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Visitor Tracking System using Mobile Adhoc Network

KEYWORDS: RFID, GPS, MANET

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ABSTRACT A Visitor tracking system uses an Adhoc network and Infrastructure in which a set of domain nodes share the responsibility for producing and storing monitoring information about a set of visitors. This information is stored regularly, depending on the visitor nodes grows and shrinks. Such a system can be used to store monitoring information of visitors and maintain the traffic through monitoring system by deciding the threshold value for number of visitors. The salient features of system include counting the number of visitors through monitors located at every entry/exit points, Tracking the visitors at a particular place, and locating an individual visitor at the time of natural disaster and storing this information in a continual, resourceful and searchable manner. The database must be searchable, so that an administrator must be able to know where about a particular visitor node is. The records in the database must be continual, in the sense that no entries in the database can be missing by network disruptions. The algorithms for maintaining the database should run with minimal message and computational overhead.

I. Introduction

A Mobile Ad hoc Network (MANET) is a self-configuring infrastructureless network of mobile devices. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently [1]. Each node works as a router.

II. Broadcasting mechanisms [6]

In Visitor tracking system visitor nodes are moving nodes. And visitor node broadcasts the information about its own when it is in the vicinity of an infrastructure. Hence it is necessary to study the following broadcasting mechanisms.

A. Simple Flooding

In this method, the monitor disseminates a message to all of its neighboring Infrastructures. Each infrastructure that receives this message further disseminates this message to all its neighbors. This continues unless all the nodes in the MANET have seen this message. The problem with this approach is that it causes an extremely high amount of redundant broadcast and uses up a lot of bandwidth. Redundant broadcast leads to contention and collision. This problem is sometimes referred as broadcast storm problem. The approaches to overcome from it, is mention in next subsections.

B. Probability Based Methods

Probability based approach: This approach is intended to overcome the problem of flooding method. Each node is given a predetermined probability for re-broadcasting. This solves the problem of redundant re-broadcasting, congestion and collision. However, there is a risk that some nodes may not receive the message.

Counter based scheme: This scheme works with three variables: a random assessment delay (RAD), a threshold K, and a counter k. k counts the number of times a node receives the message. Every time a node receives a redundant message, k increments. If the value of k is greater than the threshold value K when RAD expires, the message is dropped. Otherwise, the message is rebroadcast. With this approach, when the network density is high, some nodes do not broadcast. Otherwise, all the nodes broadcast.

C. Area Based Methods

Distance based approach: Similar to the counter based approach, this approach uses the distance, d, between the receiving node and the source node to decide whether to drop the message or rebroadcast it. The larger the distance, the larger will be the broadcast coverage of the receiving node. A threshold value, D is set and RAD is checked constantly. After the RAD expires, if d>D then the message is dropped, otherwise it is rebroadcast.

Location based approach: In this approach, each node adds its own location in the header of the message it sends or rebroadcast. The receiving node will use the location of the sender to calculate the additional coverage area to rebroadcast. If this value is lower than some threshold when RAD expires, the message is rebroadcast. Otherwise the message is dropped. The main problem with this approach is the cost of calculating additional coverage areas.

D. Neighbour Knowledge Methods

Self-Pruning: In this method, each node in the MANET is supposed to have knowledge of its neighbours. The receiving node compares its neighbours list to the senders neighbour list. If the additional nodes could be reached, the node will rebroadcast, otherwise the message is dropped. It shows that even with this method a situation can come which causes message redundancy.

Scalable Broadcasting Approach: This is an approach similar to self-pruning except that each node is now required to have information about its neighbors up to a two hop distance. With this approach, there are better chances of each node receiving the message, unlike in self-pruning where there was a possibility of some node not getting the message.

Ad Hoc Broadcasting Approach: This approach attempts to find its neighbors that can cover the most the network nodes. This node is then given the designation of Broadcast Relay Gateway (BRG) and only this node is allowed to broadcast the message. Since, this approach does not use local information to decide whether to rebroadcast or not, it suffers a lot in highly mobile MANET.

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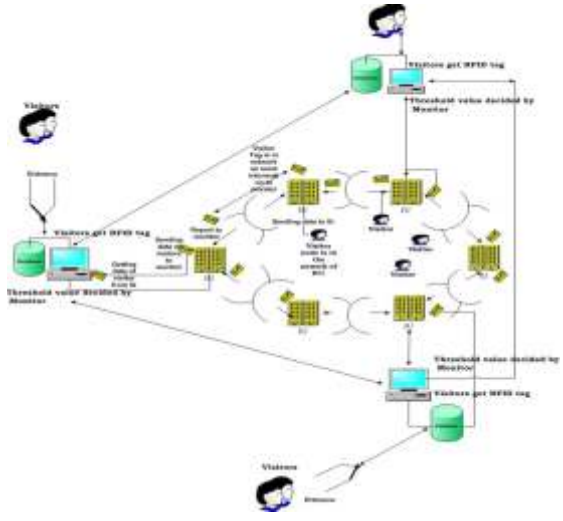
III. RFID Introduction [16]
RFID stands for radio frequency identification. It is an automatic identification technology whereby digital data encoded in an RFID tag or "smart label" is captured by a reader using radio waves.

IV. Comparison between various locations tracking system:
Patient movement tracking system[7]:
Mechanism: Track the location of patients in an indoor environment and monitor their physical status i.e. walking, running.
Pros.
1) We can track an individual patient in the organized network.
2) Also track the motion or the movement of the patient like walking, running etc.
Cons.
1) Localization network which required multiple power consuming sensors.
2) The use of a relatively large mobile node.
3) The power and running lifetime of the mobile node.
Visitor tracking in theme park[8]:
Mechanism: In this system, the model of the movement of visitors in a theme park.
Pros.
It decreases the number of waypoints in a map and allowing the simulation of a large number of visitors.
Cons.
It uses trace based model so it uses GPS for tracing. It is difficult to collect real data and the amount of publicly available data is limited.

Visitor face tracking system[9]:
Mechanism: This system will record the visitor face by camera.
Pros. Track the face of the visitor at various places.
Cons. Visitor needs to appear in front of the camera for at least 10 seconds so it is time consuming process.
RFID Based Equipment Monitoring System[10]
Mechanism: Tracking of laboratory equipment movement to ensure its availability.
Pros. It aims at helping the lab administrator in monitoring the equipment from lost or misplaced
Cons.
1) Reader collision when the signals from two or more readers overlap.
2) The tag is unable to respond to simultaneous queries.
Online Student Monitoring System Using Passive RFID[11]:
(GUI based)
Mechanism: Online student monitoring system to ensure the availability of the students in the campus.
Pros.
1) Improving the current tradition way of monitoring the students.
2) Used GUI interface so it is more efficient way to review the attendance.
3) Easy to handle and convenient for college/university level.
4) This system gives time saving, easy to control and reliability.
Cons.
1) Reader collision when the signals from two or more readers overlap.
The tag is unable to respond to simultaneous queries.
Boarding school students monitoring systems using RFID[12]:
Mechanism: Monitoring Boarding school student movement using by using RFID technology.
Pros.
It can ease the workload of school management and save time.
Cons.
1) Cannot control the punctuation of student
2) Reader collision when the signals from two or more readers overlap.
3) The tag is unable to respond to simultaneous queries.

VI. Proposed Approach:
A protocol will be developed which provides details of visitors at a specific location. Such a protocol can be used to store monitoring information of visitors and maintain the traffic through monitoring system by deciding the threshold value for number of visitors. So at the time of disaster we are able to know the number of visitors at tourist place and approx location of individual visitor at the time of natural disaster and storing this information in a persistent, efficient and searchable manner. And all the data or information of tracking will be stored in one central gateway which is not the part of the setup of system.

Proposed model:



[Life saving Model]

Proposed Algorithm:
[Monitor Module]

Step1: [Initialize Process for pre-setup]
No_users=0;
Threshold_value=N;
No_Infrastructure=5
No_monitor= 1
L_id[No_Infrastructure index]
L_mid[Monitor index]
Step2:[Registration of Visitor]
Check for threshold:
IF No_users <= Threshold_value then "Insert the details in to the database":
<Visitor_id(Serial_ No), Visitor_name, Date, Time_arrival, Leaving_time, tag_id, Address,Phone_no>
"Issue the tag to visitor manually with
<TAG (visitor_id, tag_id)>"
else
Stay in queue until registration.
Step3: [Insert information to the database of Monitor]
Compare the visitor details detected and provided by all L_id:
if(Visitor_id,tag_id already exist for particular L_id)

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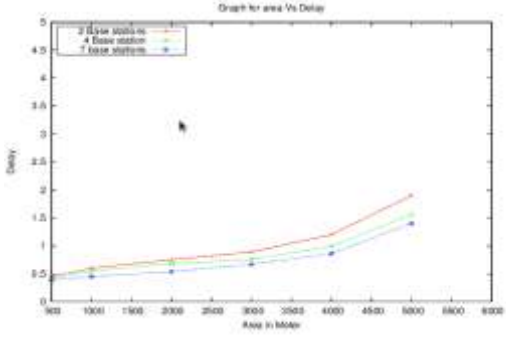
```
    {
 "Update the information of File1 with <L_id, time>"
    }
 else
 "Make new entry into File2 with all tracking detail for all L_id
with <tag_id, visitor_id, L_id, time>"

Step4: [Search for Request]
        -Request()
if (Request for V_id ,L_id, time from L_mid)
{
<request to all infrastructure for L_id of V_id for specific
time>
}
       -Reply()
if (requested V_id is found from L_id)
then
print V_id and Tag_id with L_id
store V_id and Tag_id with L_id in search_file

Step5: [Monitor send information to internet] "Monitor is
having internet facility "


[Visitor Module]
Step1: [Get tag(tag_id) form monitor]
<get registered and get tag from monitor>

Step2: [Start Moving]
"Periodically Broadcast the information
<BROADCAST(tag_id, visitor_id )>

[Infrastructure Module]
Step1:  [Establish all Infrastructure]
<Infrastructures have their own L_id>

Step2: [insert into DATABASE]
 if (V_id FOUND)
{
"insert into database(V_id,L_id,time) " and
"Send ACK of visitor detection to Monitor with
L_id,Visitor_id,tag_id,time"
}

Step3: [Search for Request]
IF(request FOUND for L_id of V_id)
{
"Give response back to the monitor for L_id, time of
V_id,tag_id"
}
```

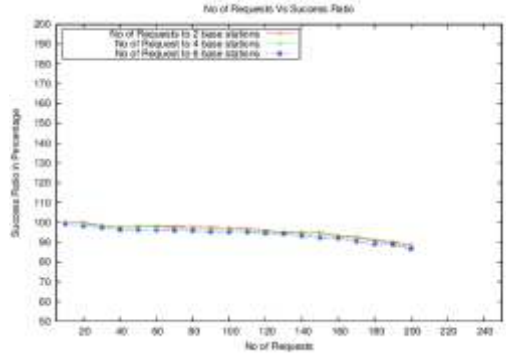
VII. Result and Analysis

Graph in Figure 7.1 represents effect of changing area on performance parameter i.e. searching Delay for searching the visitors. As the area increases search delay also increases.



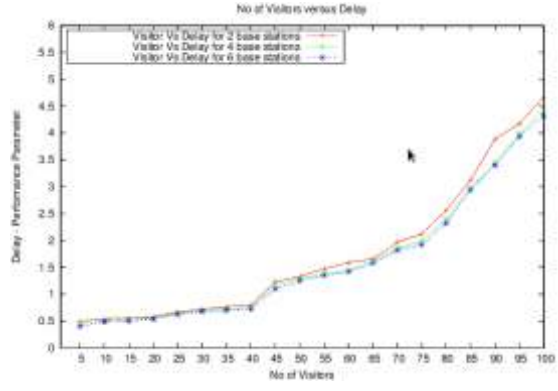
[Fig 7.1]

Graph in Figure 7.2 represents the effect of no of requests on the success ratio. Success ratio is the ratio of "number of sending requests" and "number of responses" received from the base station.



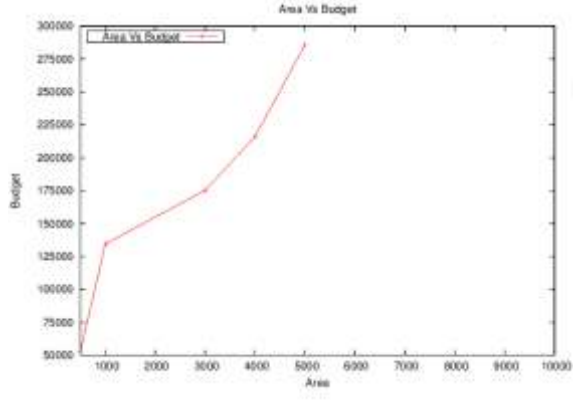
[Fig 7.2]

Graph in Figure 7.3 represents the effect of no of Visitors on the Performance parameter Search delay. As per analysis, by increasing the number of visitors in increasing area, the delay increases.



[Fig 7.3]

Graph in Figure 7.4 represents the effect of area on the budget.The budget includes the number of visitor RFID tags, number of base stations and number of RFID readers. As area increases, the budget required to establish the network also increases linearly.



[Fig 7.4]

Conclusion:

In this paper, an approach for tracking the moving visitors and transmitting the location information in the small scale fixed scene is developed. During the setup process, the

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quantity of fixed nodes participating in location is limited, so that the network overhead is reduced. During the process of uploading the location information of moving nodes to the central gateway, the quantity of request packet transferred during the routing discovery with the node location information is also properly controlled. GPS is far field communication, and RFID is near field communication and with the help of both the systems we can track the visitors, but in the case of disaster RFID is more feasible then GPS. Because by using RFID we can get more accurate and fast result. And it is very crucial to find out the human being after the disaster was happened at the tourist places, so through the system at least we can identify the approximate location of visitor at the place if RFID Tag is in the working condition.

Future Work:

In the visitor tracking system there is good future scope. The main focus of the system is to get the response to track the visitors after the occurrence of the disaster. In future, the algorithm can be improved by adding Quality of service parameters and also by adding security parameters to enhance the security features.

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