Effective Design and Evaluation of Context-Aware and Location-Based Service Discovery Protocols for Organizational Transport Management, Based on Embedded Technology

Josephine R L[1*], Akash Saravanan A S, Arun Bharathi R, Divya Priyadharshini M[1] , Chandragupta Mauryan K S[1]

Department of Electrical and Electronics Engineering,

Sri Krishna College of Technology, Coimbatore.

akash.selvaraj23@gmail.com

***Abstract*— Vehicle tracking system is used in many applications like public transportation systems, personal vehicle security and many other applications. Since the number of vehicles in the road is increasing rapidly, the Global Positioning System (GPS) and Global System for Mobile Communication (GSM) helps the user to track their vehicles with ease. This system helps the users to track their vehicles remotely through mobile network with SMS alerts. This project presents the development of the vehicle tracking system's hardware prototype. Specifically, the system will use the GPS to obtain the vehicle's coordinate and transmit it to the user's phone using GSM modem through SMS using the mobile network. It also monitors the vehicle by setting geographical limits and therefore receiving SMS alerts when the vehicle crosses this pre-defined limit. Additionally, the location of a given vehicle can be monitored using this system. The proposed system provides a ubiquitous vehicle tracking system with maximum accessibility for the user anytime and anywhere. The main hardware components of the system are SimComSim908 GSM/GPS/GPRS module and Arduino Duemilanove Microcontroller.**

Keywords- Traffic monitoring, GPS, Location notifier, network analyser, routing protocols.

I. INTRODUCTION

Nowadays, with technology growing at a fast pace, automated vehicle tracking system is being used in a variety of ways to track and display vehicle locations in real-time. This research paper is to develop a vehicle tracking system for organizational transport management, using GPS / GSM / GPRS technology and a Smartphone application to provide better service and cost effective solution for users as shown in Fig 1.

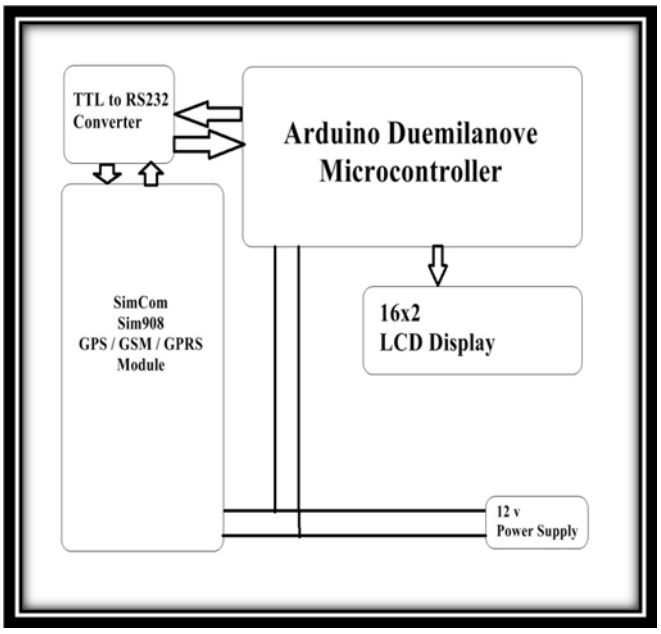

Figure 1. Block diagram of the system

Service discovery is a crucial challenge in VNs; however, in this paper, we propose a efficient and scalable infrastructure based context-aware and LOCVSDPs for VANets: 1) election-based LocVSDP*(EB-LocVSDP)* and 2) its variant *Naive-LocVSDP*. The protocols' infrastructure relies on clusters of wireless roadside routers (RRs) distributed in the VANet. The distribution of clusters depends on the application requirements in the VANet. Clusters of RRs are mainly formed around and near service providers to help manage service queries. Our proposed protocols provide a scalable framework for the discovery of time-sensitive and location based services in VANets.

Iman M. Almomani*et al.* explained development of a vehicle tracking system where they use GPS, GSM and GPRS technologies to create a database of the GPS coordinates of a vehicle [1]. Here, any details regarding the past location of a vehicle at a particular time can be detected The main drawback of this system is that, when there is no network coverage for internet, either for the transmitting module in the vehicle, or for the user, the system fails to operate. This system cannot help the end users, who cannot accommodate a smart phone. So, a system that can use the GSM technology, to transmit the GPS coordinates through SMS should be developed [3].

II. MULTITASKING THREADS

Arduino Threads is a library for managing the periodic execution of multiple tasks. Arduino does not support "REAL" parallel tasks (aka Threads), but we can make use of this Library to improve our code, and easily schedule tasks with fixed (or variable) time between runs. Arduino Threads is designed to simplify programs that need to perform multiple periodic tasks as shown in flowchart in Fig 2. It should be noted that these are not "threads" in the real computer-science meaning of the term: tasks are implemented as functions that are periodically run to completion. On the other hand, this makes Arduino Threads memory friendly, as no stack needs to be allocated per task.

III. DESTINATION-SEQUENCE DISTANCE VECTOR (DSDV)

DSDV has one routing table, each entry in the table contains: destination address, number of hops towards destination, next hop address. Routing table contains all the destinations that one node can communicate. When a source A communicates with a destination B, it looks up routing table for the entry which contains *destination* address as B. Next hop address C was taken from that entry. A then sends its packets to C and asks C to forward to B. C and other intermediate nodes will work in a similar way until the packets reach B. The first time two DSDV nodes meet, they exchange all of their available routing information in full dump packet. From that time, they only use incremental packets to notice about change in the routing table to reduce the packet size.

3.1 Reactive Protocol:

These protocols were designed to overcome the wasted effort in maintaining unused routes. Routing information is acquired only when there is a need for it.

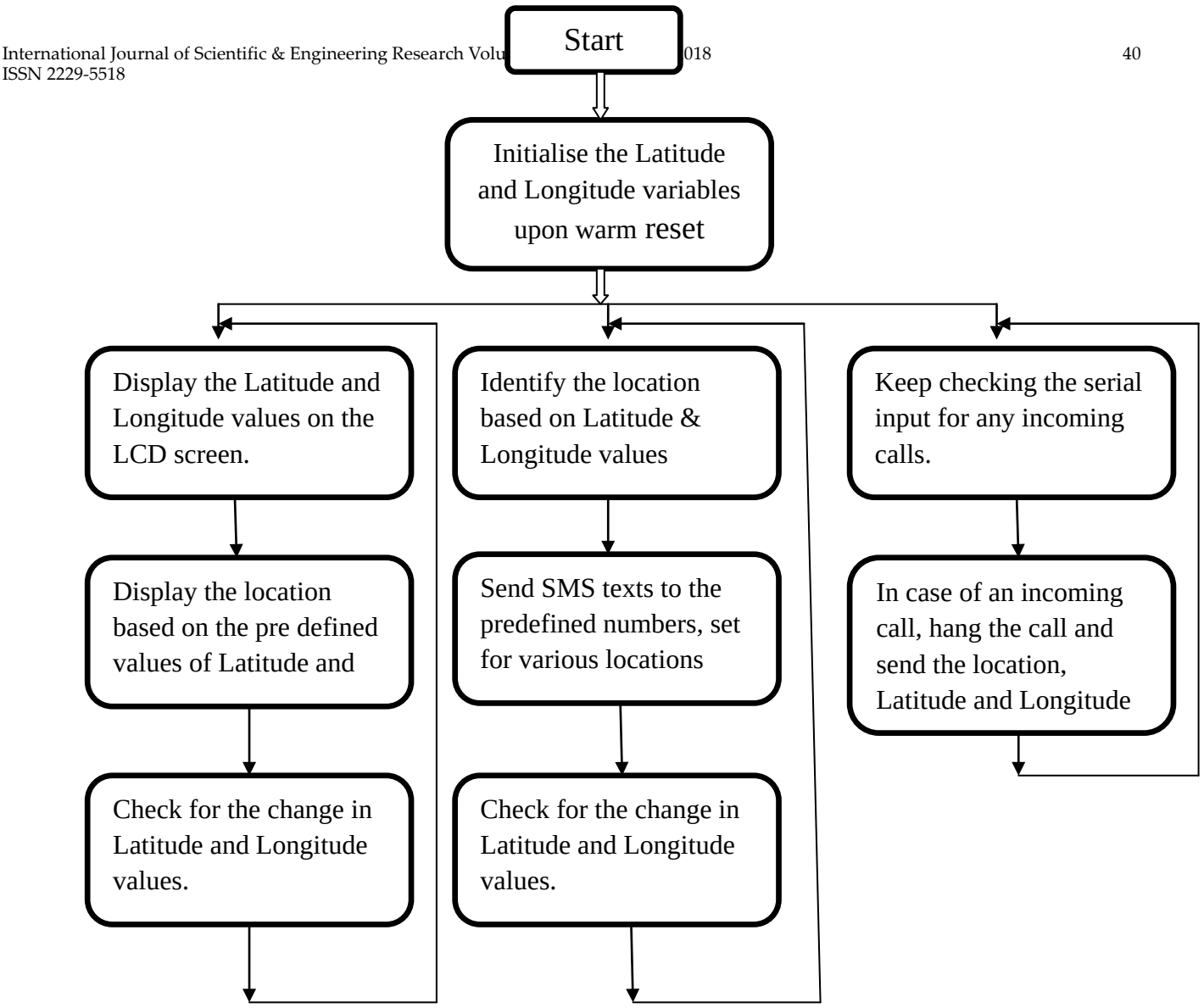

Figure 2 Flowchart for Tasks done via Multithreading

3.2 Route Discovery

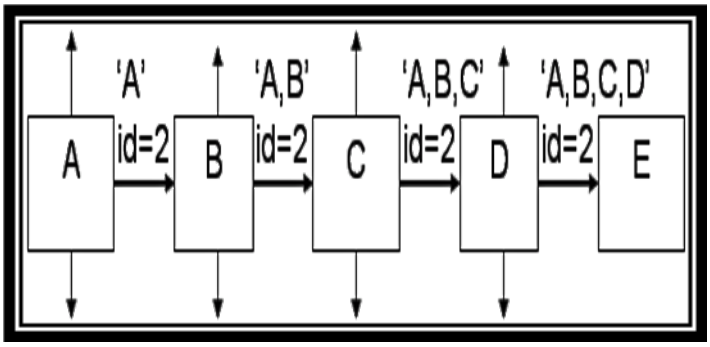

Figure 3. Block diagram of route discovery procedure

1. Node A (initiator) sends a Route Request packet by flooding the network
2. If node B has recently seen another Route Request from the same target or if the address of node B is already listed in the Route Record, Then node B discards the request.
3. If node B is the target of the Route Discovery, it returns a Route Reply to the initiator. The Route Reply contains a list of the "best" path from the initiator to the target. When the initiator receives this Route Reply, it caches this route in its Route Cache

for use in sending subsequent packets to this destination.

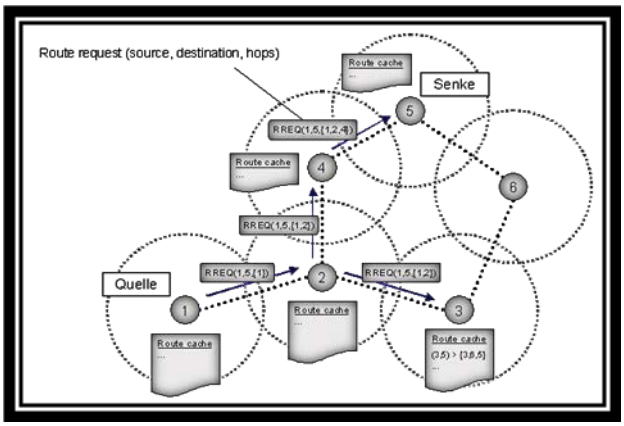

Figure 4 Path-finding-process: Route Request

3.3 Route Maintenance

In DSR every node is responsible for confirming that the next hop in the Source Route receives the packet. Also each packet is only forwarded once by a node (hop-by-hop routing). If a packet can't be received by a node, it is retransmitted up to some maximum number of times until a confirmation is received from the next hop as shown in Figure 4.

Only if retransmission results then in a failure, a Route Error message is sent to the initiator that can remove that Source Route from its Route Cache. So the initiator can check his Route Cache for another route to the target. If there is no route in the cache, a Route Request packet is broadcasted.

1. If node C does not receive an acknowledgement from node D after some number of requests, it returns a Route Error to the initiator A.
2. As soon as node receives the Route Error message, it deletes the broken-link-route from its cache. If A has another route to E, it sends the packet immediately using this new route.
3. Otherwise the initiator A is starting the Route Discovery process again.

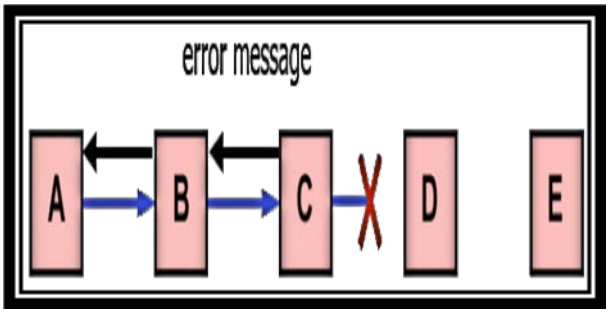

Figure 5. Block diagram of Route Maintenance

IV. RESULTS AND DISCUSSION

The Arduino IDE is used to develop the code for any type of arduino boards. It is a open source software, and consists of an editor, compiler and a serial monitor. Here, we use arduino 0022 version, which requires no installation of software.

In the Hardware implementation, a single power supply is used for both the SIM908 module and Arduino controller. The LCD display is powered up from the 5V and ground pins of Arduino controller. As the power supply employs a 7812 voltage regulator IC, the 12V power supply is ideal for both the SIM908 module and the Arduino controller. In the fig 8 and 9 the hexagon blocks denote the roadside router units and the red coloured rectangular blocks denote the various service providers alongside the road. The blue coloured blocks, on the other hand denote the vehicles i.e., the Service requesters. The blinking circles denote the transmission of data packets from the routers to vehicles, routers to service providers or vice-versa. Here, since DSDV protocol is used, every router is

updated now and often and this enables the routers to remain up to date and provide exquisite services on demand.

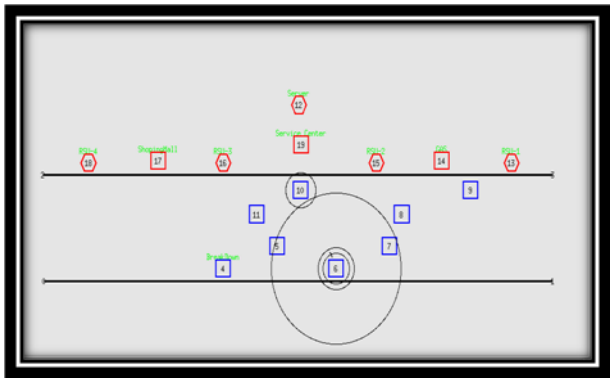

Figure 6.Vehicle notification during normal traffic

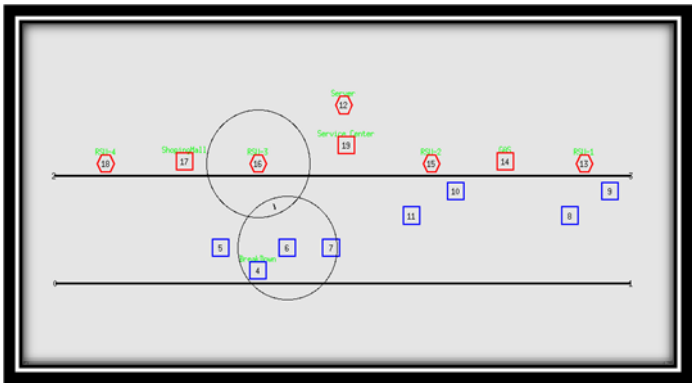

Figure 7. Vehicle notification during traffic congestion.

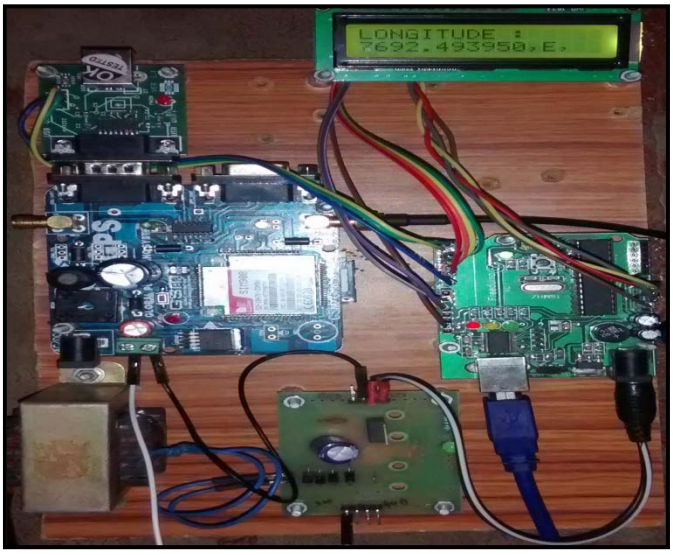

Figure 8.Hardware in transmitter unit

V. CONCLUSION

Our proposed protocols have provided vehicles with an efficient mechanism to locate service providers and how to reach them (routing) simultaneously, thereby resulting in overall bandwidth savings. They use multiple channels to exchange discovery and routing packets, which decreases congestion on single channels and reduces delay of service discovery. Our proposed service discovery protocols find services located in an RI specified in the driver request using an efficient location-based request propagation mechanism and an efficient computation of the reply. We have discussed the message complexity and the cost function computations of the EB-Loc VSDP. We have presented the performance study of our protocols with an extensive set of simulation experiments and have simulated them with the VITP using a realistic traffic pattern. A thorough study of our schemes with the existing Loc VSDP VITP has shown that our techniques greatly outperform the VITP in terms of success rate, average response time, bandwidth usage, and bandwidth efficiency.

In these days, many organizations having a large number of employees and students have started their own transport systems to assist the people for reaching the organization on time. A system that notifies the arrival of these transportation vehicles at various spots may help the people in managing their

time. Moreover, when the system also helps in tracking the vehicle, with just a cell phone will be a boon for those people.

VI. REFERENCES

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