HEART ATTACK PREDICTION IN VEHICULAR ADHOC NETWORK

Dissertation submitted in fulfilment of the requirements for the Degree of

MASTER OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

By

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Phagwara, Punjab (India)

November,2017

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TOPIC APPROVAL PERFORMA

School of Computer Science and Engineering

Program : P172::M.Tech. (Computer Science and Engineering) [Full Time]

COURSE CODE : CSE548 **REGULAR/BACKLOG :** Regular **GROUP NUMBER :** CSERGD0048

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Qualification : M.Tech (CSE) **Research Experience :** 3+ years

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SPECIALIZATION AREA : Networking and Security **Supervisor Signature:** 19372

PROPOSED TOPIC : Real-time Heart Attack Mobile Detection

Qualitative Assessment of Proposed Topic by PAC		
Sr.No.	**Parameter**	**Rating (out of 10)**
1	Project Novelty: Potential of the project to create new knowledge	7.33
2	Project Feasibility: Project can be timely carried out in-house with low-cost and available resources in the University by the students.	7.33
3	Project Academic Inputs: Project topic is relevant and makes extensive use of academic inputs in UG program and serves as a culminating effort for core study area of the degree program.	7.00
4	Project Supervision: Project supervisor's is technically competent to guide students, resolve any issues, and impart necessary skills.	7.83
5	Social Applicability: Project work intends to solve a practical problem.	7.83
6	Future Scope: Project has potential to become basis of future research work, publication or patent.	7.50

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Final Topic Approved by PAC: **Real-time Heart Attack Mobile Detection**

Overall Remarks: Approved

PAC CHAIRPERSON Name: 11024::Amandeep Nagpal **Approval Date:** 04 Nov 2017

11/30/2017 2:09:55 PM

ABSTRACT

The vehicular adhoc networks is the decentralized and nature-configuring type of network in which vehicle nodes can join or leave the network when they want. In the network, automobile to automobile and automobile to structure type of communication is possible. The event which happens in the network and that information get transmitted to road side units. The IOT is the technology which can transmit the information over the internet to take appropriate actions. A global system that includes the numerous computer networks within it is known as Internet. In order to provide communication amongst innumerable users available, the standard Internet Protocol Suite (TCP/IP) is utilized. There are numerous types of users present within these networks which include private, public, government and such other sectors. With the advancement in technology over the years, in the 1970s the Advanced Research Projects Agency Network (ARPANET) was developed which continued till the 1990s. The network of interconnected regular objects is known as Internet of Things (IoT). Within various applications that include the various universities, the IoT has been utilized in order to provide computing and networking efficiently within them. The main objective here is to interconnect all the things present within this self-configuring wireless network which includes numerous sensors. An object that gets involved within a communication chain is also present. The combination of communication capabilities which are given by the data transmission is given by these lines present. The information which is sensed by the devices will be transmitted to the nearest road side unit. In this research work, technique will be applied which will select the nearest road side unit. The information which is transmitted to road side will be uploaded to the internet. The proposed improvement leads to reduction of delay in the network.

DECLARATION STATEMENT

I hereby declare that the research work reported in the dissertation proposal entitled " HEART ATTACK PREDICTION IN VEHICULAR ADHOC NETWORK", in partial fulfilment of the requirement for the award of Degree for Master of Technology in Computer Science and Engineering at Lovely Professional University, Phagwara, Punjab is an authentic work carried out under supervision of my research supervisor Ms. Nahita Pathania. I have not submitted this work elsewhere for any degree or diploma.

I understand that the work presented herewith is in direct compliance with Lovely Professional University's Policy on plagiarism, intellectual property rights, and highest standards of moral and ethical conduct. Therefore, to the best of my knowledge, the content of this dissertation represents authentic and honest research effort conducted, in its entirety, by me. I am fully responsible for the contents of my dissertation work.

Signature of Candidate

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11605440

ACKNOWLEDGEMENT

I am using this opportunity to express my gratitude to everyone who supported me throughout the course of dissertation. I am thankful for their aspiring guidance, invaluably constructive criticism and friendly advice during this thesis work. I am sincerely grateful to them for their truthful and illuminating views on many issues related to this research.

I express my sincere thanks to my guide **Nahita Pathania** for his invaluable assistance, motivation, guidance and encouragement without which this research work will be dream. In spite of his busy schedule, he was always there to iron out difficulties which kept o aspiring at regular intervals.

I am really thankful to our **Lovely Professional University** for providing me with an opportunity to undertake this research topic in this university and providing us with all the facilities.

I am highly thankful to my friends and family for their active moral support, valuable time and advice. I am thankful to all of those, particularly the various friends, who have been instrument in cresting proper healthy and constructive environment and including new and fresh innovative ideas during project, without their help, it would have been difficult to complete dissertation within time.

SUPERVISOR'S CERTIFICATE

This is to certify that the work reported in the M.Tech Dissertation/dissertation proposal entitled **"HEART ATTACK PREDICTION IN VEHICULAR ADHOC NETWORK",** submitted by **Swati** at **Lovely Professional University, Phagwara, India** is a bonafide record of his / her original work carried out under my supervision. This work has not been submitted elsewhere for any other degree.

Signature of Supervisor

Nahita Pathania

Date: 30-11-2017

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1) **Concerned HOD:**
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   Date: _____

   Internal Examiner

   Signature: _____

   Name: _____

   Date: _____

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LIST OF ABBREVATIONS

VANET	Vehicular ADHOC Network
ITS	Intelligent Transportation Systems
OBU	On Board Unit
RSU	Road Side Unit
IOT	Internet of Things
RFID	Radio Frequency Identification
QOS	Quality of Service
LAN	Local Area Network
WBAN	Wireless Body Area Network

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CHAPTER 1

INTRODUCTION

1.1 Introduction to Vehicular Ad-Hoc Networks (VANETs)

In order to study the ad-hoc networks which are a communication technology for vehicle-specific applications in intelligent transportation systems (ITS), numerous researches have been proposed recently. There are numerous applications of ITSs which are related to the vehicle transportation. They consist of various components such as computers, communications, sensors and control techniques and management techniques. The functioning of transportation systems is enhanced by the working of these components all together. The safety and efficiency of the ground transportation networks is enhanced with the help of real-time information gathered from these systems. The warnings related to environmental hazards, and traffic and road conditions can be delivered by the vehicles with the help of VANETs. The information related to any issue such as road closure, accident, traffic jam etc. is transferred by the vehicles to other vehicles so that the driver can avoid such routes and prevent more troubles. The vehicles can distribute the information or warnings to all other vehicles through communication. The VANETs can be deployed in emergency scenarios due to their least configuration and ease of deployment characteristics. In case there is a need to assemble vehicles for help or inform the authorities regarding any serious issues the messages help in transmitting these messages [1].

There are numerous messages transmitted across the network. However, the authentication of such messages is very important which can assure that these messages are valid and not altered by any malicious users. A scenario can be taken here in which a vehicle travelling needs some kind of help and is about to run out of resources. The vehicles might ask for help and must show its permanent identity. However, an attacker that is monitoring the communication of the network might attack this vulnerable vehicle and extract all the important information that it is present in it. Without making any direct communication with the authorities, the vehicle occupants might be stranded. The vehicles will remain safe in case when the permanent identity of the vehicle is hidden from rest of the vehicles and only he

authorized personnel can view the request generated by the vehicle. This mechanism can help in protecting the vehicles from being attacked by any malicious users and provide safe environment. The vehicles are also needed to be registered with particular central authority such that any node that is malicious can be recognized easily and the problem can be dealt with. All the messages generated by the nodes thus need to represent their sources which will help in authenticating the network.

There are four basic messages used within VANETs that help in exchanging information amongst the vehicles and infrastructures. They are [2]:-

a. **Emergency and warning messages:** There are various issues that arise within the networks that cause emergency situations. The emergency messages are delivered within these conditions. The warning messages include warning related to traffic congestion, road repairing and so on.
b. **Inter-personal messages:** Within this category, the messages related to the profile of a driver and other passengers on the vehicle are included.
c. **Routing and Safety messages:** The information that is utilized by numerous routing protocols and the driving conditions is transmitted through these types of messages. The information that is related to the speed, position, direction and identity of the vehicle is gathered by the safety messages.
d. **Information and Entertainment messages:** There are messages generated for the resources and services available on the roadside infrastructure and the services that are provided by the other vehicles that are present on the road. The information relevant to the facilities available near to the required vehicles is delivered through these types of messages.

1.1.1 Characteristics of VANETs

There are some special characteristics which differentiate VANETs from other networks. Some of these characteristics are explained below:-

a. The large-scaled networks which consist of huge number of vehicles within them are known as VANETs. It is possible to register each type of vehicle within the network even with the presence of such large number of nodes.
b. On the basis of the configuration of roads, the laws of traffic and the speed limits, mobility of vehicles can change. The reasons that affect the mobility of

the vehicle are mainly the behavior and the interaction amongst the drivers. The simulation of vehicular traffic is very difficult, and it is thus used in numerous applications.

c. Because of high mobility the positions of vehicle changes very often. As a result, network topology tends to change frequently.

d. Higher numbers of resources are accessed by the vehicles within the VANETs in comparison to the mobile devices that are presented within MANETs. Here, there is a need of large number of batteries, antennas and processing power. Thus, the resource conservation mechanisms are not required within these networks [3].

e. On-board sensors like GPS is used for sensing the current location and movement of nodes.

1.1.2 Communication Types In VANET

There are three types of communication in VANET.

a. Vehicle to vehicle (V2V) - Vehicle to vehicle communication is satisfactory for small range vehicular network. Its main motive is to prevent accidents by allowing vehicles. There is no need of any roadside infrastructure. In V2V warnings are broadcast from vehicle to vehicle.

b. Vehicle to Roadside (V2R) - In this it provides communication between roadside units and vehicles. V2R communication makes use of pre-existing network infrastructure like wireless access points. At first the warning messages are send to roadside units and then to the vehicles.

c. Vehicle to Infrastructure (V2I) - Vehicle to infrastructure communication is parallel to vehicle to vehicle communication. It provides longer range vehicular networks. The V2I infrastructure needs to control on its large area reportage and requires more feature improvements for vehicle submissions.

1.1.3 VANET Architecture

The complete VANET architecture is separated into three areas which are In Vehicle domain, ad-Hoc Domain and the Infrastructure Domain. There is an On-Board Unit (OBU) and the Application Units (AUs) present within the In-Vehicle domain. There

are numerous functions performed by RSUs while interacting with OBU as they are considered to be user devices. There is a wireless communication possible amongst the OBUs and RSUs when they both are within the range of each other. As the vehicles connect to the RSUs in an ad hoc manner as per the needs, an ad hoc domain is generated. Within the infrastructure domain, the RSUs and CA are available. In substitution for CA, the RSU is placed in these networks. Multi-hop communication is needed amongst the OBUs and RSUs in case the packet is forwarded from one OBU to another which will further lead them to the RSUs.

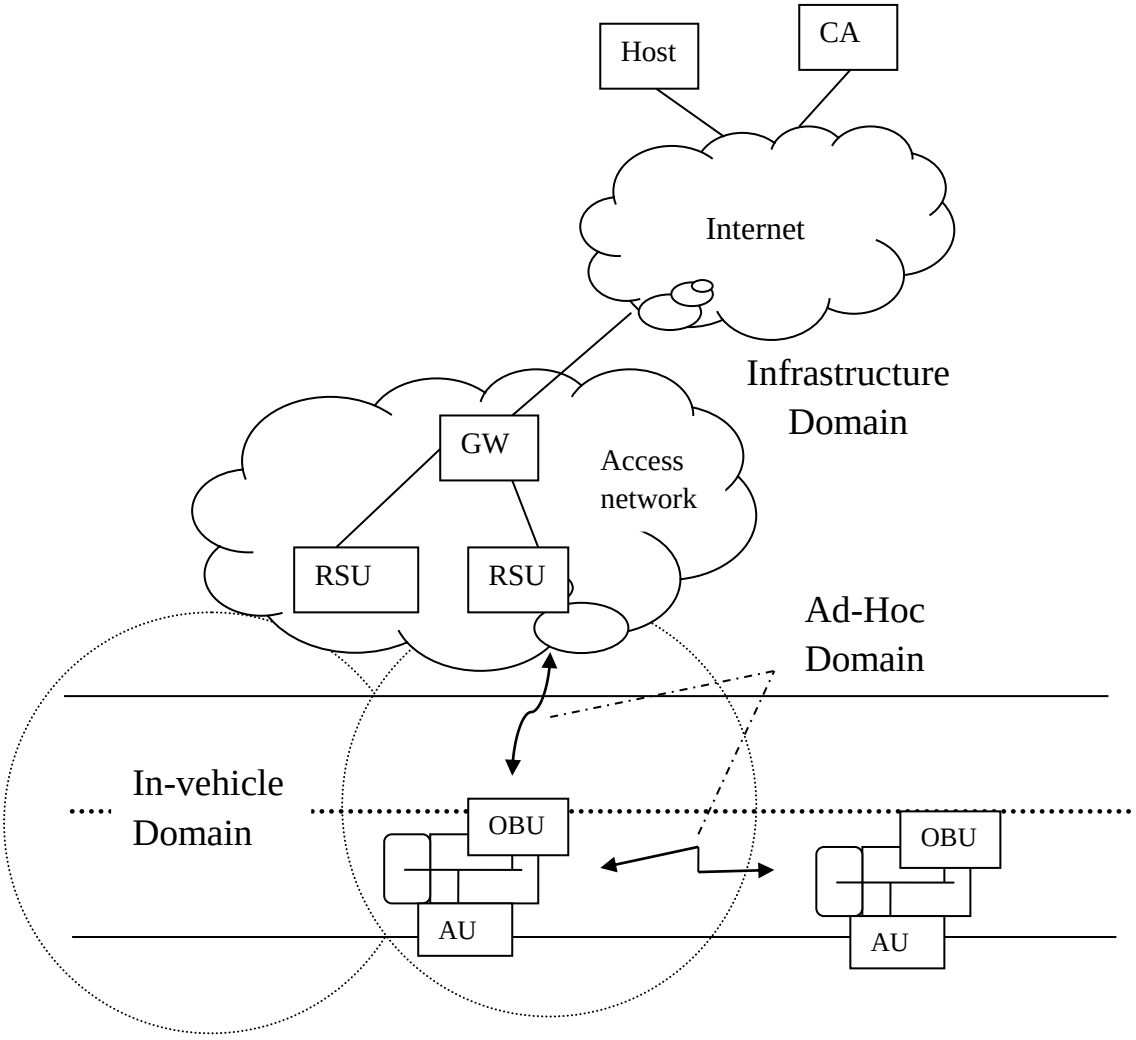


Figure 1.1: VANET system architecture

1.1.4 Routing Protocols in Vanet

In vanet there are a variety of routing protocols. Topology primarily based Routing, Position based routing/Geographic routing, Cluster based routing, Broadcast routing and Geocast routing. Topology based totally routing function packet forwarding through the use of the links that exists in the network. Types of topology based routing are Proactive, Reactive and Hybrid. Proactive protocols are table driven routing. Reactive protocols are on-demand routing protocols. Hybrid protocols reduces the control overhead of proactive routing protocol. In Position primarily based routing protocols every nodes is aware of about its neighbour via the GPS information. It does not keep any routing table. In Cluster primarily based routing protocols the automobiles which are nearer to each other form a cluster. There are two kinds of conversation in cluster primarily based which are inter-cluster and intra-cluster. In intra-cluster automobiles communication is accomplished via the usage of the direct links and in inter-cluster automobiles communicate via the cluster heads. Broadcast routing protocols are named as flooding routing protocols and the purpose behind this is that it transmit the facts to the most nodes when an accident takes place. Geocast routing protocols are also recognized as the area based routing protocols because they are used to send the messages in chosen location called as the Zone of Relevance.

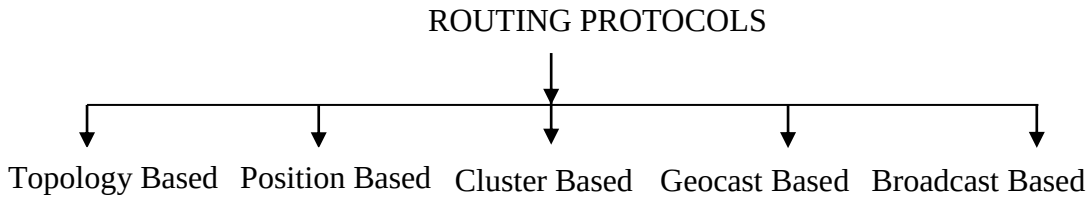


Table 1.1: Routing protocol table

1.1.5 Security Problems in VANET

The VANET packets have critical information regarding life so it is very important to make sure that these packets are not modified or altered by the attacker, like the responsibility of drivers should also be to establish that they inform the traffic environment correctly and within time. These security issues are not similar to general

communication network. The network size, mobility and geographic relevancy etc makes the implementation very difficult and distinct from other network security.

1.1.6 Various Attacks on VANET

a. **Network Attacks (NA):** These are the most important attacks. These attacks distresses the complete network. These attacks are the straight attacks over functionality of nodes and network. Attacks alike DoS, Sybil etc are the instance of this class.

b. **Application Attack (AA):** These type of attacks are essentially afraid with the evidence being shared and by the use that aided. Fake evidence, eavesdropping are examples of these type of attacks.

Classes of attacks	Prerequisites compromised
MONITORING ATTACKS	*authentication, anonymity*
SOCIAL ATTACKS	*all requisites may affected*
TIMING ATTACKS	*delay handling*
APPLICATION ATTACKS	*authentication,reliability, confidentiality, integrity*
NETWORK ATTACKS	*authentication, availability, integrity*

Figure 1.2: classification of attacks

c. **Timing Attacks (TA):** For adding some delays in messages these attacks are performed. The attacker make modification in time slots of messages.

d. **Social Attacks (SA):** All these communications or attacks that generate emotional disproportion in other drivers come into this sort. In this session of attacks disreputable messages are sent to automobiles that distract the driver and hence results into driving distraction, loss of other fundamentals of safety system.

e. **Monitoring Attacks (MA):** In these kind of attacks, attacker mutely monitors and tracks the entire system and can do malicious events based on those interpretations. All passive attacks inherit this category. Impersonation and session hijacking can also be count up under this class.

1.2 Introduction to Internet of Things (IOT)

The collection and exchange of data through inter-networking of various hardware and software components is known as Internet of Things (IoT). Within already existing architecture the objects can be sensed and controlled remotely through this technology [4]. There is a direct integration of physical environment within the computer-based systems which helps in improving the efficiency, accuracy and minimizing the overall costs. The tasks for humans are minimized to great extent within this method. When the IoT is combined with sensors and actuators, a cyber-physical system is generated. Various applications such as smart grids, smart homes, and intelligent transportation and so on are evolved from here. Every object is recognized on the basis of its own embedded computing system involved. It is however easy to provide the interoperation in the present Internet architecture. Within an IoT, an advanced connectivity of services, devices as well as systems which is higher even for machine-to-machine (M2M) communications is needed. There are numerous protocols involved along with various domains and applications within this system. There is such inter-connection amongst the embedded objects that helps them to be used amongst different fields.

1.2.1 Properties of Things in IoT

There are different sizes and types of things present within the IoT systems. There are numerous features and access capabilities also present within these systems. The properties of IoT can thus be summarized as given below [5]:-

A. Resource Granularity: On the basis of size of resources, the things of IoT can be divided into two categories which are coarse and fine resources. Depending on the complexity of structure and function, the granularity of the assets can vary. There is a basic structure and a single function present within the fine grain resources which are then categorized into sensors, controllers as well as RFID equipment's depending on the type of resources. There is a complex structure and multiple functions are involved within the coarse grain resources. A limited measure of fine-grain sensors for example has a coarse-grain car. The partitioning of coarse grain resources is done into M2M devices, sensor networks as well as various other devices depending on the type of resources.

B. Functional Characteristics: There are single and complex types of functions in IoT. There is one type of basic function within the single-function devices. Various applications utilize this function such as the sensors that are utilized to record the environmental conditions, the controller devices which can control the industrialised and home-based applications and the devices that have implanted processors which can help them to compute and process the data. There are devices and equipments which already have multiple functions in case of complex-function devices. The typical smart switches which involve both switch status insight function and switch control function are an illustration of this type.

C. Access Capabilities: There are equipments and resources present within the things of IoT which help in processing the IoT and provide huge range of information to them. For example, the single hardware and software resource can be responsible for providing communication on smart telephone or computer in order to access the IoT. Further, with the service of communication resources, the IoT can be accessed by some industrialised equipment which supports the M2M technology. There are large numbers of heterogeneous devices that do not have access abilities within the real world and are known as access controlled devices. Large number of sensors and sensor based networks for example cannot access the IoT in direct manner as there are some exceptionally restricted resources within these networks. There is a need to cooperate with particular device and networks in order to be a potential IoT access resource for accessing the IoT in indirect manner [6].

1.2.2 Access Requirements of Things in IoT

The access requirements for accessing the limited devices within IoT are explained in this section. The access requirements are needed to be defined because there are large numbers of applications in which they run and there is huge amount if important information stored within these applications. The application fields of IoT expand with increase in the access restricted devices present within IoT. The systems turn to be highly powerful and intelligent due to this system. There are mainly functional and non-functional requirements involved.

a. Functional Requirements There is a need to recognize and certify any of the access devices within IoT in initial step. For instance, when the internet is accessed by a computer device, a unique MAC or IP is utilized for delivering the content to the

required identity. There is a need of external hardware and software resources by the access restricted devices within the IoT so that they can execute their particular functions. The requirement of external communication modules can be explained here for example, which is used by the industrial controller for receiving the control direction as of the upper platform for smart control. The investigation and summarization of the access restricted devices of access functional requirements can be done on the basis of:-

a. **Identification & authentication:** The unique identification and authorization of things in IoT on the basis of specific identity. The things can be operated and viewed in independent manner with the help of this identification. A unique, traceable and controllable identification can be presented here. The registration, authentication and information transmission security related methods are required within this process [7].
b. **Environment perception:** In order to gather the surrounding information, many things are present in the environments which gather the information in direct or indirect manner. The processing information is compared and further utilized within numerous applications of IoT. The communication interface is to be set up by the access restricted devices within the environment perception. Also, there are special channels present within the perceptive terminal and service platform which help in providing certain functions. Numerous key technologies such as the depiction of resource, resource addressing and so on are included within this process.
c. **Interactive control:** There are few "things" present within the IoT which provide detailed equipment's for automatic control and management in these systems. The control channels are to be established within the control terminal and service platform by the access restricted devices so that they can provide iterative control in these systems. The business function description, service publication and key technology are provided within this process.
d. **Computing & processing:** Some "things" in IoT have computing and dispensation capacities along with the environment perception and interactive control capability [8]. A particular software and system resource is required in order to sort the access restricted devices for computing and preprocessing the

functions within the IoT systems. These systems support the data processing function along with the various other service functions.

B. Non-functional Requirements

The software and hardware resources for performance requirements are expanded by the access restricted devices within the non-functional requirements. By the hardware resources, some access restricted devices are to be prevented. There is limited amount of calculation and storage performance within some sensor networks for example. However, there is very less communication capability within some industrial controllers. The access constrained devices need to synchronise with particular software and hardware resources as the normal implementation of functions cannot be supported by hardware performance. The hardware performance is enhanced here along with ensuring the improvement in QoS.

An analysis and summary of the access restricted devices within non-functional requirements is done on the basis of:-

a. **Unified access:** The heterogeneity of the devices is to be protected when there is a need to access the restricted devices. The data format and operation processes are unified on the basis of interfaces and protocols within the IoT through this feature. A general interface design is present within the unified access along with the general adapter design and multi-protocol implementation in these systems.
b. **Platform expansion:** The limitation of resources within the external equipments and devices is a major concern. However, the access restricted devices take care of this problem. The hardware and software platform performances are enhanced along with the implementation f the function. This results in ensuring quality of service that results in enhancing the computing, storage and communication capabilities of the overall systems. Along with the maintenance of important functions, the resource consumption has to be reduced through this technique [9].

1.2.3 Applications and Things in IoT

There are numerous applications in which the IoT applications are being used today. Within the arenas of smart home, forestry monitoring, medical applications, and so on, the IoT has been deployed. The distinctive resources which are known as 'things', are accessed by numerous applications which use IoT systems within them. The numerous applications in which the IoT has been deployed are explained below:-

a. **Smart Home:** Within the applications that help in monitoring the home applications the IoT systems have been deployed lately. A control centre is present within this system along with an electrical device and agent devices. Various functions are accessed by these systems such as agent management, data transmission, access authentication as well as environmental monitoring. In order to provide the facility of device identification, the RFID technology is used here. Further, for providing data transmission services, the Bluetooth and GSM modules are utilized within these systems. Any kind of electrical device which has any kind of controlling functions can utilize these systems. The controlling functions can be handled through the deployment of such systems [10].

b. **Forestry Monitoring:** This type of application includes the monitoring of forest assets and the environment at such areas. In order to measure the environmental factors of the forest, an IoT forest ecological factors assortment platform is generated by numerous researchers. In order to process the collected GPS and clock information are conveyed to the server. This helps in gathering the effective monitoring records of the resources of forests. There are numerous sensors places within the things present in the environment. These sensors help in gathering the environmental conditions and help in extracting required information from these surroundings which can help in further analysis.

c. **Intelligent transportation:** The traffic conditions of roads are monitored within these applications so that the important information can be gathered. The collected information might help in managing the huge traffic and might also provide various help guidelines to the drivers. There are immovable roadside exposure units, on-board units, backend server and the client

terminals present within this designed system. The information is gathered from the images which are taken from the cameras deployed on roadsides. The temperature, speed and information of the location of vehicles present on road are achieved from these images. The on-board units help in providing all such important information. The collected and aggregated data is transmitted by the system to the backend server database. The 3G network is used for transmitting this information. The users that have portable terminal are provided with the information related to the traffic. The cameras are placed in order to gather the information from images. In order to perform calculations for deciding the traffic conditions and weather, the roadside units are used. Further, the environmental information is obtained from various sensors present within the things and communication is provided by 3G modules. All such information is very important for avoiding various accidents and resolving various problems within these systems [11].

d. **Smart Health:** The elderly or disabled people that are living alone and independently need help. The records of all such patients are kept in order to make sure that their health issues do not arise and they face no further problems. The details are recorded after regular intervals in order to keep the track of their health. The IoT controlled systems also provide devices which store the vaccines, medicines and other organic elements within these huge storage applications. Further, the blood pressure, weight, speed, health and steps of the sportsmen are also to be recorded so that they can be analysed.

e. **Smart Living:** The products can be sold in a better way to the customers through this application by keeping in track of the interests of customers, their choices, expiry dates and other important factors. This method can also help in saving various resources and reducing the costs of the systems. Further, the energy and water supply consumption can be monitored in order to make sure that there is no wastage of resources. In order to improve the energy consumption, the lighting and heating products are also introduced further. With the help of remote access, the remote appliances can be switched on and off so that the accidents can be avoided, and the energy resources can be saved [12].

1.2.4. Fog Servers

The infotainment data is self-motivated in nature due to which data is essentially affected by amount of users, mobility and real-time applications. In order to covenant with such issues, a large bandwidth is required in radio range. With the hottest developments on the Internet of Things (IoT), a new epoch has appeared in the Smart City domain, introductory new prospects for the enlargement of efficient and low-cost applications that ambition to improve the inferiority of life in cities. To elucidate such issue, intermediate devices (between cloud and end users) are looked-for like Fog Servers (FSs). Fog server is container type server that executed on fog device. Fog servers are the part of fog computing that help in reducing service response time and network traffic. To take advantage of fog computing, there is need to deploy a fog server on the network near user so that they can handle the service. The service response time, network traffic, and fog device's computing resources should be considered to determine the position of fog server in LAN. It has been seen that by using fog, service response time is reduced drastically as compare to cloud service processing time.

CHAPTER 2
LITERATURE SURVEY

Samr Ali et.al (2017) stated in this paper [13] that there are large numbers of researches being done in the fields of IoT due to their growing popularity. The area which is gaining popularity in very recent times is the E-health application in IoT networks. With the introduction of new concepts such as Mobile Edge Computing (MEC) which is characterized by latency sensitivity and geographical awareness, the networking and communication fields are facing problems. The programming of the network with the separation of data plane and control level is known as the Software Defined Network (SDN). This also provides global intelligence for the networks. A novel IoT e-health service is proposed in this paper by merging all such technologies. The Real-time Heart Attack Mobile Detection Service (RHAMDS) method is proposed here with the help of voice and gesture controls provided from the smart watches. The response time of emergency aid for heart attack patients is enhanced with the utilization of RHAMDS within the VANETs specifically. This helps in preventing any types of collisions amongst the vehicles. The experiments are conducted to analyse the performance of this proposed technique. It is seen through the simulation fallouts the planned method achieved improved results in comparison to the existing approaches.

Moumena Chaqfeh, et.al (2016) presented in this paper [14] that in order to provide latest services to smart cities, the IoT aims to connect the innumerable sensors present with the Internet. There might raise the progression of Internet of Vehicles (IoV) from prevailing systems which might help in delivering the numerous services to drivers. The services might be provided by incorporating the vehicles, sensors, and the mobile devices with the global network. With the aim to improve the daily lives of users by providing them solutions related to the traffics on roads, the Vehicular Cloud Computing (VCC) has been evolving. It also provided the computation resources to the VANET applications. The Intelligent Transportation Systems (ITS) are benefitted with the help of the solutions provided to various applications and services. Within the ITS, data collection is an vital part which can help in serving the online mobile systems with the help of Vehicular Cloud (VC). For introducing a data assembly

model to improve the ITS systems, a novel design of VCC is proposed in this paper. There is less participation of vehicles in dynamic VC as shown in the results achieved through the experiments conducted. This helps in providing collection of meaningful data to the users.

Prof. Dr.Saad Talib Hasson, et.al (2017) proposed in this paper [15] a clustering methods along with various road models which are the part of VANET environment. The Netlogo simulator version (5.2.1) was used in order to design, run and evaluate the proposed method. In this paper, the various performance parameters were used for analysing the performance of this proposed technique. The parameters included were throughput, endways delay, and the amount of packets received. Once all the simulations were performed, various results were achieved. It was seen through these results that the proposed method improved the existing outcomes. Within the two-way road model, the throughput and endways delay were maximized with the growth in the coverage area. Here, in all the three models, the numbers of messages being received are reduced. It is seen that with change in the pause time of the simulation, the throughput also reduces in the single-way road and junction road. However, this is opposite in the case of two-way road that has two pause times in it. Within the two-way, the number of messages being received will increase when there is 50 seconds of pause time given.

Rahul Talreja, et.al (2016) proposed in this paper [16] a method that will help in making the roads a safer place for the drivers. Here, the IoT enabled vehicles are to be used for developing the method. The trust levels of each vehicle are assessed in the proposed method along with the behavioural patterns of the drivers. A mobile Agent (MA) is also to be used here that would identify the misbehaving nodes present within the IoT based VANET system. On the basis of an assumption that all the nodes present within the vehicular networks have sensors present within them which can provide them with the necessary information related to the user and behaviour of sensors, the proposed method is established. The design required to introduce this system is laid upon the IoT infrastructure. Other vehicles can thus utilize the leanings from one of the vehicles. This results in establishing an intelligent and safer scenario for the drivers.

Mario Gerla, et.al (2014) proposed in this paper [17] the need to establish a secure environment for the drivers which can help in saving the lives of all others. There have been numerous advancements made within these applications for improving the existing systems to avoid collisions of vehicles. The communications, controls as well as the embedded systems are also to be enhanced in this model which might provide the Intelligent Vehicle Grid. The information is gathered from the environment by the vehicles and is fed to the drivers and infrastructure so that they can help in navigation and pollution control and managing the traffic. Further, various enhancements are made within the internet of autonomous vehicles as well. All the services that are needed for the autonomous vehicles are provided by the proposed method in an enhanced manner. The complete evolution of systems from Smart Vehicle Grid to Self-directed to Internet-connected Vehicles and then further vehicular cloud are explained within this paper as well.

Moeen Hassanalieragh, et.al (2015) presented in this paper [18] that the applications that are involved within the health care services are of major importance amongst all the applications that involve IoT. The information related to the physical and mental health is collected either by deploying the sensors on the body or within it. This information can only help in providing the detailed update of the patients after certain time duration. This information is attached with the new generation of smart processing algorithms. This can help in providing growth to the medicines that are being utilized from past as per the new diagnosis and provide better treatments to the diseases. This can also provide a personal treatment and management of the options that are targeted specifically at specific situations and are required by different individuals. There is an improvement in the overall outcomes which can thus minimize the costs of the systems.

Mohammed Ghazal et.al (2016) proposed a low energy baggage localization machine for real-time monitoring mistreatment mobile utility and smart-watches in this paper [19]. It moreover consists of a power management diagram with detection of battery drainage in smart tags. This system takes into consideration random time delays for a lot of correct readings with a linear deduced relation between flight time and strength requirement. They have projected a smart machine with Kalman filtered Wi-Fi fingerprinting for real-time monitoring of luggage. They scan QR codes to urge important points of the flight and to accomplice each and every baggage with the

smart tag. Two concurrent FSMs govern the operation for management of the actions of the smart tag proposed and additionally the server. By coming up with a energy administration scheme the smart tag that stops from depleting its battery before arrival to destination. For this a number of modes are designed like: - Flight Mode, landed Mode, Arrival Mode and Deep Sleep Mode. The proposed machine simulation outcomes of have an impact on on Wi-Fi network show efficient notifications traffic delivery to passengers for bags arrival by means of giving them the flight data and additionally the notification of bags as it arrives from the fusion of multi-sensor and flight information.

Rania Hamouda et.al (2015) propose a smart queue management system that gives you real-time provider request update to client's smartphones by way of victimization audio and visible feedback. The essential elements of this paper region unit client satisfaction and accelerated individual productiveness rate are at once proportional to the success of the built-in planned system at some point of a provider outlet. This approach additionally focuses on enhancing the high-quality of waited time on region through providing them a means of leisure via streamed TV audio, newspapers and downloaded magazines. In the proposed system, the unit is equipped with an NFC for scanning their NFC-equipped smartphones and a rapid response (QR) code scanner that may also scan while no longer NFC smartphones and may moreover scan the QR codes to initiate a ticket in a system. This paper [20] consists of three units that are Tickets' Registration and Verification Unit, Streaming and Queue Management Unit and AN IOT for smart Queuing. The embedded Linux board implements the queue management system using a database and net servers and enforce a text-to-speech engine that converts the board's data into audio. For streaming, they make use of internet real-time Communications (WebRTC) technology, which has recently emerged as a dominating success in web communication systems. By the implementation of this machine the user allows to make a request from virtually any place, alternatively this approach inclined to false ticket improvement wherever user request ticket alternatively now not exhibit up for his or her turn, a model of a denial of service attack.

Amir-Mohammad Rahmani et.al (2015) presents [21] the construct of Smart e-health gateway that is a bridge for medical sensors and home/hospital building automation applications for IP based networks and cloud computing platforms. By exploiting the

distinctive strategic position of gateways in IOT architectures the Smart e/Health gateway will tackle several of the challenges in ubiquitous healthcare system like energy efficiency, interoperability, and scalability and reliability issues. They have presented an idea implementation of an IOT-based remote health monitoring system in which the demo of a smart e-Health gateway referred to as UT-GATE is introduced, that has efficient local services for health monitoring application like :- local repository, compression data standardization, signal processing, protocol translation and tunnelling, Web-Socket server, firewall, data mining and notification. System demonstrator includes all data flow process from bioelectrical signal acquisition at sensor nodes for remote cloud-based aid centre and web shoppers. By facultative present computing, all the healthcare system entities (individuals, appliances, medicine) may be monitored and managed often and the IOT's property provides some way for monitoring, store and utilize health and wellbeing related data on a 24/7 basis.

Amir-Mohammad Rahmani et.al (2015) presents [21] the construct of Smart e-health gateway that is a bridge for medical sensors and home/hospital constructing automation functions for IP primarily based networks and cloud computing platforms. By exploiting the one-of-a-kind strategic position of gateways in IOT architectures the Smart e/Health gateway will handle several of the challenges in ubiquitous healthcare machine like power efficiency, interoperability, and scalability and reliability issues. They have an concept implementation of an IOT-based remote fitness monitoring device in which the demo of a smart e-Health gateway referred to as UT-GATE is introduced, that has efficient local offerings for fitness monitoring utility like :-local repository, compression information standardization, sign processing, protocol translation and tunnelling, Web-Socket server, firewall, data mining and notification. System demonstrator consists of all records go with the flow technique from bioelectrical signal acquisition at sensor nodes for remote cloud-based useful resource centre and web shoppers. By facultative existing computing, all the healthcare machine entities (individuals, appliances, medicine) may additionally be monitored and managed regularly and the IOT's property offers some way for monitoring, keep and make use of fitness and wellbeing associated information on a 24/7 basis.

Zhijing Qin et.al (2014) has introduced [23] an authentic SDN controller design via victimization IOT Multinetwork who's central, a alternative characteristic is that the layered primarily based architecture that approves flexible, effective, and efficient management of task, flow, network, and resources. They gave a novel view of duties and sources in IOT environments, and embellish how the gap will be unified between summary high-level duties and unique low-level network/device resources. A variant of Network Calculus model is developed to precisely estimate the end-to-end flow overall performance in IOT Multinetwork, for serving a novel multi constraints flow scheduling algorithm beneath heterogeneous traffic sample and network links. By Simulation-based validations, they have shown that the proposed go with the flow scheduling algorithm gives higher performance whereas evaluating with current ones. The linguistics modelling strategy performs useful resource matching and the GA-based algorithm schedules flow. This novel layered controller structure helps heterogeneity and flexibility is of predominant significance to successfully manage IOT Multinetwork.

Bundang-Gu et.al (2015) has been proposed in this paper [24] a novel SDN-based architecture which supports the Fog Computing for safety and non-safety services. Resource management and Fog coordination fashions are regarded right here to construct the Fog framework for this SDN-based VANET. Data streaming and Lane-Change help offerings are illustrated in this architecture. By thinking about specific properties of BS and RSUC this model that are cooperative with SDN Controller for network information which optimize the useful resource utilization and service hosting, migration and replication. At second course to format protocols at SDN controller for optimizing information forwarding rules modification, to enhancing load-balancing approach and decreasing service latency via the utilization of the available assets in BSs, RSUCs and OBUs built-in in vehicles. The third ought to be a backup/feedback mechanism in case of failure between automobiles to SDN controller for retaining the services. To simulate test-bed for SDN-based machine more than a few simulator can be used such as ns-2, ns-3 and SUMO and actual test-bed could be built the usage of a variety of switchboards.

Flavio Bonomi et.al (2012) have explained the primary traits of Fog Computing, a platform to supply a prosperous portfolio of new offerings and functions at the side of the network. We visualize the Fog to form unifying platform, which is prosperous

enough for handing over this novel breed of rising offerings and allow the improvement of new applications. The IOT architecture is designed to function Fog Computing at edge locations. This paper [25] additionally described the function of Fog computing in a variety of eventualities like: - Connected Vehicles, Smart Grid and Wireless Sensors and Actuator Networks. They welcome production on the vital body of work ahead: 1) Architecture of this massive infrastructure of compute, storage, and networking devices; 2) Orchestration and useful resource management of the Fog nodes; 3) Innovative offerings and functions to be supported by way of the Fog.

Robert Richer et.al (2015) in this paper [26] a novel wearable gadget with the functionality of measuring the user's cardiac features at some stage in the day, from one-time heart rate measurement following non-stop ECG monitoring. Various smartphone software points were combined with the probabilities of wearable gadgets like Google Glass and smart-watches primarily based on Android Wear. In addition, novel human pc inter-action principle have been integrated for increasing usability and also grant a feasible solution for day by day usage. Each element was designed for shaping an built-in gadget that are encountered at some stage in day by day usage. Google Fit platforms permits a subsequent supervision and storing the obtained information in the interior database for the user as properly as physician. By using the developed gadget for cardiac monitoring it outcomes in each qualitative and quantitative evaluation that is useable for each day life. DailyHeart is included as an extension for future work to beautify the range of features.

CHAPTER 3

PRESENT WORK

3.1 Problem Formulation

There are multitude technologies developed by different automobile companies and independent researchers that aim to improve the safety and security of the automobile drivers. Modern automobiles are equipped with hi-tech gadgets, sensors and peripherals that aim to improve the safety and ride-control of the driver. In addition, with the development of modern computing and internet facilities, the modern cars are able to provide state-of-the-art experience to the passengers.

Over the last few decades with the explosion of the number of automobiles on the road, the number of car accidents and casualties has been on the rise. With about 1.3 million of people every year dying in road accidents and hazards **("Road traffic deaths", 2017)**, it is undoubtedly a domain where extensive research and development is pivotal. Out of which, 26% of the road accidents occur due to heart attacks to the drivers **("Car Accidents and Heart Attacks in Personal Injury and Wrongful Death Cases - Palm Coast Injury Law", 2017). Henceforth, it is a rudimentary requirement to develop improved car safety solutions that can effectively and efficiently track the health condition of the car driver.**

Incidentally, the focus of automobile engineering has been solely on the driver safety, and with the introduction of a number of security features, the number of automobile casualties can be drastically decreased. Although, modern vehicles are equipped with features such as: GPS (Global Positioning System), augmented reality display, and integration with smartphone devices. However, there is no dedicated facility in the automobiles that can track the physical health condition of the driver or the passengers. Contrarily, various smartphones and smartwatches are equipped with health n sensors such as: heart rate monitor, temperature monitor and calorie counter that can be used by individuals to track their health status on the go.

The vehicular adhoc networks is the self-configuring type of network which can join or leave the network when they want. The vehicle can converse with each other to interchange information with each. The vehicles will pass the sensed information to

the servers which can take required actions as soon as possible. The internet of things is the technology which can pass the information to the internet. In the base paper, technique is proposed which will detect the heart failure and pass this information on the internet. The information is gather by the ambulance services and take the patient to the hospital from the road which is clear and shortest. In this research work, technique will be proposed for heart attack prediction and the efficient path establishment from source to destination which has least congestion and establish path in least amount of time.

3.2 Scope of Study

The vehicle ad-hoc networks are the sort of network in which vehicles to vehicle and vehicle to infrastructure type of communication is possible. The vehicle to vehicle communication can be done to exchange information like MAPS, real time data etc. In the second type of communication the vehicles can exchange information with the road side units. The internet of things is the technology in which the information can be broadcasted on the internet correspond the broadcasted information required actions can be taken. The base paper of the research work is based on the vehicle adhoc network and internet of thing technology. In the base paper, technique the sensitive information like any accident which occurred will be sensed by the vehicle node. The vehicle node selects the nearest road side unit, the road side units will be connected to server throughput which information get published on the internet. When any accident occurs, the ambulance needs to reach the accident area to take patients to the hospital. The efficient and shortest path will be established to take the patients to the hospital. The efficient selection of the road side unit is required which can broadcast the information to the internet with minimum delay in the network.

3.3 Objectives

Following are the various objectives of this research work:-

1. To propose improvement in the VANETs and IOT based approach for the selection of appropriate road side unit with zone selection approach.

2. To propose zone algorithm by using the concept of expected zone and predicted zone in the network. Technique will compare the threshold values for selecting appropriate RSU.

3. To compare performance of proposed algorithm with existing in terms of delay, throughput and packet loss.

3.4 Research Methodology

3.4.1 Tool Description:

NS2: In order to analyze the presentation of the model that is deployed by the researcher, the simulation is performed. It helps in computing the performance of the proposed technique when it is applied in real time scenario. There are two types of simulators. They are event based and time based simulators. An event based simulator in which the generated events are triggered within a certain time duration is known as network simulator version two. The network models are simulated with the help of this network simulator. There are some latest versions derived for this network simulator with the advancement in research. The version with higher compatibility with Ubuntu 12.04 is NS2-2.35. Both text and animation based simulations are performed within this simulator. There are two outputs generated when the object oriented language is executed. The initial output is the .tr file which is also known as the trace file. Here the text base simulation is saved within this output. Further, the second output is in the form of .nam file. This results in providing animation based simulation. There are numerous applications that utilize this simulator as there is no other simulator which can provide both text-based and animation based simulations for various applications.

This research is based on the heart attack prediction in vehicular ad hoc networks and Internet of Things. To predict the heart attack, in the base paper, technique has been proposed in which the person wears a band on their hand which will monitor its heart beat and predict the chances of heart attack. When the chances of heart attack are high, or person gets affected with the heart attack, then the vehicle will inform to its nearest RSU. The RSU will take the appropriate action to take that person to the nearest hospital. The technique will be proposed in this work which will predict the heart attack in the least amount of time. To predict the heart attack, the technique of

wireless body area network will be used. In the WBANs, the sensors are deployed on the human body which will monitor the human body condition like body temperature, heart rate and so on. When the heart rate goes to certain threshold value then, the chances of heart attack are declared, and this information will be conveyed to the nearest RSUs. The RSU will take appropriate action to send this person to the nearest In the vehicular adhoc network, vehicle to automobile and vehicle to infrastructure conversation is accessible for communication. To vehicle to vehicle communication is on hand to trade vital records between vehicles. To set up route between a number of automobiles a variety of routing protocols had been proposed which are of reactive and proactive type. The reactive routing protocols had extremely good performance in VANETS which use the broadcasting approach for route establishment. The broadcasting approach will enlarge delay in the network and network resource consumption enlarge at consistent rate. To minimize delay in the network, the approach of multicasting had been proposed. The following are a variety of assumptions of the proposed technique:-

1. The network will be deployed with the constant number of nodes and roads shape already defined.
2. Every node are accountable to hold the table of its adjacent nodes.
3. Some nodes in the network are predefined as root nodes for multicasting nodes.

In the proposed technique, in the whole network we outline some nodes which are root nodes, beneath these root nodes we will defines the leaf nodes. The leaf node comes under which root that will be determined by way of prediction based approach for multicasting.

Figure 1.3: root node define in the network

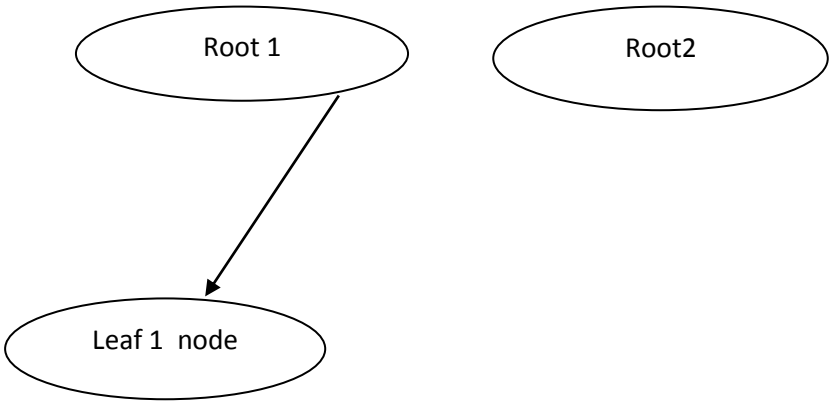
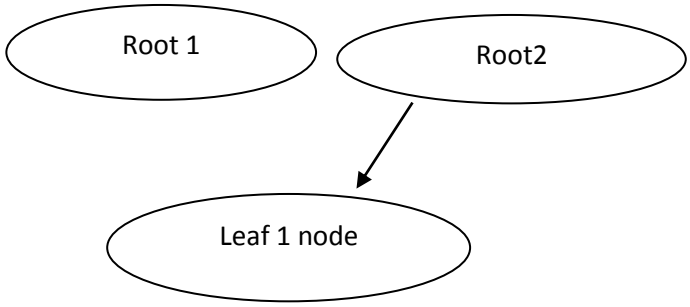


Fig : new node join the network which comes beneath the origin node 1 which can be utilized with regards to the distance and time formulation with the use of the prognostication based technique. Taking an example relating to the destination node moves and comes in the collection of origin node 2 and then destination node 1 will merge the root node 2. On the basis of distance formula used we can decide which leaf node comes will come under the origin node. when distance will much larger than the already predefined distance then only we can choose the threshold value The maximum distance will be described, then handoff takes place. two



The space between the nodes is conserved by the origin node. The origin nodes can be utilized to uphold routing table and information about their destination nodes are stored. Origin nodes utilize this preserved information to RSU's and before demanding for way towards the destination. The main node establishes a connection with the RSU and a way can be established. The main node directs route request packets to only those root nodes, which have access to desired leaf node.

The vehicle adhoc network is the type of network in which vehicle can exchange information with each other and also road side units are involved in the

communication. The information which is exchanged between the road side units will be broadcasted on the internet. The selection of the most appropriate road side unit is the critical issue which will be resolved in this research. To select most appropriate road side unit, whole network will be divided into zones. The two zones are selectedwhich are expected zone and predicted zone. The predicted zone is the zone in which road side unit is available but can be busy which increase delay in the network. The expected zone is the zone in which RSU is free and broadcast the information in the least amount of time. The RSU which has free will be selected as appropriate which broadcast information on the internet.

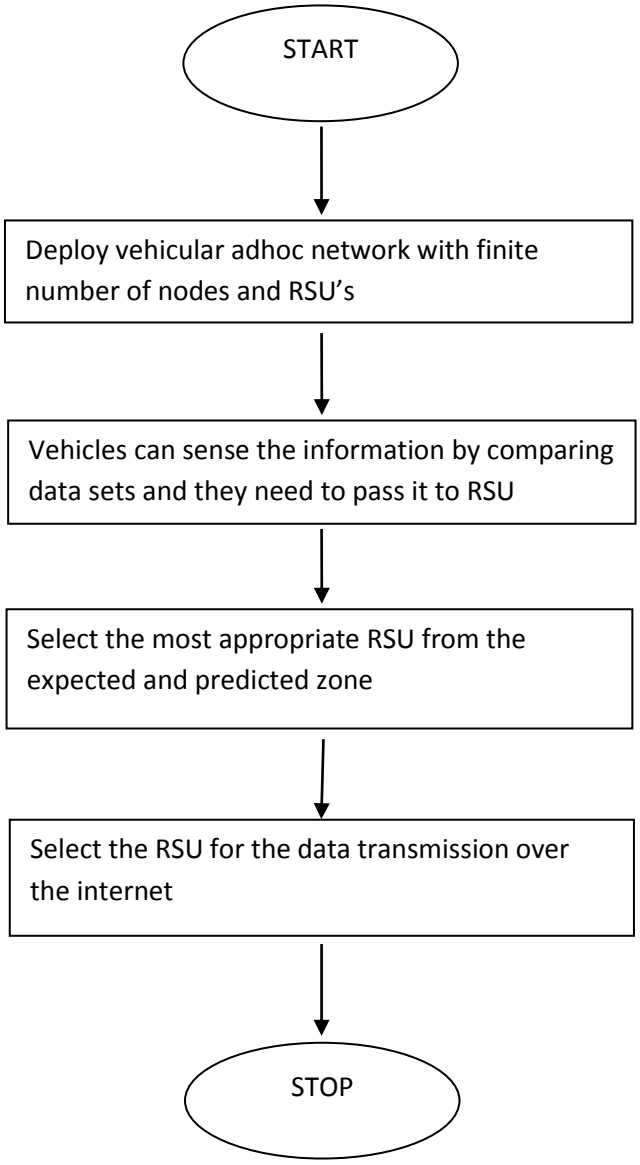


Figure 1.4: Proposed flowchart

3.5 Expected Outcomes

Following are the various expected outcomes of this research:

1. The proposed technique is based on to transmit the sensed information to the RSUs in the least amount of time. This leads to reduce delay in the network and increase reliability of the model.

2. The second improvement will be based on predicting the heart attack of the patient. This will increase the prediction rate of the proposed model.

CHAPTER 4

CONCLUSION

The vehicular ad hoc network is the decentralized type of network in which vehicles can communicate with each other and also they can communicate with the road side units. The RSUs are connected to the virtual servers which can upload the information to the internet. This research is based on to transmit the information to the RSUs with least amount of time. In this work, we will also consider the parameters to predict heart attack of the driver. The proposed improvement leads to increase reliability of the system and reduce delay of the network.

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