

**AN EFFICIENT HEALTHCARE MONITORING AND PRE-EMPTIVE AMBULANCE
CONTROL THOROUGH TRAFFIC SIGNALS**

PROJECT REPORT

Submitted by

Vasanthan V (211616205108)

Selvabharathi S(211616205094)

Teja Sai Vignesh D(211616205106)

in partial fulfilment for the award of the degree

Of

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY



RAJALAKSHMI ENGINEERING COLLEGE, THANDALAM

SEPTEMBER 2020

ANNA UNIVERSITY: CHENNAI 600 025

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report titled "AN EFFICIENT HEALTHCARE MONITORING AND PRE-EMPTIVE AMBULANCE CONTROL THROUGH TRAFFIC SIGNALS" is the bonafide work of "VASANTHAN V (211616205108), SELVABHARATHI S (211616205094) AND TEJA SAI VIGNESH D (211616205106)" who carried out the project work under my supervision.

SIGNATURE

Dr. L.PRIYA

HEAD OF THE DEPARTMENT

Information Technology
Rajalakshmi Engineering College,
Rajalakshmi Nagar, Thandalam,
Chennai- 602 105

SIGNATURE

Mrs.S.SREE SUBHA

SUPERVISOR

Information Technology
Rajalakshmi Engineering College,
Rajalakshmi Nagar, Thandalam,
Chennai - 602 105.

This project report is submitted for the University Project Viva-Voice held on 22-09-2020

INTERNAL EXAMINER

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

We thank the Almighty God for the successful completion of the project. Sincere thanks to our Chairman **Mr. S. MEGANATHAN B.E, F.I.E.**, for his sincere endeavour in educating us in his premier institution.

We would like to express our deep gratitude to our beloved chairperson **Dr.(Mrs.)THANGAM MEGANATHAN, Ph.D.**, for her enthusiastic motivation which inspired us a lot in completing our project.

We also express our gratitude to our principal **Dr.S.N.MURUGESAN,Ph.D.**, who helped us in providing the required facilities for completing the project.

We would like to thank our Head of the Department of Information Technology and the project coordinator **Dr.(Mrs.) L.Priya, Ph.D.**, for her invaluable guidance and encouragement for completing the project.

We are also thankful to **(Mrs.) S.Sree Subha, M.Tech** Department of Information Technology for her invaluable guidance, ideas, and encouragement for the successful completion of this project.

ABSTRACT

Monitoring the pulse, heart beat rate and oxygen levels of a person in an ambulance and then shifting the person to the emergency ward and then continuing the monitoring is what being done usually. The monitoring is stopped in the time when the person is shifted from the ambulance and admitted in the emergency ward. This is a big disadvantage because there is chance of drop in oxygen or pulse levels at any particular time. We eliminate this disadvantage by installing pulse sensor , temperature sensor , gps , pressure sensor , gas sensor in the stretcher itself and all these can be connected to a person's body and can be monitored continuously . All these data are displayed in a webpage using IOT. The same stretcher can be used in emergency ward and the data of the person is not lost at any time period. Using nrf sensors , the ambulance makes a communication with the traffic signals located on the way of the ambulance and makes it to turn green until the ambulance passes through it. Therefore the ambulance can reach the hospital soon.

CONTENTS

Chapter no.	Title	Page no
1.	INTRODUCTION	9
	1.1. General	
	1.2. Objective	
	1.3. Organization Of The Project Report	
	1.4. Conclusion	
2.	LITERATURE SURVEY	12
	2.1. Introduction	
	2.2. Related Works	
	2.3 Conclusion	
3.	SYSTEM ANALYSIS	15
	3.1. Introduction	
	3.2. Existing System	
	3.2.1. Limitation Of Existing System	
	3.3. Proposed System	
	3.3.1. Module 1- Monitoring Of Vital Data	
	3.3.2. MODULE 2- Real-Time Transfer Of Data Using IOT	
	3.3.3. MODULE 3-Pre-Emptive Ambulance Control	
	3.3.4. Advantage of Proposed System	
	3.3.5. Application of Proposed System	
	3.4. Hardware And Software Requirements	
	3.4.1. Hardware Requirements	
	3.4.2. Software Requirements	
	3.5. Technologies Used	
	3.6. Conclusion	

4.	SYSTEM DESIGN	20
	4.1. Introduction	
	4.2. System Architecture	
	4.2.1. Bpm	
	4.2.2. Temperature	
	4.2.3. Oxygen level	
	4.2.4. Arduino Uno	
	4.2.5. Nrf Sensor	
	4.3. Use Case	
	4.4. Conclusion	
5.	SYSTEM IMPLEMENTATION	24
	5.1. Introduction	
	5.2. Snapshots	
	5.3. Conclusion	
6.	SYSTEM TESTING	27
	6.1. Introduction	
	6.2. Types Of Technology Used	
	6.2.1. Unit Testing	
	6.2.2. Functional Testing	
	6.2.3. Performance Testing	
	6.3. Conclusion	
7.	CONCLUSION	29
8.	REFERENCES	29
	APPENDIX	

LIST OF FIGURES

Figure No	Name of the figure	Page No
1	Pulse sensor	16
2	Gas sensor	16
3	Temperature sensor	16
4	Pressure sensor	16
5	Node MCU(microcontroller)	16
6	Data in webpage	16
7	Bluetooth module	17
8	NRF24L01 sensor	17
9	Arduino UNO(microcontroller)	17
10	System architecture	20
11	Use case	22
12	Displaying vita data's in webpage	24
13	Android application for traffic light control	25
14	Project model	25

LIST OF ABBREVIATIONS

ACRONYM	EXPLANATION
BPM	Beats per minute
UML	Unified Modelling Language
DFD	Data Flow Diagram
GPS	Global Positioning System

CHAPTER 1

INTRODUCTION

1.1. GENERAL

The ambulance plays a major role in saving lives. There are a lot of hindrances in the way of an ambulance reaching the hospital. One such important hindrance is the traffic. The traffic in the way of ambulance needs to be cleared. To resolve this problem many technologies have been introduced. One such technology is the use of RFID. But the problem with the RFID's is that communication between ambulance and traffic signal occurs only when the ambulance is too close with the traffic signal. To encounter this drawback we are using Nrf sensors(Near-far communication) in our proposed system . This nrf sensors is attached with the ambulance and with the traffic signals. When the ambulance comes near the traffic signal , the corresponding traffic signal turns green until the ambulance passes through it. Even in a 4 way junction road , the corresponding traffic signal is turned green and other traffic signals are not disturbed . Thus the proposed system helps the ambulance to reach the hospital on time.

Another problem that happens in an ambulance is monitoring the vital data such as heart beat rate, temperature , pressure within the ambulance and the problem in this is the data is not continuously monitored . The data is not monitored when the person is shifted from the ambulance to the emergency ward. To encounter this problem we have come up with a solution wherein all the sensors like the heart beat rate sensor , pressure sensor , humidity sensor are all situated in the stretcher itself. And this stretcher is carried to the emergency ward . Such that there is continuous monitoring of data, We ensure that the data is not lost in the middle .

Internet of Things (IOT) is a rising technology. Using IoT, we enable a real time data transfer of the data that is being monitored in the ambulance. This helps the doctors in the hospital to do the suitable treatment according to the levels of data. This also helps the doctors to guide the paramedics in a most efficient way.

1.2. OBJECTIVE

The objective is to

- To monitor the oxygen , temperature , pulse , BPM , GPS of a person in emergency .

- The monitoring is done in the stretcher itself so the monitoring of data is not lost when the person is shifted from the stretcher to the emergency ward
- The location is updated to the nearest police station.
- To eliminate the waiting time of ambulance in traffic signals.

1.3. ORGANIZATION OF THE PROJECT REPORT

Literature Survey

The Chapter 2 deals with the explanation of the various reference papers that were used is present. It gives the name of the author and their techniques that were used.

System Analysis

The Chapter 3 deals with an explanation on the proposed system is given. A detailed explanation on the architecture of the proposed system along with the workings of each module. A detailed explanation on the various testing that were performed and the experimental results are given.

System Design

The Chapter 4 deals with System Design that describes the System Architecture and various explanation of the module.

System Implementation

The Chapter 5 deals with System Implementation that describes various algorithms used along with the snapshots of the algorithms used.

System Testing

The Chapter 6 deals with System Testing that deals with a detailed explanation on the various testing that were performed and the experimental results are given.

1.4. Conclusion and Future Work

The Chapter 7 deals with an overall review of the report along with work that can be implemented in the future.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is a survey of sources on a specific topic. It provides an overall view of the knowledge, allowing us to identify relevant theories, methods, and gaps in the existing research. A good literature review not only summarize sources it analyses, synthesizes, and critically evaluates to give a clear picture of the state of knowledge on the subject.

2.2 RELATED WORK

Aprita K.M et al. proposed a system [1] that aims at collecting and sending the patient's information to the hospital prior to the patient. Apart from the basic equipment present inside most of the ambulances like emergency medical kit, two types of stretchers , defibrillator , portable oxygen cylinder , glucometer, ECG and ventilator this health monitoring system for ambulance will also continuously monitor the patient's vital health parameters using various sensors . This system reduces the time wasted in fulfilling hospital formalities.

Syed Misbahuddin et al. proposed a system [2] that stores real – time data locally for a short time for the observation of on-board paramedics . The data is also displayed graphically on an LCD screen of the host computer. The hospital emergency room staff may observe the patient's vital signs generated from the ambulance in real time while the patients are in transit to the hospital's emergency room. The doctors can access the patient's health conditions and may communicate with the paramedics inside the ambulance to stabilize the patients. The proposed system using Internet of Things (IoT) for real-time data transfer . The proposed system does not have a preemptive traffic control system.

Qurrat UI Ayan et al. proposed a system [3] that presents design of a monitoring system for emergency patient even during transportation to hospital in an ambulance. A low-power , wireless , wearable physiological monitoring system implemented using with the help of embedded system , sensors , IOT and GSM technology . This project performs three main functions. First one is monitoring the health of the patient ; second one is tracking the Ambulance which is carrying the patient and third one is to send above two details to the Hospital or Doctor using GSM and the vital parameters values to the cloud using Wi-Fi Technology .

Elangeswari et al. proposed a research [4] in which first a semantic data model is proposed to store and interpret IOT data. Then a resource-based data accessing model (UDA-IOT) is designed to acquire and process IOT data ubiquitously to improve the accessibility to IOT data resources. Finally, an IOT based system for emergency medical services is developed to demonstrate how to collect , integrate and interoperate IOT data flexibility to provide support to emergency medical services is developed .

S. Dhivya et al. proposed a system [5] to control traffic light signals using IOT. It helps the ambulance to reach the hospital soon and also save the patient life. It is also used to send location of the ambulance reach the traffic signal for prior arrangements to manage the traffic. The major role of this project is control the traffic lights from the ambulance and make clearance for its way of path automatically without any disturbance of public . The project is used to save the time of delay in most efficient way to save life .This system uses a timer and arduino for traffic signal control. Problem with traffic signal control may occur in a 4 way junction.

Irin Sherly et al. proposed a system [6] that connects the ambulance with the IOT which has biomedical sensors like the heartbeat rate sensors, temperature sensors , ECG sensors that will sense and detect the injured person's health conditions and update these information to the nearby hospital server . And also this system has a finger print scanner that takes the finger print of the injured person and sends to the hospital server and the server will search for the injured person's fingerprint in the cloud and fetch the personal details of the person then automatically registers the patient's admission form .

S.N.Sivaraj et al. proposed a system[7] that consists of two important things . The first sections is the basic information and condition of patient is collected in the ambulance by the means IOT (Internet Of Things) and make it available to hospital before ambulance reaches the hospital .The second section is control traffic lights from the ambulance and makes clearance for its path automatically .Thus this project allows us to save the time of major delay aspects in more efficient and economical manner and save the life .

Deepali Ahir et al. proposed a system[8] with Intelligent Traffic Control System for ambulance . The proposed system clears the traffic congestion y turning all the red lights to green on the path of the ambulance, hence helping in clearing the traffic providing way towards its destination. The system consists of an android application which registers the ambulance on its network. In case of emergency

situation , if the ambulance holds on its way , the application sends an emergency command to the traffic signal server and also the direction where it wants to travel along with this the current position with the help of Global Positioning System . The nearest signal is identified based upon the current position of the ambulance . And that particular signal is made green till the ambulance passes by and later it regains its original flow of control. In this way it acts like a lifesaver project as it saves time during emergency y controlling the traffic lights. Problem occurs when the ambulance crosses a 4 way junction.

Syed Mohd Faisal Malik et.al proposed a system [9] that helps in navigating the traffic by using a decisive algorithm and round robin algorithm to find the Optimum path through the traffic . Raspberry Pi is used to manage all components collectively and individually. Total traffic in a region is determined by the help of IR sensors which used RFID to distinguish high priority vehicles such as ambulance and VIPS from day to day traffic.

2.3. CONCLUSION

This concludes the Literature Survey report on the various reference papers that have been used

CHAPTER 3

SYSTEM ANALYSIS

3.1 INTRODUCTION

System analysis is a process of collecting, interpreting facts, identifying the problems, and decomposition of a system into its components. System analysis is conducted for this purpose to study the system or its parts in order to identify its objectives. It consists of problem-solving techniques that improves an existing system and ensures that all the components of the system work efficiently to accomplish their purpose in comparison with a proposed system.

3.2 EXISTING SYSTEM

The existing system has the devices that measures pulse, BPM and oxygen levels in the ambulance. The data is lost when the person is shifted from the ambulance to the ICU room. There is no continuous monitoring of vital data. In the existing system , the ambulances travels in the normal route and gets struck in the traffic .

3.2.1 Limitations of Existing System

- The data is lost when the person is shifted from stretcher to the ambulance
- Ambulance need to wait in the traffic signal till it turns green
- Wastage of time and not monitoring the data in the time internal of arrival of ambulance till the admission time
- Location of ambulance is not updated neither to the hospital nor to the police station.

3.3 PROPOSED SYSTEM

3.3.1 MODULE 1 – MONITORING OF VITAL DATA

The vital data such as temperature, heart beat rate and pressure of a person in emergency is measured using the heart beat sensor, pressure sensor, temperature sensor, respiratory sensor. These sensors are attached to the stretcher itself in the ambulance. The same stretcher is used in the ambulance too.



Fig (1) Pulse sensor



Fig (2) gas sensor



Fig (3) temperature sensor



Fig(4) pressure sensor



Fig(5) nodeMcu(MC)

3.3.2 MODULE 2 – REAL-TIME TRANSFER OF DATA USING IOT

Using IOT, we display the vital data in a webpage dynamically. The values get updated automatically without refresh. This technique enables the doctor to know about the patient before the patient arrives in the hospital. This also enables efficient communication between the doctor and the paramedics

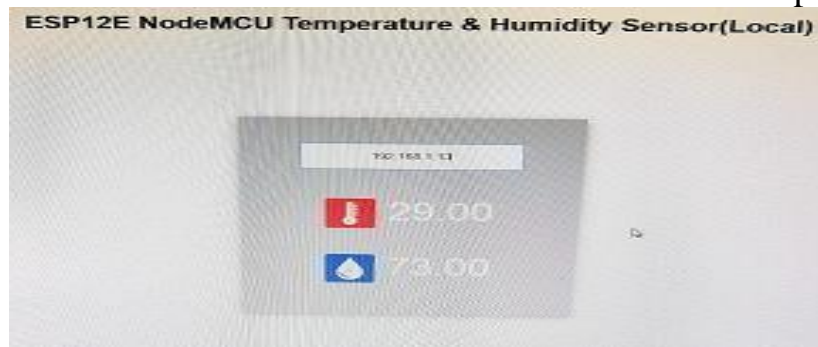


Fig (6) data in webpage

3.3.3 MODULE 3 – PRE-EMPTIVE AMBULANCE CONTROL

Using NRF sensors attached in the traffic signals and the ambulance, the traffic signal in the way of ambulance can be turned green until the ambulance passes through the traffic signal



Fig (7) Bluetooth module



Fig (8) NRF24L01 sensor



Fig (9) Arduino-Uno(Microcontroller)

3.3.4. Advantages of proposed system

- In Existing system, the ambulance waits in traffic. There is no live monitoring of the patient's data.
- In the proposed system, the ambulance driver can turn the signal green when he approaches the corresponding signal. The live monitoring of data helps the doctor to plan the treatment before the patient arrives in the hospital .

3.3.5. Applications of proposed system

- The stretcher has pulse sensor , GPS , temperature , pressure and gas sensors attached along with it .The sensors on the stretcher can be connected to the person placed on the stretcher. The same stretcher is carried into the emergency ward. This ensures that the data is not missed anywhere. Continuous monitoring of oxygen, pulse and temperature of a person easily

facilitates the doctor to give the suitable treatments. The ambulance location is continuously sent to the nearest police station. The traffic signal located on the way of the ambulance is turned on green till the ambulance passes through.

3.4 HARDWARE AND SOFTWARE REQUIREMENTS

According to IEEE standard 729, a requirement is defined as follows:

- A condition or capability needed by a user to solve a problem or achieve an objective
- A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification or other formally imposed documents.

3.4.1 Hardware Requirements

- Node mcu
- Gas sensor
- Pulse Sensor
- NRF module
- Temperature sensor
- Arduino UNO

3.4.2 Software Requirements

- Arduino Software
- Android Studio

3.5. TECHNOLOGIES USED

- Internet of Things
- Android

3.6. CONCLUSION

In this chapter our conclusions related to each theme we introduced at the start of the report is addressed. These conclusions reflect detailed analysis of the system and the requirements for adequate support is also gathered for further implementation.

CHAPTER 4

SYSTEM DESIGN

4.1 INTRODUCTION

Systems design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development.

4.2 SYSTEM ARCHITECTURE

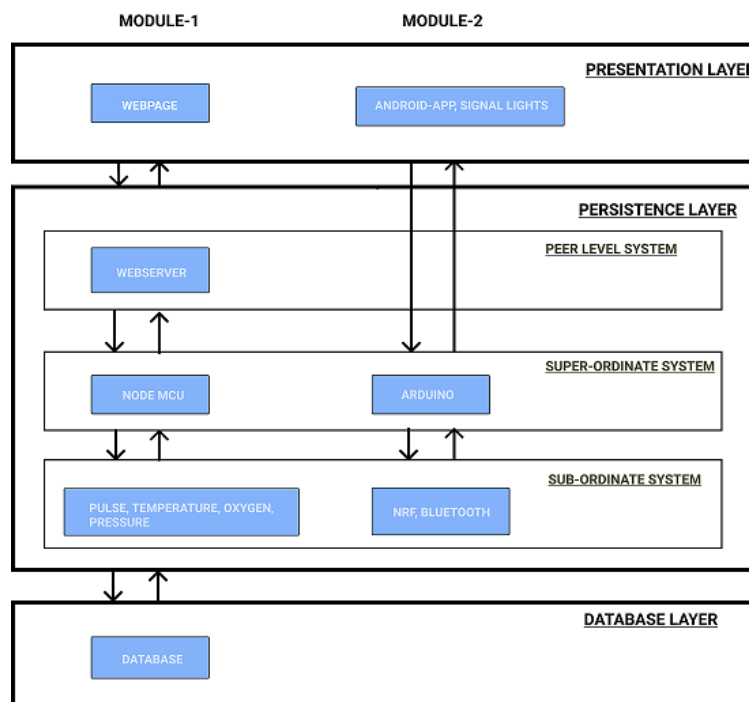


Fig (10) System Architecture

4.2.1 BPM

The pulse sensor is used to calculate the BPM.

4.2.2 TEMPERATURE

The temperature sensor is used to calculate the temperature

4.2.3 OXYGEN LEVEL

The gas sensor is used to monitor the oxygen level.

4.2.4 ARDUINO UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino. Here, it is used to control the various other hardware components.

4.2.5 NRF SENSOR :

nRF24L01 is a single chip radio transceiver for the world wide 2.4 - 2.5 GHz ISM band. The transceiver consists of a fully integrated frequency synthesizer, a power amplifier, a crystal oscillator, a demodulator, modulator .

4.3 USE CASE

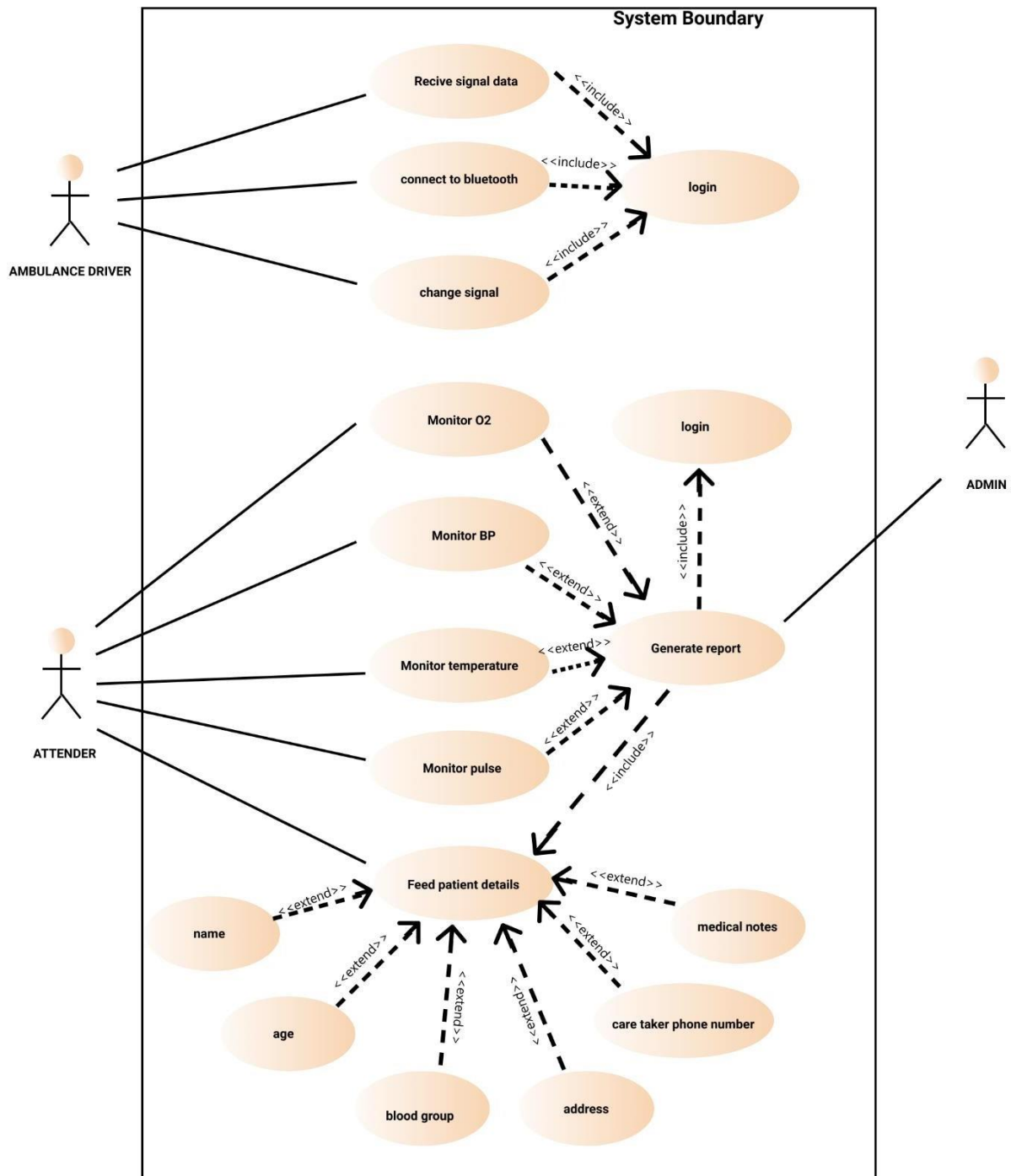


Fig (11) use case diagram

4.4 CONCLUSION

Chapter 4 thereby concludes describing what analysis specifies. It guides the system what it should do whereas the design describes how a task is accomplished. The UML diagrams is given for further understanding of the system.

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 INTRODUCTION

System implementation defines how the information system should be built and should also ensure that the information system is operational and used, information system meets all quality standards. The design of algorithms is constructed for the functioning of the project in this phase.

5.2 SNAPSHOTS

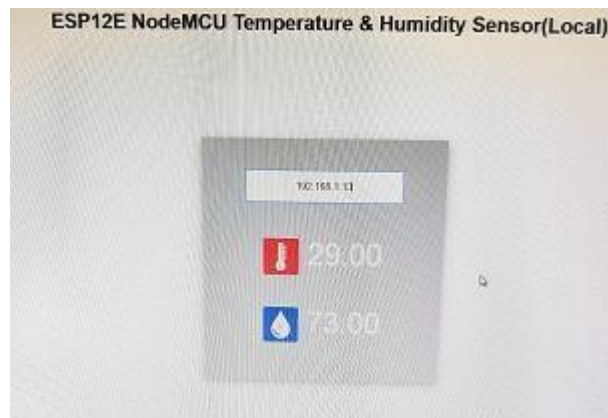


Fig (12) Displaying vital data's in webpage

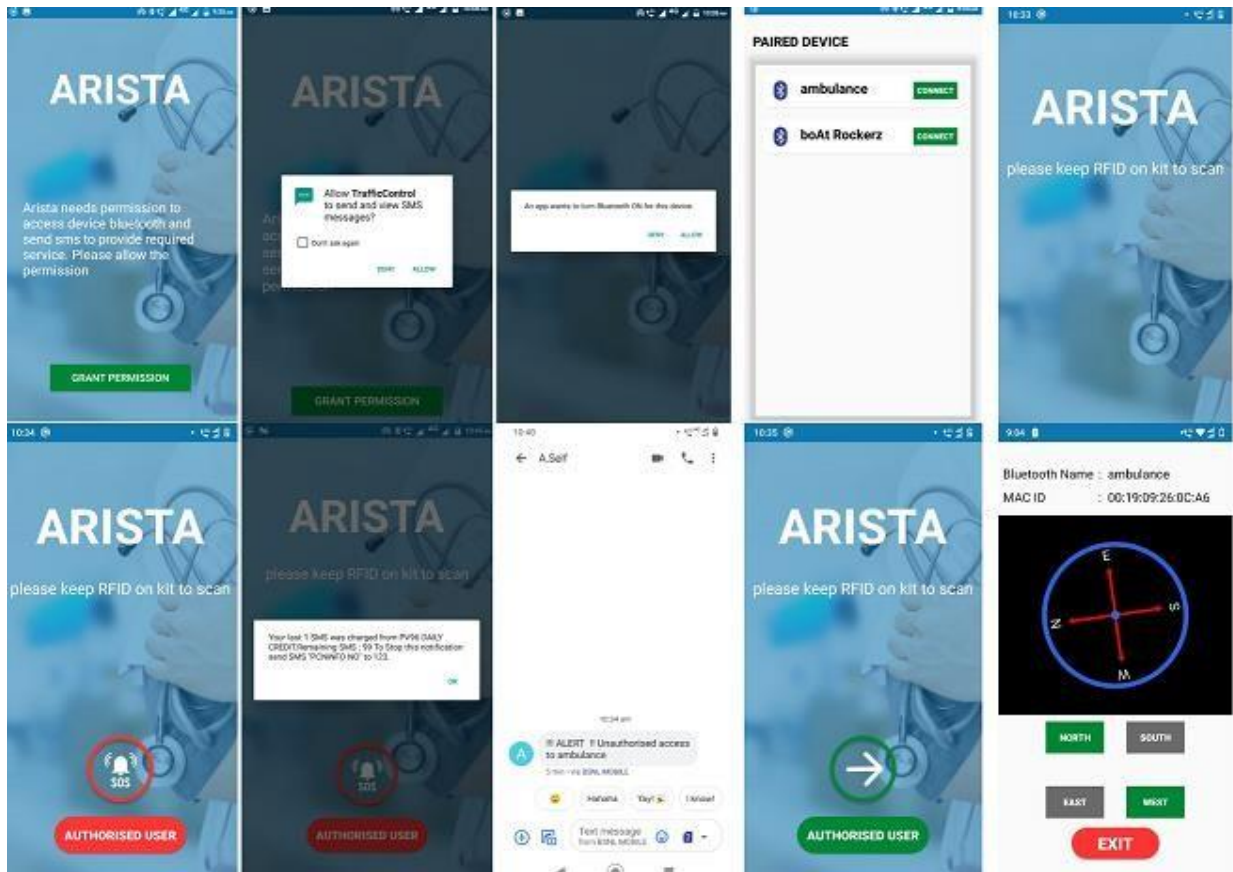
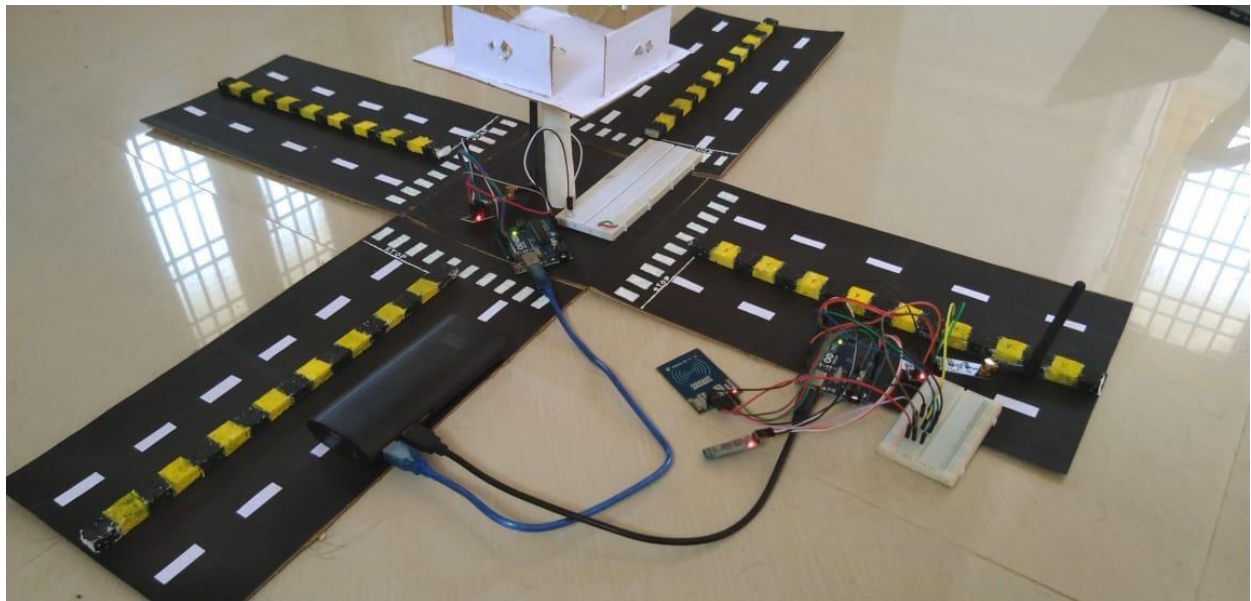


Fig (13) android Application for traffic light control



Fig(14) Project model

5.3 CONCLUSION

Chapter 5 thereby concludes the various algorithms associated with the project. The implementation also focuses on the domain ensuring better standard of the project as discussed in the introduction.

CHAPTER 6

SYSTEM TESTING

6.1 INTRODUCTION

Testing is performed to identify errors. It is used for quality assurance. Testing is an integral part of the entire development and maintenance process. The goal of the testing during phase is to verify that the specification has been accurately and completely incorporated into the design, as well as to ensure the correctness of the design itself. For example, the design must not have any logic faults in the design is detected before coding commences, otherwise the cost of fixing the faults will be considerably higher as reflected. Detection of design faults can be achieved by means of inspection as well as walkthrough.

6.2 TYPE OF TESTING USED

6.2.1 Unit Testing

Unit testing is conducted to verify the functional performance of each modular component of the software. Unit testing focuses on the smallest unit of the software design (i.e.), the module. The white-box testing techniques were heavily employed for unit testing.

6.2.2 Functional Test

Functional test cases involved exercising the code with nominal input values for which the expected results are known, as well as boundary values and special values, such as logically related inputs, files of identical elements, and empty files.

6.2.3 Performance Test

It determines the amount of execution time spent in various parts of the unit, program throughput, and response time and device utilization by the program unit.

6.3 CONCLUSION

System testing is the testing conducted on a complete integrated system to evaluate the system's compliance with its specified requirements. System testing takes the input, all of the integrated components that have passed all the tests.

CHAPTER 7

CONCLUSION

- The proposed system helps in monitoring the vital data of a patient in the ambulance and enables real-time data transfer of vital data to the hospital. The vital data is also displayed in the webpage and the values are updated dynamically.
- This enables the doctor to know about the patient before the patient arrives in the hospital, suitable treatment can be given to the patient. Our proposed system also enables efficient communication between the doctor and the paramedics.
- Our proposed system also enables fast transportation of the patient by using NRF sensors(near far communication) that helps in controlling traffic signals . The traffic signal in the way of ambulance turns green.

CHAPTER 8

REFERENCES

- [1] Aprita K.M, K.S Asha , T. Ashwan , Janvi Maddi, M.P Sunil,“Health monitoring system for ambulance “, ISSN: 2321-9653 , 2019.
- [2] Abdul Rahman Alahdal , Junnaid Ahmed Zuairi , Muhammad Arshad Malik, Syed Misbahuddin ,“IoT based Ambulatory vital data signs data transfer system “, Journal of Computer Networks and Communication, Volume 08 , Article ID 4071474, 2018
- [3] Veena Saraf , Qurrat UI Ayan , “ An IOT based ambulance tracking with patient health monitoring system using GPS and GSM “ , Journal of Engineering Research and Application , ISSN :2248-9622 Volume 9, Issue 6 , June 2019.
- [4] Elangeswari , R. Poorni, R. Rashmi , M. Varalakshmi ,”Emergency medical services in Internet of Things “ , Intrenational Journal of engineering Technology in Computer Science and electronics , ISSN : 0976-1353 volume Issue 3 , April 2016.

- [5] S. Dhivya , M. Palani , S. Saravanakumar , S.Venkatesh , M. Vikhneswaran , “ IOT based traffic signal control for ambulance “ , International Journal of Pure and Applied Mathematics , volume 118 , ISSN : 1314-3395 ,2018.
- [6] S. Irin Sherly, A. Maria Soitham Princy , S. Monisha , K. Nandhini ,”Smart ambulance rescue system with patient health monitoring using IoT ,International Journal of Advanced Research in Science , Engineering and Technology , Vol 6 , Issue 2 , February 2019, ISSN : 2350-0328.
- [7] S.N Svaraj , K. Vigneshwaran . S. Vigneshwaran , M. Vishnu Priyan , “IOT ambulance with automatic traffic light control , SSRG International Journal of Industrial Engineering – Special Issue ,March 2017.
- [8] Deepali Ahir , Mihir Shah, Pradnya otre , Saurabh harade , Sayali Nagane , ”Intelligent traffic control System for smart ambulance , International Journal of Advanced Research in Science , Engineering and Technology , volume : 5 Issue : 6 , June 2018 .
- [9] Torez Nafis , Syed Mohd Faisal Malik ,”IoT enabled traffic control model using raspberry pi “ , International Journal of Advanced Research in Computer Science , Volume : 9 May-June – 2018 .

APPENDIX

Vasanthan V, Teja Sai Vignesh , Selvabharathi S “An Efficient Healthcare Monitoring and Pre-Emptive Ambulance through Traffic Signals ” 8th INTERNATIONAL CONFERENCE ON CONTEMPORARY ENGINEERING AND TECHNOLOGY 2020 organized by Organization of Science and Innovative Engineering and Technology (OSIET) in association with Prince Shri Venkateshwara Padmavathy Engineering College Prince Dr.K.Vasudevan College of Engineering and Technology on 14th March 2020.





