically make available data at certain geographic locations in a highly mobile vehicular network. The boomerang protocol returns the Geocache through nodes traveling toward the anchor location. To increase the probability of successful return, it records a node's trajectory while moving away from the anchor location then select nodes to return the Geocache based on the trajectory (RevTraj). The boomerang protocol improves packet return rate by 70% compared to a baseline shortest path routing protocol.

REFERENCES

[1] J. Li, J. Jannotti, D. Couto, D. Karger, and R. Morris, "A scalable location service for geographic ad hoc routing," in *Proc. of the 6th annual international conference on Mobile computing and networking*, 2000, pp. 120–130.

[2] Y. B. Ko and N. H. Vaidya, "Flooding-based geocasting protocols for mobile ad hoc networks," *Mobile Networks and Applications*, vol. 7, pp. 471–480, 2002.

[3] P. Juang, H. Oki, Y. Wang, M. Martonosi, L. S. Peh, and D. Rubenstein, "Energy-efficient computing for wildlife tracking: Design tradeoffs and early experiences with zebranet," *ACM SIGOPS Operating Systems Review*, vol. 8, pp. 96–107, 2002.

[4] B. Hull, V. Bychkovsky, Y. Zhang, K. Chen, M. Goraczko, A. Miu, E. Shih, H. Balakrishnan, and S. Madden, "Cartel: a distributed mobile sensor computing system," in *Proc. of the 4th international conference on Embedded networked sensor systems*, 2006, pp. 125–138.

[5] U. Lee, E. Magistretti, B. Zhou, M. Gerla, P.Bellavista, and A. Corradi, "Mobeyes: Smart mobs for urban monitoring with a vehicular sensor network," *Wireless Communications, IEEE*, vol. 13, pp. 52–57, 2006.

[6] J. Burgess, B. Gallagher, D. Jensen, and B. Levine, "Routing for vehicle-based disruption-tolerant networks," in *Proc. of the 25th IEEE International Conference on Computer Communications*, 2006.

[7] B. Hoh, M. Gruteser, R. Herring, J. Ban, D. Work, J. Herrera, A. Bayen, and Q. J. M. Annavaram, "Virtual trip lines for distributed privacy preserving traffic monitoring," 2008, pp. 15–29.