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V2v Communication Using Rfid Tags And Optimizing Through Ant-Colony Algorithm

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Abstract: **The extensive growth of traffic on highways and junctions began hampering the safe and effective movement of traffic. The ascending car accident rate leads to research on deriving optimal solution to streamline the traffic and to take alternate measures to reduce the accidents. The intelligent transmission techniques are used to communicate with other vehicles during cases of vehicle collision and accidents. The promise of intelligent traffic system and early warning system enables effective monitoring of road mishaps. With the development of Vehicular Ad hoc Networks the transmission of emergency messages is considerably progressed to accelerate traffic safety measures. VANETs exchange information between vehicles and the Road Side Unit (RSU) for making intelligent decisions spontaneously. Communication can take place between V2V, V2I and I2V. Sometimes messages received using GSM(Global System for Mobile Communications) communication may not be entrusted due to some adverse effects of undesirable communication held. Hence, in addition to GSM Communication, the proposed approach uses NFC communication to read data from RFID tags that are placed on the road side at danger locations and at junctions. RFID assisted vehicles reads data written in RFID tags using RFID readers available in Android mobiles automatically for taking vital decisions. The data read by RFID tags is sent to Web Server for transmission over network. Finally, the targeted solution is refined using Ant-Colony algorithm for fast retrieval of data from neighborhoods**

Index Terms— VANET, Location Information,RFID,NFC,Ant-Colony Algorithm

I. INTRODUCTION

Today's research brings to a focus about improving safety measures in VANETs. The VANET users communicate among them about the Location Information on the Geographic earth using Global System for Mobile Communication(GSM) services. The conventional way of communication between the network users over the VANET[2] is through OBU (On Board Unit) fixed in cars. This is feasible for normal communications like sharing data over the network, taking a printout even while moving through car and in some way of monitoring home appliances. This has been connected to GSM communication through mobiles. The forwarding of messages using GSM communication is shown in Fig.1. NFC(Near Field Communication) communicates well even with the absence of GSM link failures. Hence detection of objects is accurate and hence convenient for giving alerts at dangerous locations. RFID is a technology used to transmit radio waves between the reader and the object that is tagged with RFID tags. The main components of RFID transmission are 1.RFID Tag. 2. RFID Antenna 3. RFID Reader and 4. RFID server (PC). RFID is a label that contains micro chip in it. This micro chip used to transmit data when it is exposed to radio waves[5]. Chip holds information about the physical object. This information is read through Antenna by reader and is stored in the server

for further processing. This paper is organized as follows. Section 2 describes the previous carried out in establishing VANET communication. Section 3 tells about the system architecture of the proposed system. Section 4 gives the simulation results of GCM services applied in VANET communication. Section 5 discusses methodology. Section 6 tells about the experimental analysis carried out using Android Sensor and NFC programming. And finally, conclusion states the significance of optimization of route map using Ant-Colony algorithm

Fig.1. Communication established between mobile, printer and laptop using GSM communication in VANETs

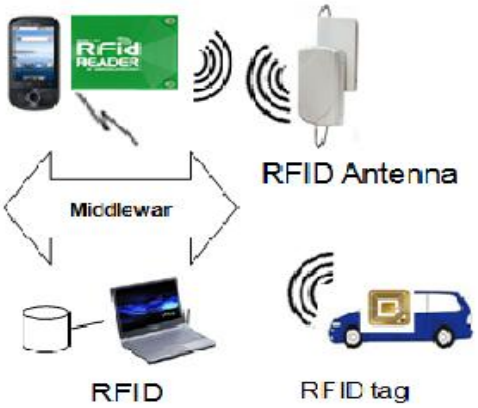


Fig.2. Rfid Based Communication Linked With Gsm Communication

1. RELATED WORK

Ning Lu focused on wireless technologies and potential challenges to provide vehicle-to-x connectivity. The state of art of wireless solutions for vehicle-to-sensor, vehicle-to-vehicle, vehicle-to-internet and vehicle-to-roadside infrastructure is discussed. The alternatives include Bluetooth, ZigBee[1], Radio Frequency Identification(RFID), Ultra-Wideband and 60GHz Millimeter Wave(mmWave). The wireless technology analyzed is DSRC. V2I connectivity includes Industrial solutions(tethering their own smart phone to the car(3G/4G), Drive-Thru internet(WiFi) and Real-world measurement(IEEE 802.11b and IEEE 802.11). The Car Connectivity Consortinum(CCC) introduced phone centric cars. Mirror Link technology is used to connect phone to the vehicle infotainment system via wires(USB) are wirelessly(WiFi or Bluetooth). Built in connectivity is integrated with cellular service in the On Board infotainment system. The cost effective solutions uses cellular based technologies to provide ubiquitous internet access to vehicles. In V2R connectivity DSRC/WAVE technology is used[3]. The goal of Ant Colony Optimization (ACO) algorithm is to appreciate the behavior of ants, in finding shortest path between food and nest without the use of visual information [6]. This concept envisages in making it applied in e-Sensor communication system in building up shortest path dynamically using Location Information of neighborhood of the accident object.

2. SYSTEM ARCHITECTURE

The architecture of communication scenario of VANET with the RFID tags equipped is shown in Fig.2. When a car is met with an accident, the RFID tags equipped in cars automatically sense this information and send it to Web Server for broadcasting over the network. The Web Server collects information from RFID tags through VANET nodes and broadcasts over the network as GCM notifications and may change their route for crossing over that region. This could be a better cost effective approach as the RFID tags are less in cost collection of data from neighborhood nodes is articulated using Ant-Colony algorithm which is more analogous in nature.

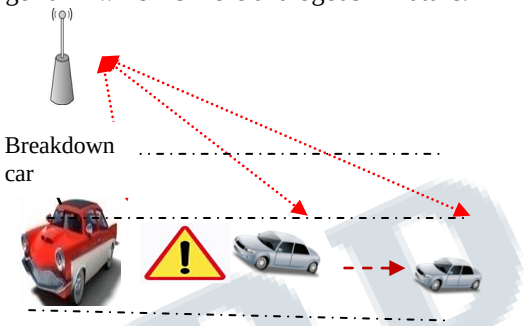


Fig.3. Communication across VANETs using GSM Services

The vehicle to vehicle communication is established using gsm communication during the occurrences of accidents. the communication mechanism is simulated using android technology. this is tested for real time application[2]. this implementation results are shown below. the nodes in vanet have to logon to the network for validating authentication information with the web server. the nodes send the emergency information to web server and the web server in turn sends this information to nearby users using google cloud messaging services. the sequence actions performed are like this. fig.4. shows the deployment of app in mobile application[3], fig.5. shows how login verification of the vanet node is done with the web server,fig.6. shows sending emergency information to web server along with device id for broadcasting information to nearby users fig.7. shows how the message is received by vanet user. the web server maintains the location information of all users added in vanet.

3. Communication across VANET users using GCM Services

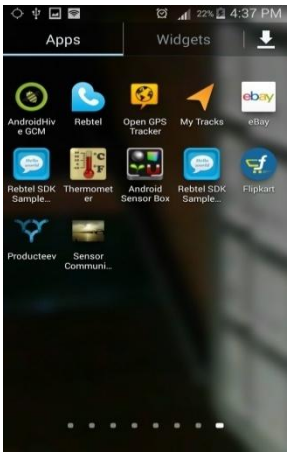


Fig.4. Deploying app in Android Mobile

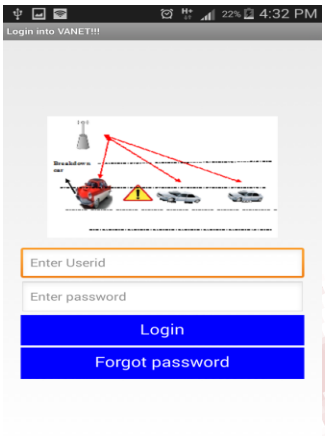


Fig.5. Authentication check for VANET user

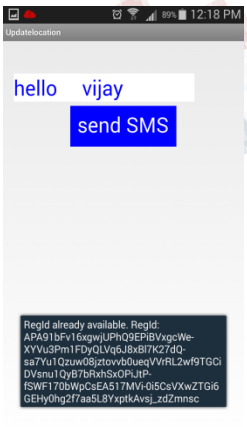


Fig.6. Sending SMS to nearby users.

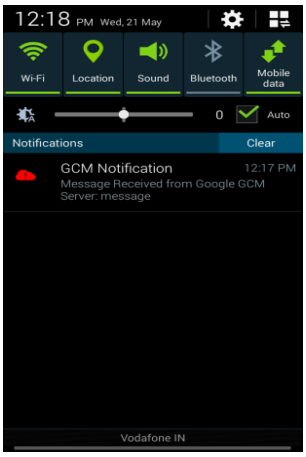
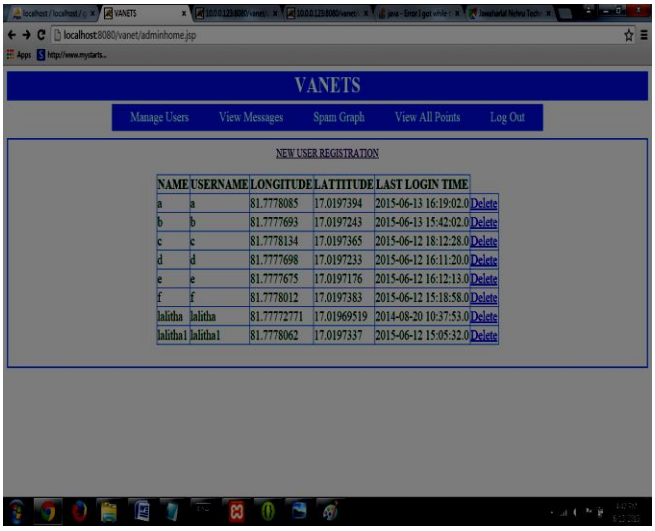


Fig.7. Receiving GCM Notification by VANET users

The performance degradation usually occurs due to contention, congestion and sometimes due to link failures. Retracing is required for every transmission to test whether they are trustful or not base on the significance of the message. Hence this methodology is linked up with the RFID Technology for cross verification instantly. During emergency situations the transmission of emergency messages over the network are done by Base Station. With the evolution of NFC(Near Field Communication) in Android Mobiles, it became ease in development of Apps for broadcasting messages over the network in an intelligent way. In real time, the RFID tags are placed at danger prone locations and the information of the tags are read by RFID reader at the Base Station. Base Station uses middleware to read data from tags and store it in the local database. In this paper NFC service of the Android mobile is used for testing. Enable NFC service of the Android Mobile to exchange data between RFID tags and mobile through Android Beam installed in the mobile. In this paper, reading of RFID tags is done by bringing mobile nearer to tag as part of testing. This data is sent to Web Server for transmission over the network. Web Server uses Google Cloud Messaging(GCM) services to broadcast it over the network.

The topology of the network shown above is simulated using Android mobiles. Web Server(implemented in JSP) monitors all the positions of VANET nodes and messages. The users who are interested to add as a user into network, need to install Android App(Sensor Communication) into their mobiles. Then do the following steps to connect to Web Server through internet. Settings->More…->Tethering & portable hotspot->Enable Portable Wi-Fi hotspot. IP address along with MAC address of the Web Server will be displayed on the mobile by clicking on the Portable Wi-Fi hotspot settings under connected devices. Users need to register with the Web Server and obtain their username and password. Then, to communicate with the Web Server use Sensor Communication app. Consider

a,b,c,d and e are the example nodes added into the network and currently they are in the range of the network. After logging in, their positions will be viewed by the Web Server as shown in Table 1



NAME	USERNAME	LONGITUDE	LATTITUDE	LAST LOGIN TIME	
a	a	81.7778085	17.0197394	2015-06-13 16:19:02.0	Delete
b	b	81.7777693	17.0197243	2015-06-13 15:42:02.0	Delete
c	c	81.7778134	17.0197365	2015-06-12 18:12:28.0	Delete
d	d	81.7777698	17.0197233	2015-06-12 16:11:20.0	Delete
e	e	81.7777675	17.0197176	2015-06-12 16:12:13.0	Delete
f	f	81.7778012	17.0197383	2015-06-12 15:18:58.0	Delete
lalitha	lalitha	81.77772771	17.01969519	2014-08-20 10:37:53.0	Delete
lalitha1	lalitha1	81.7778062	17.0197337	2015-06-12 15:05:32.0	Delete

Table.1. Current Locations of nodes a,b,c,d and e viewed by Web Server

4. Methodology

Fix RFID tags at dangerous locations and store the Location Information of that particular point using Android app. Whenever any node hits RFID tag, immediately message will be sent to Web Server and the Location Information of that tag will be displayed on the mobile. Message transmission is done automatically by through sensors and map will be displayed by touching on GCM Notification. The re-route map is computed by taking arbitrary points around the accident object and shortest path is computed among the two existing paths using Ant-Colony optimization algorithm.

4.1. Ant-Colony Algorithm

Select arbitrary point near by accident object
Do While
Do Until
Choose all the possible paths from the current point to cross over the accident object by choosing arbitrary points randomly
End do
Compute the shortest path among all possible paths
Update the Location Information based on the density of the traffic
End do
Applying Ant-Colony algorithm for computing shortest path:
Procedure to compute Geographic positions for the reroute map in the Web server:

➢ Obtain Location Information of the current and arbitrary points using GPS:-

1. Compute Geographic distance between two points using Great Circle formula:
Distance=R*arcos([sin(lat1)*sin(lat2)]+cos(lat1)*cos(lat2)* cos(lon2-lon1)] where R is radius of earth.
As the built-in proximity sensors of the mobile are used, it is assumed that current position identified by the sensor will be the accident object locations.

➢ To cross over the accident region, apply Ant-Colony optimization algorithm to compute shortest path dynamically. The procedure is as follows:-

Step 1:
Assumptions
size of the object:0002km
c: current point x1 :lies to the left of current point
x2 :lies to the right of current point x3: lies to the right of x2
v1:lies to the top of current point v2:lies to the top of x2
v3:lies to the bottom of current point v4:lies to the bottom of x2

Step 2:
Obtain the left/right positions by adding/subtracting the accident object size.
Obtain the top/bottom positions by adding/subtracting the random numbers computed.

Step 3:
Route 1=$dist_{x1,c}$+$dist_{c,v1}$+$dist_{v1,v2}$+$dist_{v2,x2}$+$dist_{x2,x3}$
Route 2=$dist_{x1,c}$+$dist_{c,v3}$+$dist_{v3,v4}$+$dist_{v4,x2}$+$dist_{x2,x3}$
Optimal Path=**min**(Route1,Route 2)

5. Experimental Analysis and Results

Fig.8. shows transmission of message sent by node ‘a’. Fig.9 shows the detection of RFID tag and displaying information contained in it. Fig.9. shows the GCM notification received by users, and Fig.11 shows the re-route map display on the user’s mobile

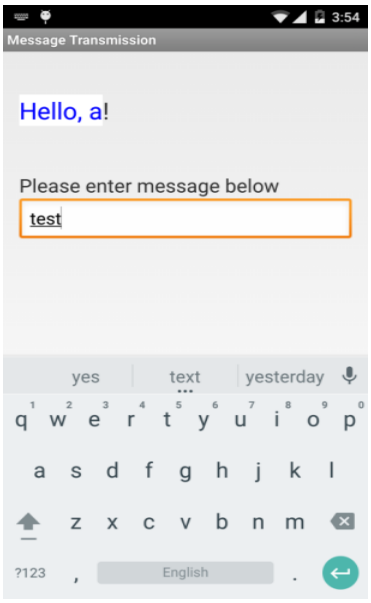


Fig.8.Message transmission by node 'a'.

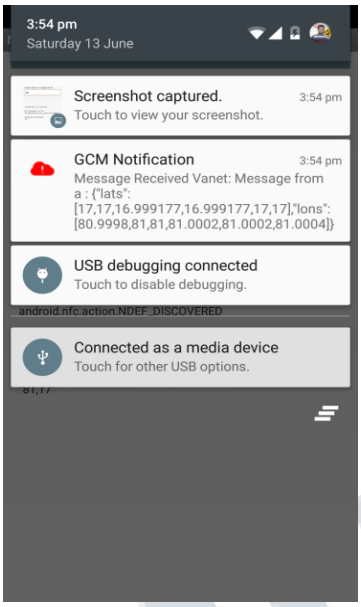


Fig.10. Messages received as GCM Notifications to other nodes in the network

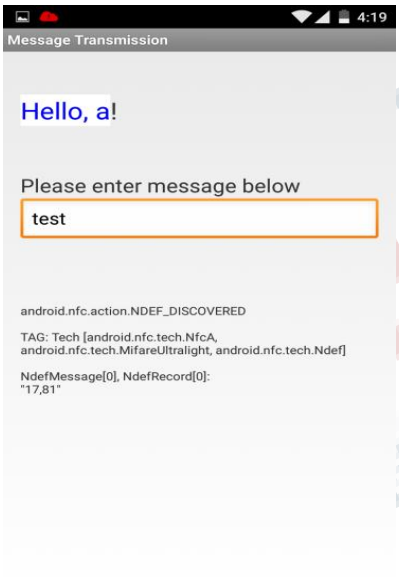


Fig.9. Since the Location Information is already written in the tag, it will be displayed on the mobile

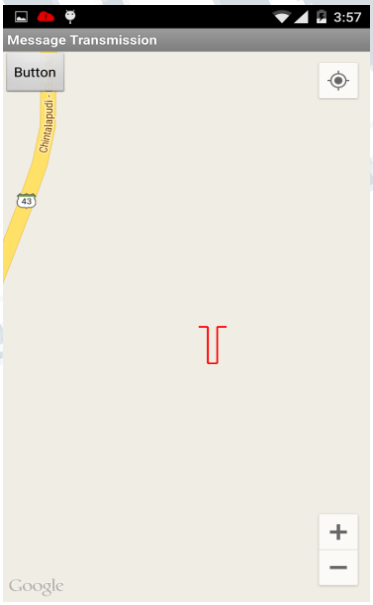


Fig.11. Re-route map is displayed on the user's mobile, which is computed using Ant-Colony algorithm

Conclusions

The Communication mechanism established in the VANET using GSM services may be sometimes fragile because of weak signal communication. The suggested mechanism outperforms well in the Personnel Area Networks, Industry related applications and at danger prone areas where forewarning is essential. This work leads to an investigative approach that enriches manifest information of Accident spot available across VANET nodes as well as

other nodes in the network along route diversion information. The approach is useful in establishing communication in hilly areas, forest areas where the line of sight is not possible.

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