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AN EFFECTIVE GEOCACHE COLLECTION IN MOBILE NETWORKS USING BOOMERANG PROTOCOL

S. MELBA[1], N.S. USHA[2]

[1]Student, [2]Assistant Professor, Computer Science And Engineering, S.A Engineering College, Chennai;

Email: *smelba22@gmail.com, sushak3001@yahoo.co.in*

Abstract

In mobile networks, sensing the geo information and retaining them around the location of interest is a challenging task. In particular, the geo information can only be obtained if the geocache holder is present in the anchor location. In order to keep the geo cache around the anchor location boomerang protocol is implemented . The protocol allows the current geo cache holder to keep the information with it until it moves out of anchor location. Using this protocol, the holder can handoff the geo cache to other candidates preferably those traveling toward the anchor location. For this purpose, each node maintains a trajectory segmentation stack. Then the geo cache is handoff to other nodes using reverse trajectory approach. The geocache holder can initiate another handoff if it detects divergence. This process is repeated to retain data in the anchor location. By this way, the geocache can be retained around the anchor location at all the times. As well as, the system efficiently handles the location based queries in mobile disconnected networks.

Keywords-- **GPS, Geocache, Trajectory approach, Mobile Adhoc network**

I. INTRODUCTION

Mobile computing and wireless communication are high-growth areas in the communications arena. An increasing wealth of compute capability is available in handheld systems, and improved support for wireless communication helps interconnect these mobile platforms with each other, as well as with tethered desktop computers or servers. The main focus of mobile computing has been on systems such as PDAs and telephones intended for direct human use. Research attention is increasingly focused, however, on systems with more limited human intervention, wireless sensor networks are a key example. In general, sensor networks are systems in which numerous compute and sensing devices are distributed within an environment. Sensor networks have been proposed for a range of engineering, scientific and defense applications. Mobile ad hoc routing protocols can be classified into topology based and position based approaches. In topology based approach, use only information about existing neighborhood links, but not provide about geographical information. But in position based approach, it includes information about the geographical information. So, it is also referred as geographic approach. Wireless data connections used in mobile computing takes three general forms.

Cellular data service uses technologies such as GSM, CDMA or GPRS, and more recently 3G networks such as W-CDMA, EDGE or CDMA2000. These networks are usually available within range of commercial cell towers. Wi-Fi connections offer higher performance, may be either on a private business network or accessed through public hotspots, and have a typical range of 100 feet indoors and up to 1000 feet outdoors. Satellite Internet access covers areas where cellular and Wi-Fi are not available, they may be set up anywhere the user has a line of sight to the satellite's location, which for satellites in geostationary orbit means having an unobstructed view of the southern sky. Some enterprise deployments combine networks from multiple cellular networks or use a mix of cellular, Wi-Fi and Satellite. When using a mix of networks, a mobile virtual private network (mobile VPN) not only handles the security concerns, but also performs the multiple network login functions automatically and keeps the application connections alive to prevent crashes or data loss during network transitions or coverage loss. The boomerang protocol is to retain geocache around the anchor location through intervehicle communication.

The two major challenges are returning the geocache to the anchor location with high probability if the carrier of the geocache becomes temporarily disconnected and minimizing the communication overhead for retaining the geocache near an anchor location. To reduce communication overhead, instead of each node sending the geocache over the wireless link as soon as it was received, it have the node keep the geocache until it drives off the original trajectory. Here the number of users available in the particular location is called as anchor location and user is called as anchor node. Any information from anchor location are stored to geocache by the anchor nodes. So geocache acts as the place for storing any information about anchor location. Anchor nodes are away from the anchor location, the geocache send the information to particular anchor nodes by means of carrier node. The anchor nodes nearer to the anchor location act as a carrier node.

II. Existing System

2.1 Abiding Geocast

Abiding geocast is a time stable geocast delivered to all nodes that are inside a destination region within a certain period of time. For some applications, in particular safety-related applications to which class the virtual traffic sign service belongs to, reliable abiding geocast is bound to be desirable. An inherent question of the abiding geocast semantics is the duration of storage and delivery availability. It provide a best effort service without guarantees, which means that it cannot provide guarantees about the duration availability, i.e. we cannot guarantee to reach the full lifetime.

For abiding geocast, it would make sense to limit the number of deliveries or the total number of hops. If a virtual traffic sign is put up, say for example an accident warning sign, it is difficult to fix a lifetime since it is unknown when the crashed cars will be removed. Many vehicular information and safety applications profit from abiding geocast as it releases the applications from blind periodical retransmissions. The first approach is a server solution to store the messages. The second approach elects a node inside the geocast destination region to act message storage inside the destination region, and complements the exchange of neighbor information necessary for many geographic unicast routing protocols with abiding geocast information. The main issue is loss of message delivery to the destination.

2.2 Flooding-Based Geocasting

Static scheme uses a forwarding zone that is rectangular in shape. The forwarding zone is defined to be the smallest rectangle that includes current location of source S and the geocast region, such that the sides of the rectangle are parallel to the X and Y axes. The source node S can thus determinse the four corners of the forwarding zone. Node S includes their coordinates in a geocast packet transmitted when initiating the geocast delivery. When a node receives the geocast packet, it simply discards the packet if the node is not within the forwarding zone specified by the four corners included in the packet. This scheme is said to be a "static zone scheme", since the forwarding zone specification included in the geocast packet sent by the source node is not modified by any other node.

2.3 Intervehicle, Geographic, And Delay- Tolerant Communication

Many projects have addressed scalable communication in mobile ad hoc networks, in sparse or disconnected mobile ad hoc networks or through Infostations. In the authors introduce Infostations to deliver data to mobile nodes. In the authors aim at providing location-specific information to mobile devices, in which they developed schemes for detecting and transferring information of interest. All of these techniques adopt a server-client approach, but in our case, the information is provided by mobiles that have passed the location. The MaxProp routing protocol is used to ensure effective routing of disruption-tolerant networks (DTN) messages via intermittently connected nodes. These protocols are based on different communication workloads, such as unicast between randomly chosen nodes, or multicast to random node sets. These techniques focus on delivering messages to certain nodes, while our protocols try to keep information around a certain location. In designated mobile nodes store and carry messages. Our project differs in that virtually all nodes are "peers. Geocast protocols transmit messages to a predefined geographical region. They are suitable for location-based services such as position-based advertising and publish-and-subscribe. Repeated geocasts or time stable geocasts could also be used to maintain Geocache in a certain area and bear similarities to our baseline scheme. It is different in concept though in that it requires the definition of a geographic region, which is not needed in our case.

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Most geocast schemes concentrate on routing messages to the areas of interest, or distributing messages to all nodes, while Geocache is established close to the anchor location and needs only be known to very few nodes. Further, time-stable geocasts continuously remain in the region of interest, while Geocache can travel away from the anchor location.

2.4 Matching GPS Observations

The problem of map matching based on GPS readings have been extensively studied. Some existing work include. Even though we share some similarities with the map matching problem when using gps readings to identify road segments, it differ significantly with the general map matching problem in the use of road maps.

Map matching solutions generally focus on matching a node's position to the nearest street presented in the map.This differs fundamentally from our work since we don't use street maps but only GPS readings of traversed paths. Therefore, the general map matching approach which involves searching and comparing nearby road segments could not be applied to our problem. Instead, we propose using absolute distances and heading differences with the recorded road segment to determine divergence.

III. Proposed System

The main challenge for implementing the boomerang protocol lies in the choice of a new carrier node at each handoff, especially if the first handoff occurs somewhere far away from the anchor location. The data may have traveled along a rather complicated route before the current carrier looks for a new carrier, 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. 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. Another challenge is the handoff criteria. When hand off is a tricky issue, especially at the first time. The first handoff can greatly impact the handoff frequency and return probability of the Geocache.

The road map is created with two way trajectories. Then the mobile nodes are created with unique IDs. Anchor location is placed around and its boundary is defined. Some events like car accident, meeting etc is created. Then a moving node is chosen as default geocache holder.

Fig:1 Accident occurs between two cars

3.1 Construction Of Geocache

The geocache holder creates an empty log known as geocache. It is allowed to capture some events. Then for each captured event, an entry is added in geocache. Entries in geocache contains type of data, time at which the data is captured, size and ID of the holder.

3.2 Creation Of Trajectory Stacks

Geocache holder creates an empty trajectory segment stack. It creates a window of a GPS traces taken with in 20m .It finds out critical points in window. Combine two critical points as a segment and push it in the stack. The points that exceed the distance difference threshold (5) is known as critical point. The stack is continuously grown while the holder is moving. Meanwhile it checks whether it goes out of radio coverage. If it goes out of coverage , it broadcasts a message including compressed and encrypted geocache with its trajectory stack .Candidate nodes(moving in opposite direction) with in radio range of geocache holder receives this, message .These nodes also prepare their own trajectory stack like geocache holder.

The key component of RevTraj is trajectory recording: the aggregated path the pervious carriers have traveled so far. The trajectory grows when a carrier is moving away from the anchor location, and shrinks when it's moving toward the anchor location. Depending on the storage and processing power available on the mobile units, we can use either raw GPS traces or "segmented" trajectory which only consists of the critical points on the path.

Next, let us look at the detailed handoff process in RevTraj. In the discussion below, we assume segmented trajectory is used instead of a continuous trace.

3.2. 1. Handoff Initiation

Handoff occurs when a divergence is detected from the recorded trajectory. The current carrier broadcasts the Geocache along with the trajectory.

3.2.2. Candidate Identification

Every node within the radio range pops out the latest segments from the trajectory stack. We use a parameter, look ahead distance (LD), to limit how many recent segments we examine. These look ahead segments can be numbered as seg1; seg2: segLD, with seg1 being the latest segment. If the node finds itself on one of these look ahead segments, it becomes a candidate node and proceeds to the next step.

3.2.3. Candidate Prioritization

All the candidates are prioritized according to the following rules: a) nodes traveling on higher numbered segments are granted higher priority than those on lower numbered segments; b) for nodes traveling on the same segment, it give higher priority to those closer to the anchor location. The prioritization rules can be easily implemented if each candidate node calculates its ACK backoff time using the following equation: where the definitions for d, d0, Tmax are the same as before, and it is the segment number.

3.2.4. Carrier Selection

The node with the smallest ACK back off will send out the ACK earliest among all the candidates. To avoid hidden or exposed terminal problem, we suggest ACK be sent using higher transmission power to cover a wider range. Upon receiving the ACK, the old carrier as well as other candidates can decide whether to delete the Geocache, or keep it for some amount of time to increase the overall reliability.

3.2.5. No Acknowledgment

If the current carrier does not receive any ACK, it keeps the Geocache and initiates another handoff after a short interval. We further distinguish between prioritized RevTraj as described above, and no prioritized RevTraj, where all candidate nodes pick a random back off value from [0, Tmax] and the node with the smallest back off becomes the new carrier.

IV. System Architecture

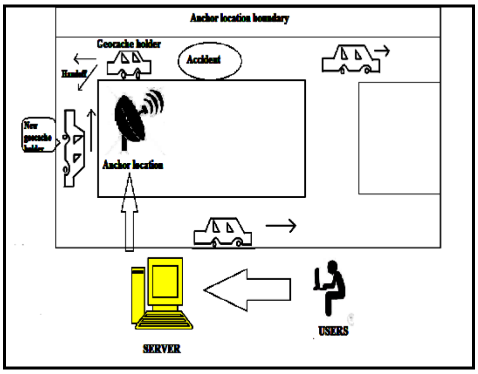

Fig:2 System Architecture

The above diagram explains the system architecture to make the data retain in the anchor location. The accident is occur in the anchor location is capture by the geocache holder and create a log list. That log list provide full detail about the accident ie., date, time, place, captured picture details. If the geocache holder is moving out from the anchor location means it will handoff the information to the new geocache holder. The handoff process is done by trajectory based selection approach. It traces the moving points of the node which are moving towards anchor location. After find out the points the node which is closer to geocache and anchor location will get the geocache information from the old geocache holder. The information is encrypted and after receive by the receiver the message is get decrypted. When the user search the information about any incident, server contact to the anchor location related to that area. The anchor point get full information from the geocache holder and respond to users.

V. Conclusion

The boomerang protocol is to periodically make available data at certain geographic locations in a highly mobile vehicular network. To increase the probability of successful return, it records a node's trajectory while moving away from the anchor location. In addition, the geo cache information details are compressed and encrypted while initiating handoff procedure. After a new candidate is elected then the decryption key is issued to that candidate. Hence the project accounts for security as well as the successful maintenance of data around the location of interest. This project is still under implementation and future work will be implemented.

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