SMART INTELLIGENT TRAFFIC CONTROL SYSTEM FOR EMERGENCY VEHICLES

The Project report Submitted in partial fulfilment of the requirements for the award of the degree

BACHELOR OF TECHNOLOGY

In

INFORMATION TECHNOLOGY

Submitted By

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CERTIFICATE

This is to certify that the project report titled “**SMART INTELLIGENT TRAFFIC CONTROL SYSTEM EMERGENCY VEHICLES”** is being submitted by **S. RESHMA (20NM1A1252) , K. SHALINI (20NM1A1218) , N. SADHANA (20NM1A1232) and N. ANOOHYA (20NM1A1231),** in B. Tech IV II semester Information Technology is a record bonafied work carried out by them. The results embodied in this report have not been submitted to any other University for the award of any degree.

Internal Guide

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DECLARATION

We hereby declare that this project titled **SMART INTELLIGENT TRAFFIC CONTROL SYSTEM FOR EMERGENCY VEHICLES** is the original work done by us in partial fulfilment of the requirements for the award of the Degree of Bachelor of Technology in Information Technology, Jawaharlal Nehru Technological University,Gurajada, Vizianagaram. This project report has not been previously submitted to any other university/Institution for the award of any other degree.

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ABSTRACT

The growth of industrialization and urbanization has lead to an immense increase in the population invariably leading to rise in the number of vehicles on road. The resulting traffic congestion and traffic jams are the major hurdles for emergency vehicles such as ambulance carrying critical patients as these emergency vehicles are not able to reach their destination in time, resulting into a loss of human life. To solve this problem to some extent we have apparently come up with “Smart intelligent traffic control system for emergency vehicles”. This project proposes a comprehensive solution to enhance emergency vehicle prioritization and public awareness within urban traffic environments. By integrating sound sensor technology with traffic signal control systems, the project facilitates the automatic activation of green lights to expedite the passage of ambulances through congested areas. In the absence of ambulance detection, the system intelligently allocates priority to high-density roads, mitigating traffic congestion. Furthermore, to ensure continuous public awareness of ambulance movement, a blue indicator light illuminates at each signal where an ambulance is detected, signaling its active passage through the area. Through this integrated approach, the project aims to optimize traffic flow, improve emergency response times, and enhance overall road safety in urban settings.

Key Words: Arduino uno, Lcd Display, IR Sensors, Sound Sensors, Traffic Congestion

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CHAPTER – 1
INTRODUCTION

1.1 INTRODUCTION

What is IoT

The Internet of Things (IoT) is the network of The physical objects or "things" that are embedded with electronics, software, sensors, and network connectivity, allowing them to gather and share data, make up the Internet of Things (IoT). Through the use of current network infrastructure, IoT enables things to be detected and controlled remotely, opening up possibilities for more direct integration between computer-based systems and the physical world and improving efficiency, accuracy, and financial gain.

When we talk about "things," we're talking about a broad range of devices that are part of the Internet of Things. Examples include electric clams in coastal waters, biochip transponders on farm animals, heart monitoring implants, cars with built-in sensors, and DNA analysis devices for monitoring food, the environment, and pathogens. Utilizing a variety of already available technologies, these gadgets gather valuable data and then autonomously transfer it between other devices.

The Internet of Things was not created by a single groundbreaking technological advancement, but rather by a number of complimentary ones that collectively offer capabilities that aid in bridging the gap between the virtual and physical worlds.

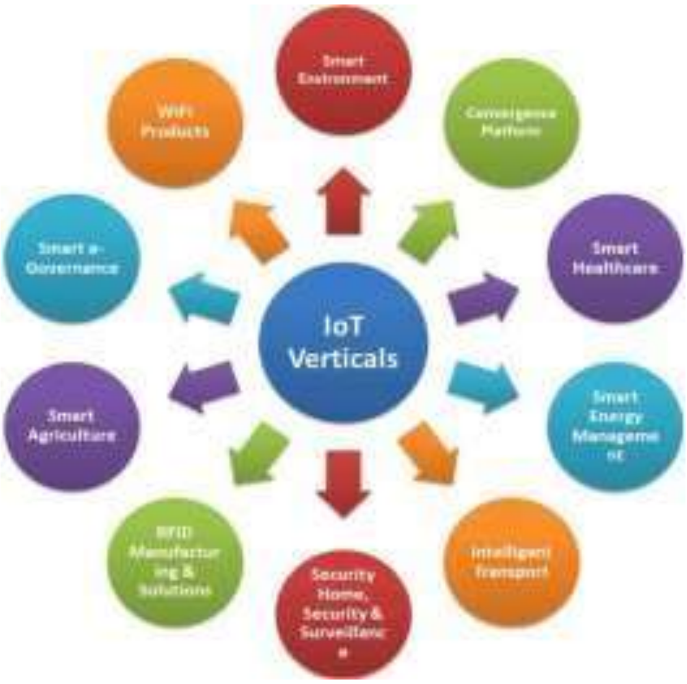


Figure 1.1: Internet of Things

Applications of IOT

- Smart Home Automation
- Healthcare Monitoring
- Industrial IOT (IIOT)
- Smart Cities
- Agriculture
- Retail
- Transportation and Logistics
- Energy Management

THE IOT REFERENCE MODEL

An IoT reference model has been established by the ITU-T. The four layers of this approach are the application layer, network layer, device layer, service support and application support layer, and each of these layers has management and security capabilities. These capabilities can cut across numerous layers and have both generic and particular capabilities, as the image illustrates. IoT apps that are part of the application layer depend on specific underlying layer support functions in order to operate.

The generic support functions found in the service and application support layer are usable by Internet of Things applications. Data processing and storage are two such instances. Other than the generic capabilities needed to provide support for a variety of applications are the specific support capabilities.

Transport capabilities and networking functions make up the network layer. While the transport capabilities concentrate on the transfer of IoT services and application-specific data, the networking capabilities offer pertinent control functions for network connectivity.

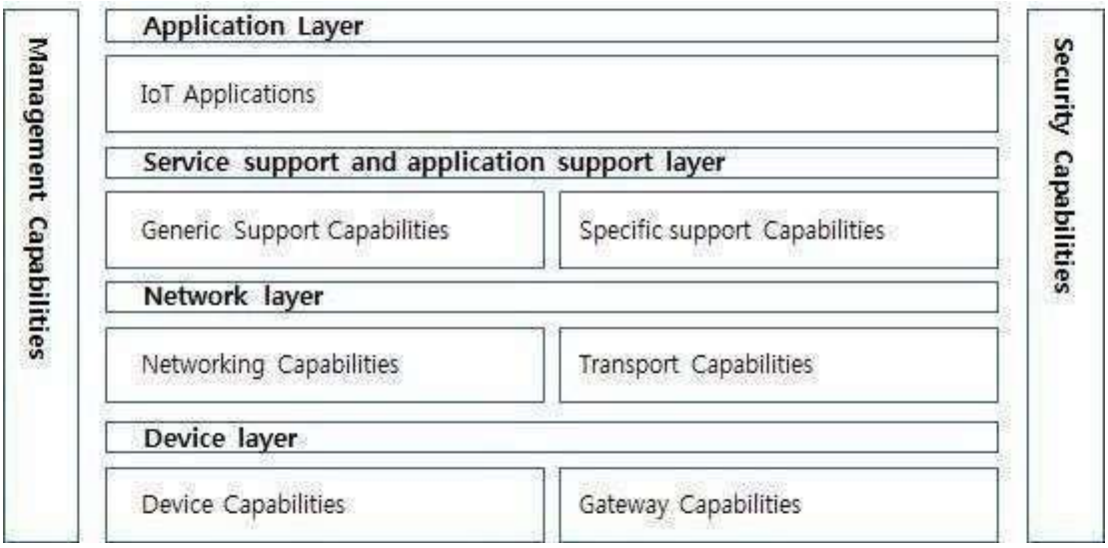


Figure 1.2: The IOT Reference Model

The device layer, which is located at the base of the model, has capabilities for both direct and indirect device interaction with the communication network. In contrast to direct interaction, indirect interaction necessitates the use of a gateway in order to transmit and receive data over the network. Ad hoc networking and sleeping and waking up, which allow devices to connect on-the-fly and save energy, are two further features. In addition, the device layer has gateway features that allow it to support many interfaces and devices linked through various wired and wireless methods.

Where is the term IoT being used?

The term IoT is being used in different contexts, such as the body, homes, cities, industry, and the global environment.

- When discussing IoT in the home, it's common to discuss remote and local control and monitoring of various lights and appliances, as well as yard plants that need to be watered automatically. Since traditional methods of watering gardens and houseplants are becoming unfeasible due to increasing water shortages, this is a topic that is becoming increasingly essential.
- When referring to cities, the term "Internet of Things" (IoT) refers to systems that efficiently collect and analyze data produced by different infrastructures, such as power grid, traffic light, and street light monitoring centers. These technologies have the potential to enhance the movement of people and cars across urban areas, significantly increase the energy efficiency of transportation networks, and enhance both individual and public safety.

• The main objectives of IoT solutions applied in industry are usually cost reduction, resource conservation, productivity gains, and operational optimizations. These are not only motivated by companies' desire to be environmentally conscious, but also by the significant financial benefits that come with improving process control and minimizing negative environmental effects.

• Lastly, but just as importantly, sensors may be used to track water flows and usage, monitor local weather patterns, monitor the use of natural resources, and assist conserve animals. They can also be used to send out warnings before and after natural disasters to help people prepare for what's to come.

IoT − Key Features

The most important features of IoT include artificial intelligence, connectivity, sensors, active-engagement, and small device use. A brief review of these features is given below −

- **AI** − IoT essentially makes virtually anything “smart”, meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks. This can mean something as simple as enhancing your refrigerator and cabinets to detect when milk and your favorite cereal run low, and to then place an order with your preferred grocer.

- **Connectivity** − New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.

Sensors − IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.

- **Active Engagement** − Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.

- **Small Devices** − Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.

By framing IoT design with these characteristics, multi-discipline teams can work across their domains to make trade-offs in interaction design, software architectures, and business models. Naturally a single product or service may choose to dial up or dial down these characteristics depending on the nature of user experience and constraints imposed by environmental and business factor. Scope and Benefits of IoT.

Today's technology is influencing and changing every facet of our actual lives. The idea of machine-to-machine (M2M) communication has been made possible by IoT. Businesses like as Microsoft and SAP are putting strategies into place to take advantage of the Internet of Things, allowing you to simply stop running your business and start growing it. IoT will have a significant impact on building and home automation systems, as networked IoT devices will take care of every convenience. Large-scale deployments are also made of it; in Songdo, South Africa, for instance, the first completely wired and equipped smart city of its kind, dubbed Ubiquitous City, is almost finished. When personal electronics are well-connected to the Internet.

Scope and Benefits of IoT

It's the technology of today which is touching and transforming every aspect of our real life. IoT has given a concept of Machine to-Machine (M2M) communication. Companies like Microsoft and SAP are implementing strategy to capitalize on the Internet of Things so that you can just stop your business and start making it thrive. IoT is going to have huge impact on home automation and building automation system where every convenience will be taken care of by the interconnected devices on IoT. It is also deployed on large scale for example in Songdo, South Africa, the first of its own kind fully equipped and wired smart city is near to completion (known as Ubiquitous City). With the personal electronics good connected to Internet will enable us to "author" our lives. In medical science field, IoT has given a privilege to devices and system to sense for coming disease and to prevent it, for e.g.: It can make a person healthier with wearables that can predict heart attack and cardiovascular strokes. As per a report of the suns daily, consumers will start initiating the usage of IoT in a better way during 2015 and onwards compared to past usage.

Issues and challenges of IoT

It is not free from challenges. Issues of Governance, security, Interoperability, privacy, regulations, providing power to billions of sensors and standardization issues can slow down the progress of Internet of Things. Due to absence of generic governance, there are many confusions and inconsistencies. Absence of a universal numbering system is a bane for providing a true IoT environment. In the current context, systems like EPC Global and ubiquitous ID systems are used to address the issue of global ID systems. There is a challenge of implementing common security protocols. So, interoperability is an issue while interacting among IoT objects developed by different manufacturers. Lack of Support of the regulatory bodies, Government agencies and ubiquitous connectivity are barriers to device integration. Even quality and cost of receiving data from multiple sources are still with issues. Companies like IBM, Cisco, GE and Amazon have decided to add Swarm and fog layers.

This effort reduces the difficulty of connecting IoT devices and also the cost of integrating these devices. Though, Applications like home monitoring systems, wearable devices along with consumer-oriented products are the center of attention of Internet of Things domain, Enterprise IT professionals are still with issues to apply these concepts from the context of generating business values. IoT Consortium conducted research on the adoption of IoT during 2015.As per the study, there is a concern for security and privacy. Though IoT is moving towards mass adoption, the manufacturers should provide cost effective, intuitive and simple solutions for connected Home. Major attack on IoT may also be possible on IoT devices which were not connected before. IoTs will derive optimum satisfaction from the customers once the firm's policies to capture and usage of personal data is quite clear and accountability is there in case of violation of policies. At the same time, customers should be provided with user friendly data management tools for easy management and viewing of personal data.

A real change can happen if we can develop a system to evaluate the massive data generated in IoT Environment and acts on these data in real time. IoT is now in early stage of adoption. Primary obstacles to adoption are awareness of IoTs among consumers, features and benefits of these products. ETSI has formed an internal M2M taskforce for M2M systems and sensor networks. Objective of this taskforce is to develop and maintain end-to-end architecture, integration of sensor network, enhancement of security, quality of service and to strengthen interface of hardware devices. Similarly, IPv6, 6LoWPANs and ROLL networks are evolved for standardization.

Basic Building Blocks of IoT

To develop an IoT application, we need several key building blocks. Figure 1 shows the different components involved in an IoT application

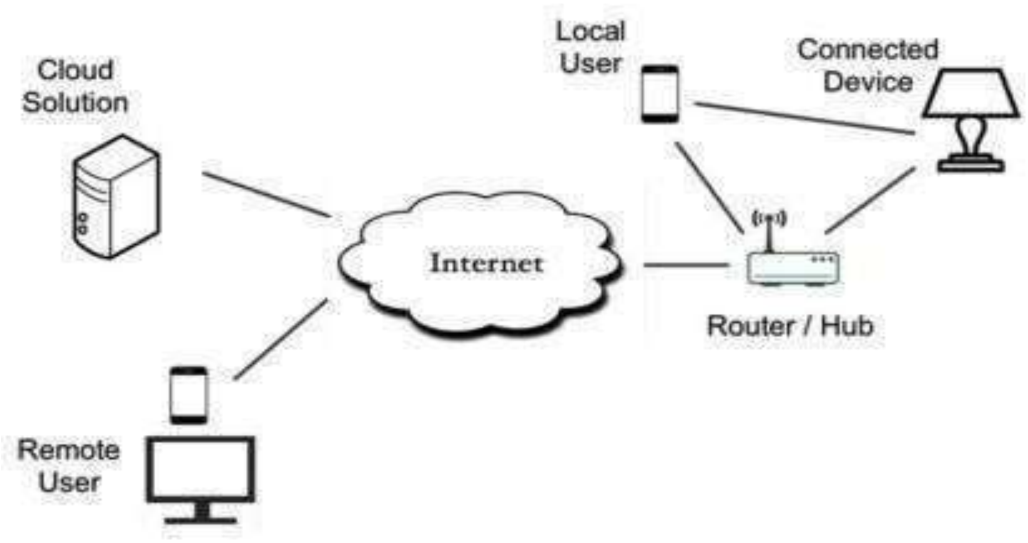


Figure 1.3: Components of IoT Application

The **connected device** – The actual physical device we want to control and manage. It needs to be connected somehow, either wired or wireless.

The **local user** – This is the user who wants to interact directly with the device to either control it, or receive information regarding its operation.

The **router** – This is the part that connects the device to the Internet. The connection can be via ADSL, cable, cellular, etc. In some cases, there is no router where we want to place our device, or a standard router is not sufficient for the application, so you may need to provide a router of your own.

The **cloud solution** – A Cloud solution can be simple storage of data flowing from your connected device, or can include complex analytic functions that are performed on the data coming from the device and reported to the local or remote user. The remote user– The user who is not in the proximity of the device, but wants to control or receive information regarding the device from a far.

IoT − Advantages

The advantages of IoT span across every area of lifestyle and business. Here is a list of some ofthe advantages that IoT has to offer −

Improved Customer Engagement − Current analytics suffer from blind- spots and significant flaws in accuracy; and as noted, engagement remains passive.

Technology Optimization − the same technologies and data which improve the customer experience alsoimprove device use, and aid in more potent improvements to technology. IoT unlocks a world of critical functional and field data.

Reduced Waste − IoT makes areas of improvement clear. Current analytics give us superficial insight, but IoT provides real-world information leading to more effective management of resources.

Enhanced Data Collection − Modern data collection suffers from its limitations and its design for passiveuse. IoT breaks it out of those spaces, and places it exactly where humans really want to go to analyse ourworld. It allows an accurate picture of everything.

IoT − Disadvantages

Though IoT delivers an impressive set of benefits, it also presents a significant set of challenges.

Here is a list of some its major issues −

Security − IoT creates an ecosystem of constantly connected devices communicating over networks. Thisleaves users exposed to various kinds of attackers.

Privacy − the sophistication of IoT provides substantial personal data in extreme detail without the user'sactive participation.

Complexity − Some find IoT systems complicated in terms of design, deployment, and maintenance given their use of multiple technologies and a large set of new enabling technologies.

1.2 MOTIVATION

This project deals with the increasing traffic problems in cities. We decided to finalize on this topic due to the following reasons -Reducing traffic congestion, reducing long time delay, keeps track of vehicles and many more. Also, we have seen that due to traffic emergency vehicles. (ambulance, fire brigade) get delayed to reach on time.

1.3 PROBLEM DEFINITION

One of the major problems commuters face every day is mismanaged traffic signals. The length of the signal does not correspond to the number of vehicles on the road, and this causes various issues. For example, in the current system, if there is no vehicle on a particular side of the road, that signal still functions on a fixed time delay, turning green, despite there being vehicles at the other signals. This causes frustration to the driver, leading to serious problems such as road rage, and causes people to "jump" a signal. To solve this problem, our team intends to build a traffic density monitoring system, that smartly changes the signal based on the vehicular density on each lane.

1.4 OBJECTIVE OF PROJECT

- Monitoring and controlling traffic lights on specified path to hospital.
- To identify possibility of ambulance on the road by using Sound Sensor.
- Suggest optimal route without traffic.
- Clearing the traffic based on the density.

1.5 ORGANIZATION OF THE DOCUMENTATION

Chapter 1, gives the brief introduction of the project. This includes motivation, problem statement, and objective of the project.

Chapter 2, tells about the existing system and its disadvantages and proposed system.

Chapter 3, analysis of the project, requirements specifications and flowchart.

Chapter 4, specifies the system design.

Chapter 5, specifies the implementation of the project and its result. Chapter 6, discuss about testing and validation.

Chapter 7, gives conclusion of the project and future work.

CHAPTER – 2
LITERATURE SURVEY

2.1 INTRODUCTION

This chapter provides an overview of previous research papers. The main purpose of the literature review is to survey previous studies on knowledge sharing and intranets. The research papers help us to find the existing models and allow us to find the loop holes and guide us to develop a new thesis by overcoming the problems which have been found out in the survey.

Intelligent Traffic Management with Wireless Sensor Network

This paper mainly focused on WSN (Wireless Sensor Networks) for real life applications. They developed the following algorithms: "*Maximum Intersection Utilization*" and "*Empty Lane with Green Light*" are tested in a java based simulated platform called *Green Light District Simulator* (GLD). The average waiting time is the average number of cycles (time in seconds) a vehicle has to wait at the intersection during one round trip of traffic flow. Through this feature of GLD they intend to generate a graph of average waiting time vs. number of cycles spend for the above algorithms and draw a comparison against the conventional traffic policies. The following diagram shows the overall design structure of the proposed work:

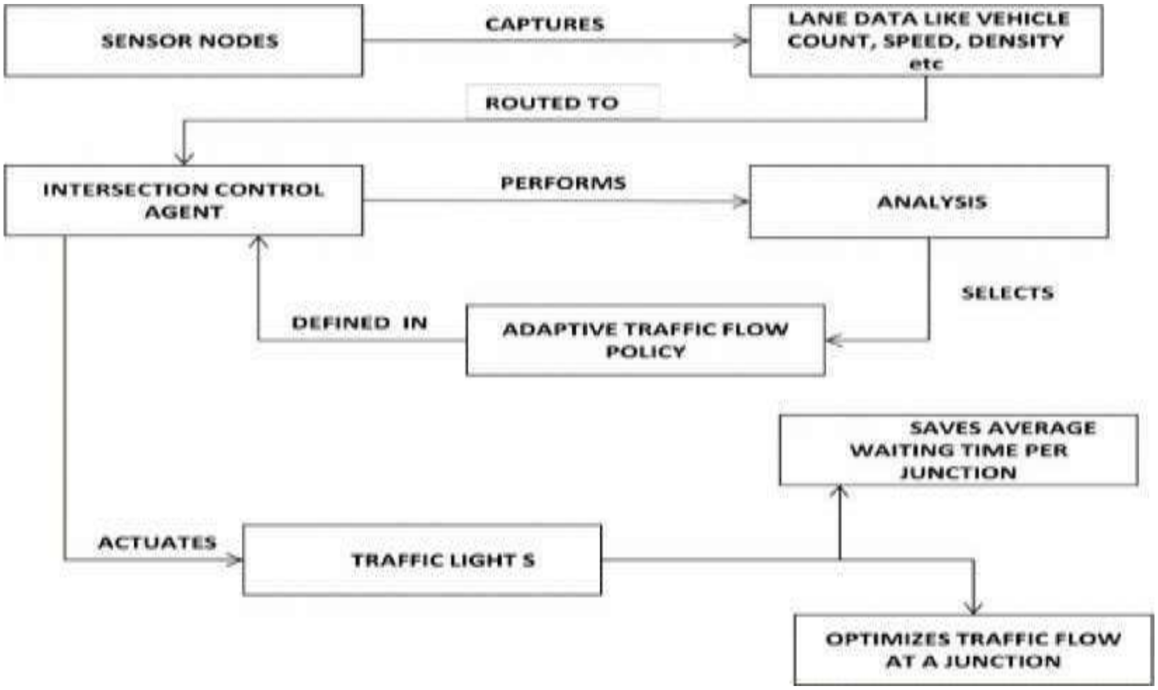

SENSOR NODES
CAPTURES
LANE DATA LIKE VEHICLE COUNT, SPEED, DENSITY etc
ROUTED TO
INTERSECTION CONTROL AGENT
PERFORMS
ANALYSIS
SELECTS
DEFINED IN
ADAPTIVE TRAFFIC FLOW POLICY
SAVES AVERAGE WAITING TIME PER JUNCTION
ACTUATES
TRAFFIC LIGHT S
OPTIMIZES TRAFFIC FLOW AT A JUNCTION

Fig 2.1: Model of previous System

The two algorithms proposed by them are as follows:

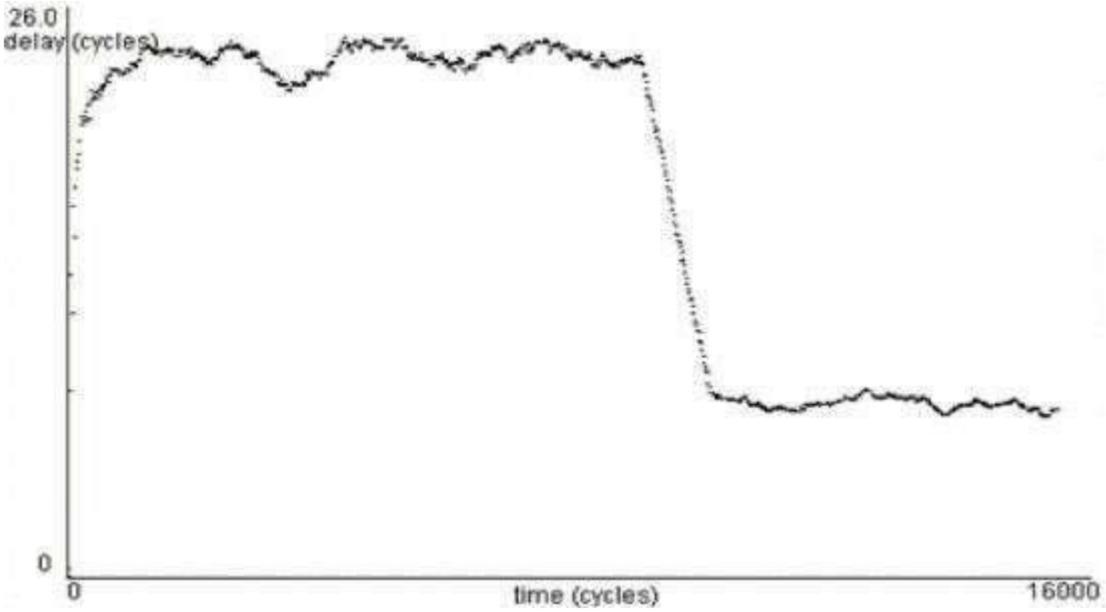
1) Maximum Intersection Utilization

- Identify the roads on the intersection in a sequence numbered from 0 to 3 clockwise.
- Start by initializing all the roads to a red state.
- Assume any 1 of the roads to be the start, the cycle continues after 4th stage.
- In every stage 2 roads (opposite to each other) are regulated.
- Vehicles on every lane wait for 3 cycles for their turn (as in the normal traffic flow) whereas the ones taking a left turn wait for 2 cycles each.
- If collision is not the concern of algorithm, free left can be provided for all the stages.
- Algorithm follows a round robin schedule giving equal time slots to each road.
- Continue operation till a pause or stop command is issued by the user.

2) Empty Lane with Green Lights.

- Identify the roads on the Intersection in a sequence numbered from 0-3 clockwise.
- Start by Initializing all the roads to a RED state.
- Round robin scheduling again with equal time slots of 20 seconds.
- When there is no vehicle on 1 road (say road E) and that road is given a GREEN signal. Assign RED to all the lanes of that road (E) Compare traffic on each of the other roads (N,W & S) and assign GREEN for road with MAX traffic for biased time (5 seconds) Check if vehicles have arrived on road E after step b If vehicles present, assign GREEN to road E else assign GREEN to the road with next MAX vehicle count for 5 seconds.
- Repeat steps (a) through (d) till time slot (20 seconds - variable sign messages can be used for lane users) expires for that particular road.
- Shift the turn to the next road and repeat steps 3 & 4 for the same.

Continue operation *till* a pause or stop command is issued by the user.



According to them, this work may also prove to be saving on fuel. Further, the Intelligent Traffic System along with other technologies like RFID, GPRS and GPS can be a potential solution for traffic control.

The following is the link to this report :

https://ieeexplore.ieee.org/document/9213796

2.2 EXISTING SYSTEM

Existing traffic signal timing methods often struggle to manage congestion effectively. High traffic volumes can hinder emergency vehicles, causing delays in reaching those in need of urgent medical care. These delays can significantly impact patient outcomes and may even lead to fatalities. Improving traffic management systems and increasing public awareness about yielding to emergency vehicles are crucial steps in addressing these issues. Implementing smart traffic signal systems that can adapt to real-time traffic conditions and prioritizing emergency vehicle access at intersections are potential solutions. By enhancing the efficiency of traffic flow and ensuring swift emergency response, we can work towards a safer and more responsive transportation system for everyone.

2.3 DRAWBACKS OF EXISTING SYSTEM

- Density based Traffic clearance is not possible due to which public faces lot of disturbance while waiting in traffic.
- There is no proper way provided to Ambulance when it is in the Traffic.

2.4 PROPOSED SYSTEM

This project proposes a comprehensive solution to enhance emergency vehicle prioritization and public awareness within urban traffic environments. By integrating sound sensor technology with traffic signal control systems, the project facilitates the automatic activation of green lights to expedite the passage of ambulances through congested areas. In the absence of ambulance detection, the system intelligently allocates priority to high-density roads, mitigating traffic congestion. Furthermore, to ensure continuous public awareness of ambulance movement, a blue indicator light illuminates at each signal where an ambulance is detected, signaling its active passage through the area. Through this integrated approach, the project aims to optimize traffic flow, improve emergency response times, and enhance overall road safety in urban settings.

2.5 ADVANTANGES

- It makes life easier.
- Real time monitoring of ambulance.
- Avoidance of traffic to Emergency vehicles.
- Provide free way to ambulance**.**

2.6 CONCLUSION

This project is to implement a small model form. That side of road having the highest density of vehicles will glow a green LED. If the sound detector detects any sound that exceeds the threshold value (which is set by us in the code) then also the green LED will glow, of the road where the sensor senses the sound. The LCD will display the temperature sensed by the sensor. It will also display which side of the crossroad has the green signal glowing. So, this is how our project will work.

CHAPTER – 3
ANALYSIS

3.1 INTRODUCTION

This chapter is about the requirements used to develop the prototype. It specifies both the hardware and software requirements that are in order to run the system properly. Hardware components like Arduino microcontroller, Infrared Proximity, Sound Sensor and reader modules, LED’s and Software Requirements are Arduino IDE.

3.2 SOFTWARE REQUIREMENT SPECIFICATION

3.2.1 ARDUINO IDE:

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

Arduino IDE is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide. Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low-cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics.

Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community.

Features of Arduino IDE

1. Open source and extensible hardware:

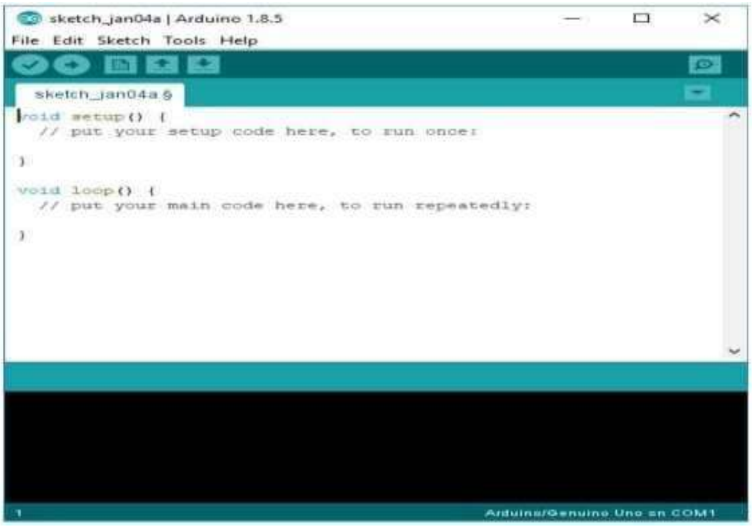
The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module to understand how it works and save money.

2. A Simple, clear programming environment:

The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

3. Cross-platform:

The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

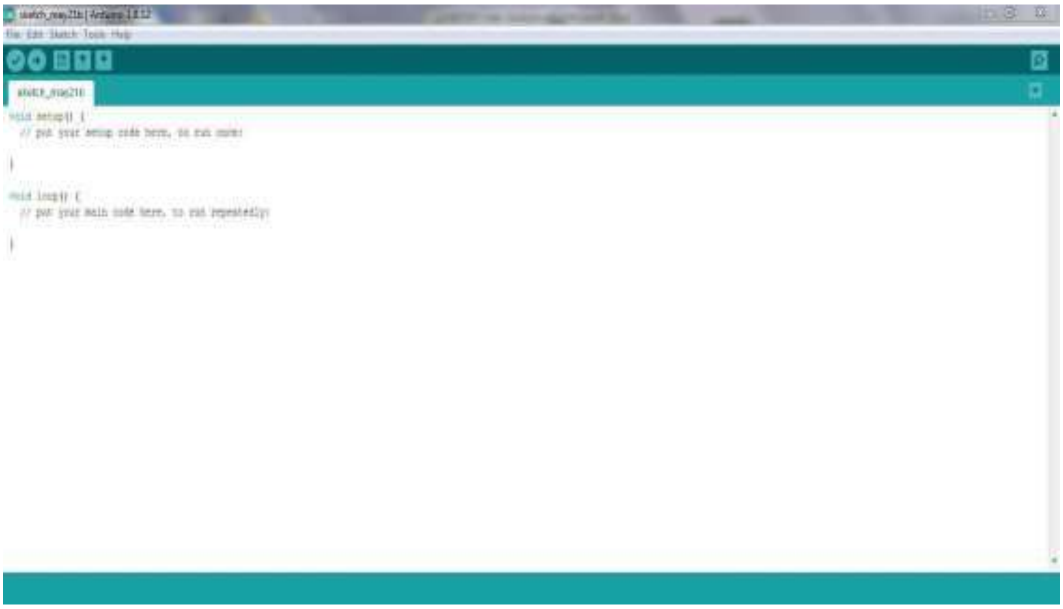

sketch_jan04a | Arduino 1.8.5
File Edit Sketch Tools Help
sketch_jan04a §
1
Arduino/Genuino Uno on COM1

```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Fig 3.2.1.1: ARDUINO IDE

Writing and Uploading the Arduino Code

Step 1: Create a new sketch by clicking on the File→New.

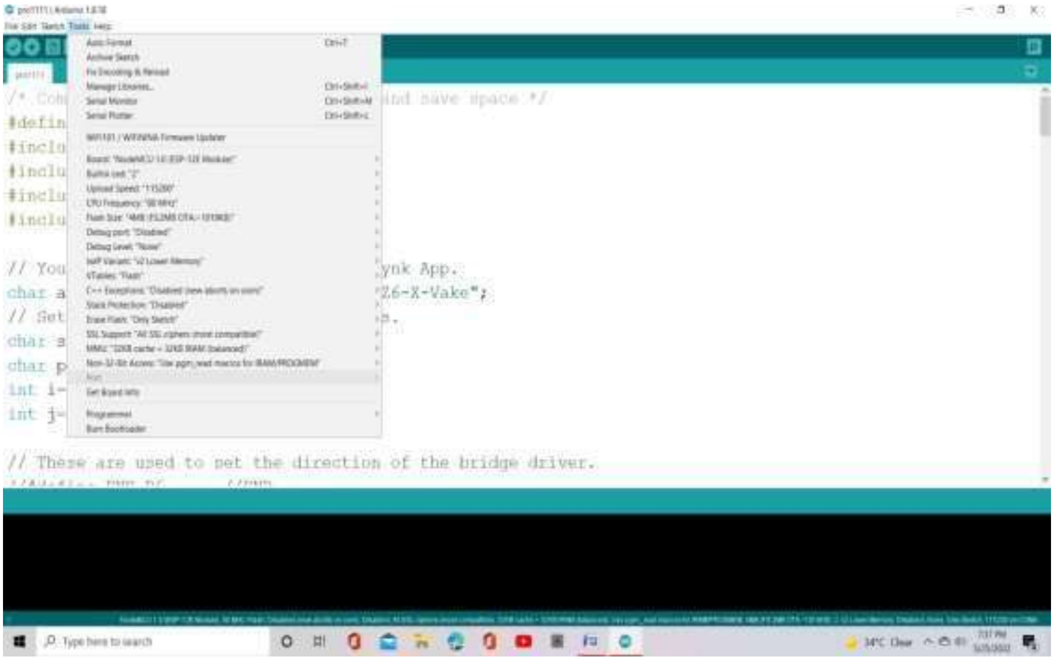


```
void setup() {
  // put your setup code here, to run once:

}

void loop() {
  // put your main code here, to run repeatedly:

}
```

Fig 3.2.1.2: New Sketch

Step 2: After finishing the code select the board to upload the code by clicking **Tools → Board.**

And also select the port through **Tools → Port.**


pcr1111 | Arduino 1.8.18
File Edit Sketch Tools Help
Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Port
Get Board Info
Programmer
Burn Bootloader
Type here to search

Board: "NodeMCU 1.0 (ESP-12E Module)"
Builtin Led: "2"
Upload Speed: "115200"
CPU Frequency: "80 MHz"
Flash Size: "4MB (FS:2MB OTA:~1019KB)"
Debug port: "Disabled"
Debug Level: "None"
lwIP Variant: "v2 Lower Memory"
VTables: "Flash"
C++ Exceptions: "Disabled (new aborts on oom)"
Stack Protection: "Disabled"
Erase Flash: "Only Sketch"
SSL Support: "All SSL ciphers (most compatible)"
MMU: "32KB cache + 32KB IRAM (balanced)"
Non-32-Bit Access: "Use pgm_read macros for IRAM/PROGMEM"

```
/* Com                                        and save space */
#defin
#inclu
#inclu
#inclu
#inclu

// You                                        ynk App.
char a                                        Z6-X-Vake";
// Set                                        s.
char s
char p
int i=
int j=

// These are used to set the direction of the bridge driver.
```

Fig 3.2.1.3: Connection to Port

Step 3: After selection of board and port connect one end of the USB cable to the USB port and the other end to Arduino board. And click on "Verify" and then "Upload" the code if there are no mistakes in the code. Once, the code is uploaded remove the USB cable. And the board is ready to use for the required task.

3.3 HARDWARE COMPONENTS

3.3.1 Introduction

Any model is a combination of different devices working collectively as one for obtaining the desired output. So, in this chapter, we are going to discuss the details and specifications of every each device used for this model. Each component has its specific purpose of usage which is needed to be studied and then use it according to our purpose and need. The combination of different components will give rise to a system having ample of benefits and can be controlled by anyone with minimum effort.

3.3.2 Components

- Arduino Microcontroller
- Infrared Proximity Sensors
- Sound Sensor
- LCD Display
- Temperature Sensor
- Arduino Working

Arduino Microcontroller

- Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.
- The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL).
- There are many different types of Arduino available, for our requirement we used Arduino ATMEGA 2560

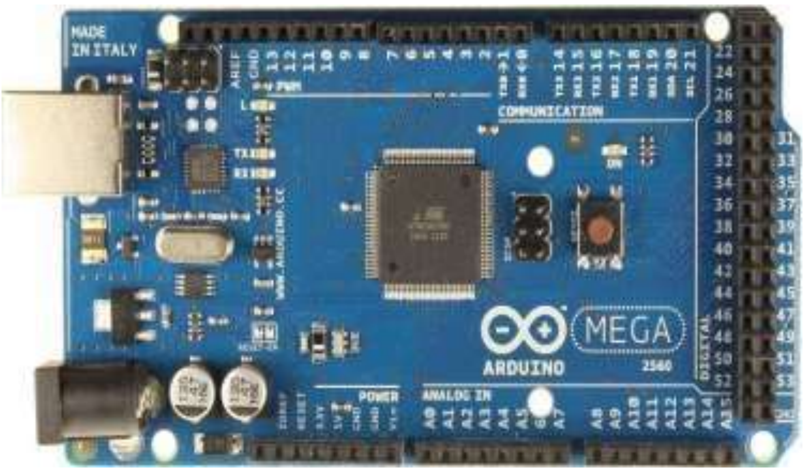


Fig 3.3.2.1 Arduino MEGA 2560

Infrared Proximity Sensor

- An Infrared Proximity Sensor consists of a IR Emitter and IR Receiver embedded on a single chip.
- It measures distance by shining a beam of infrared light and uses a phototransistor to measure the intensity of the light that bounces back.
- If an object is closer than the shortest distance, it reports a significantly higher analogue output and is inconsistent with expected in-range results.
- The effective distance measuring range for this proximity sensor is 10-80cm.

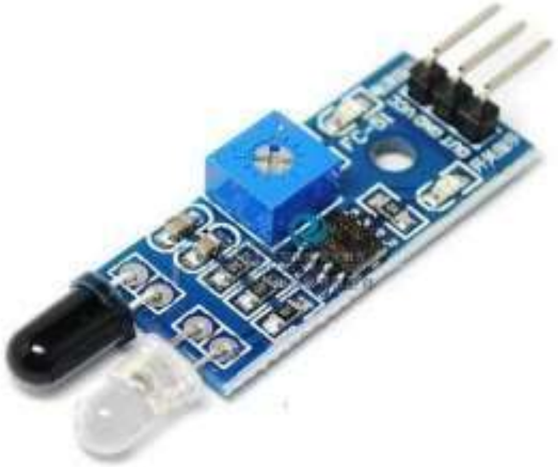


Fig 3.3.2.2 IR Sensor

Sound Sensor

LM386 is an audio power amplifier with features of low power consumption, adjustable voltage gain, wide voltage power supply, less requirements on peripheral components and minimum total harmonic distortion. LM386 can be applied to the consumer products with low voltage requirement. To minimize the number of the peripheral components in used, the voltage gain should be set to 20. Connecting a resistant and a capacitor externally between the Pin1 and the Pin8, it is able to configure the voltage gain to any value within the range of 0- 200.

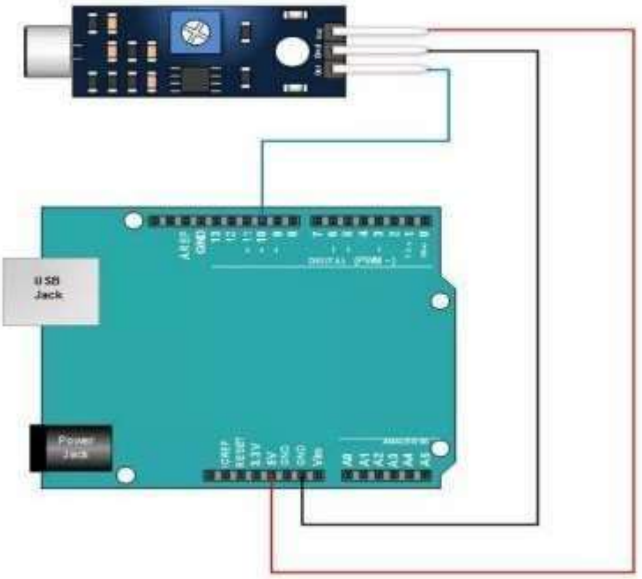


Fig 3.3.2.3 Sound Sensor

LCD Display

The principle behind the LCD’s is that when an electrical current is applied to the liquid crystal molecule, the molecule tends to untwist. This causes the angle of light which is passing through the molecule of the polarized glass and also cause a change in the angle of the top polarizing filter. As a result a little light is allowed to pass the polarized glass through a particular area of the LCD. Thus that particular area will become dark compared to other. The LCD works on the principle of blocking light. While constructing the LCD’s, a reflected mirror is arranged at the back. An electrode plane is made of indium-tin oxide which is kept on top and a polarized glass with a polarizing film is also added on the bottom of the device. The complete region of the LCD has to be enclosed by a common electrode and above it should be the liquid crystal matter.

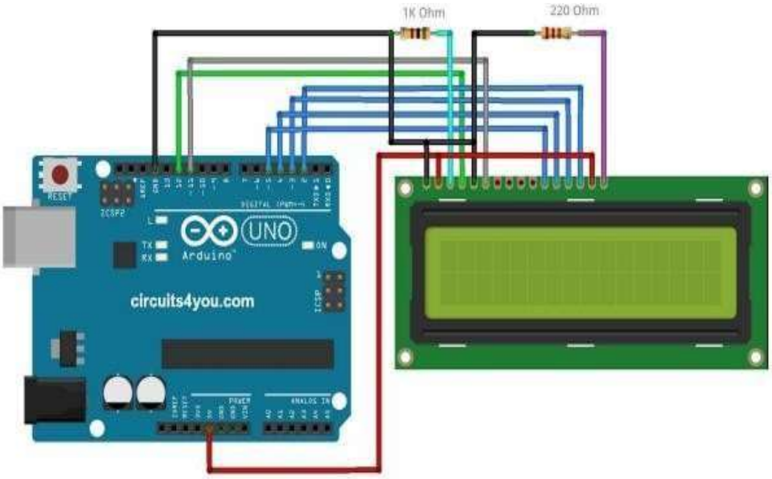


Fig 3.3.2.4 LCD Display

Temperature Sensor

In the features of lm35 it is given to be +10 mills volt per degree centigrade. It means that with increase in output of 10 mills volt by the sensor vout pin the temperature value increases by one. For example if the sensor is outputting 100 mills volt at vout pin the temperature in centigrade will be 10 degree centigrade. The same goes for the negative temperature reading. If the sensor is outputting -100 mills volt the temperature will be -10 degree Celsius.

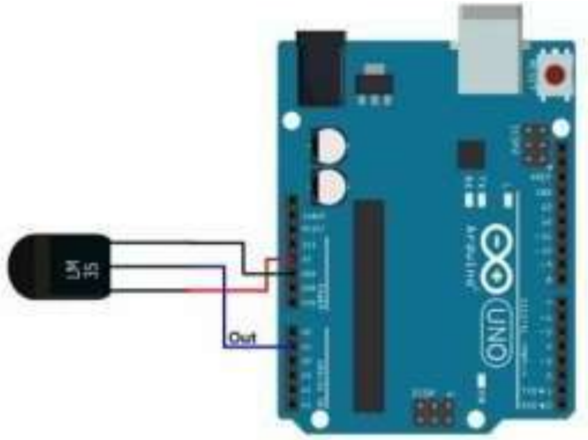


Fig 3.3.2.5 Temperature Sensor

Arduino Working

An Arduino board consists of an Atmel 8-bit microcontroller with complementary components tofacilitate programming and incorporation into other circuits. Official Arduino have used the mega AVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator or ceramic resonator in some variants.

An Arduino microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This allows an Arduino to be used by novices and experts alike without having to go throughthe difficulties first faced by many when using electronics by allowing the use of an ordinary computer asthe programmer. At a conceptual level, when using the Arduino software stack, all boards are programmedover an RS-232 serial connection, but the way this is implemented varies by hardware version.

Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chipssuch as the FTDI FT232. When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used. Arduino board provides 14 digital I/O pins, six of which can produce pulse-width modulated signals, and other six analog inputs. The output or inputs can be taken from the boards or given to the board using convenient connectors. Both digital and analog inputs and outputs are available in all arduino boards. The arduino boards can also communicate with other devices using standard communication ports like USART, IIC, and USB etc.

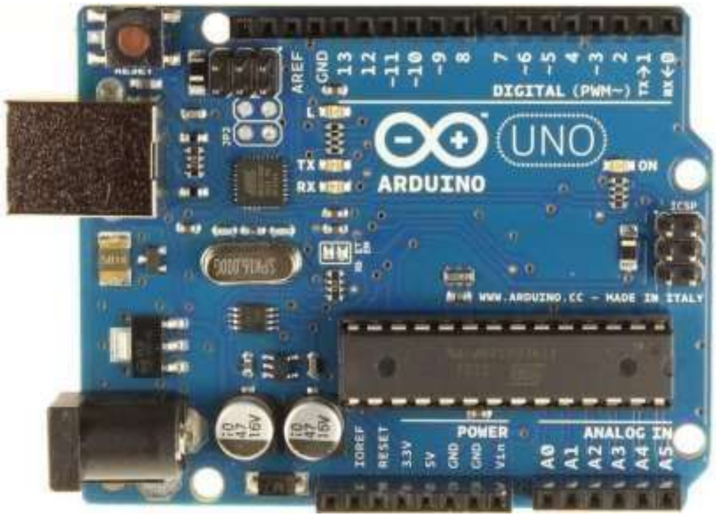


Fig 3.3.2.6 Arduino UNO Board

Pin Description:

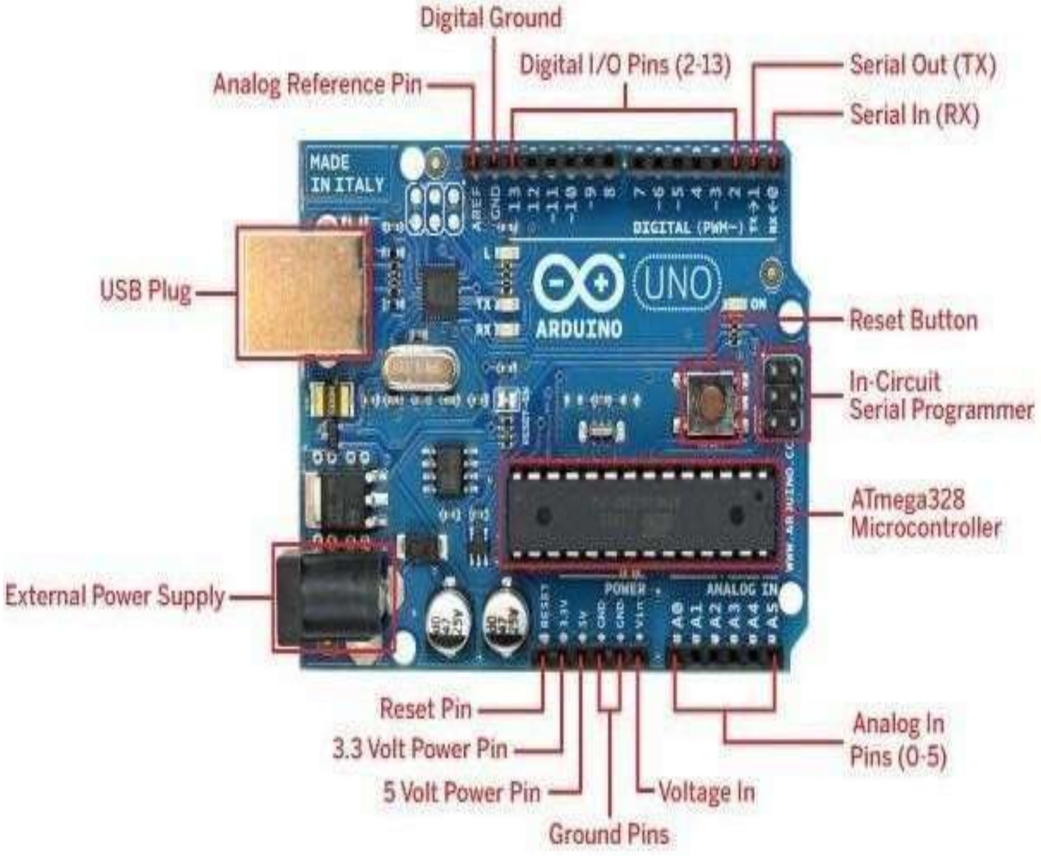


Fig 3.3.2.7 Arduino Board representing all Components

Serial: 0 (RX) and 1 (TX):

Used to receive (RX) and transmit (TX) TTL serial data. On the Arduino Diecimila, these pins areconnected to the corresponding pins of the FTDI USB-to-TTL Serial chip. On the Arduino BT, they are connected to the corresponding pins of the WT11 Bluetooth module. On the Arduino Mini and LilyPad Arduino, they are intended for use with an external TTL serial module.

Digital pins:

In addition to the specific functions listed below, the digital pins on an Arduino board can be usedfor general purpose input and output via the pinMode(), digitalRead() and digital Write() commands. Eachpin has an internal pull-up resistor which can be turned on and off using digitalWrite(). When the pin is configured as an input. The maximum current per pin is 40 mA.

3.4 CONCLUSION

Any model is a combination of different devices working collectively as one for obtaining the desired output. So, in this chapter, we are going to discuss the details and specifications of each device used for this model. Each component has its specific purpose of usage which is needed to be studied and then use it according to our purpose and need. The combination of different components will give rise to a system having ample of benefits and can be controlled by anyone with minimum effort.

CHAPTER – 4
DESIGN

4.1 INTRODUTION

Software design sits at the technical kernel of the software engineering process and is applied regardless of the development paradigm and area of application. Design is the first step in the developmentphase for any engineered product or system. The designer's goal is to produce a model or representation of an entity that will later be built. Beginning, once system requirement has been specified and analyzed,system design is the first of the three technical activities -design, code and test that is required to build andverify software.

The importance can be stated with a single word "Quality". Design is the place where quality is fostered in software development. Design provides us with representations of software that can assess forquality. Design is the only way that we can accurately translate a customer's view into a finished softwareproduct or system. Software design serves as a foundation for all the software engineering steps that follow. Without a strong design we risk building an unstable system – one that will be difficult to test, onewhose quality cannot be assessed until the last stage.

4.2 BLOCK DIAGRAM

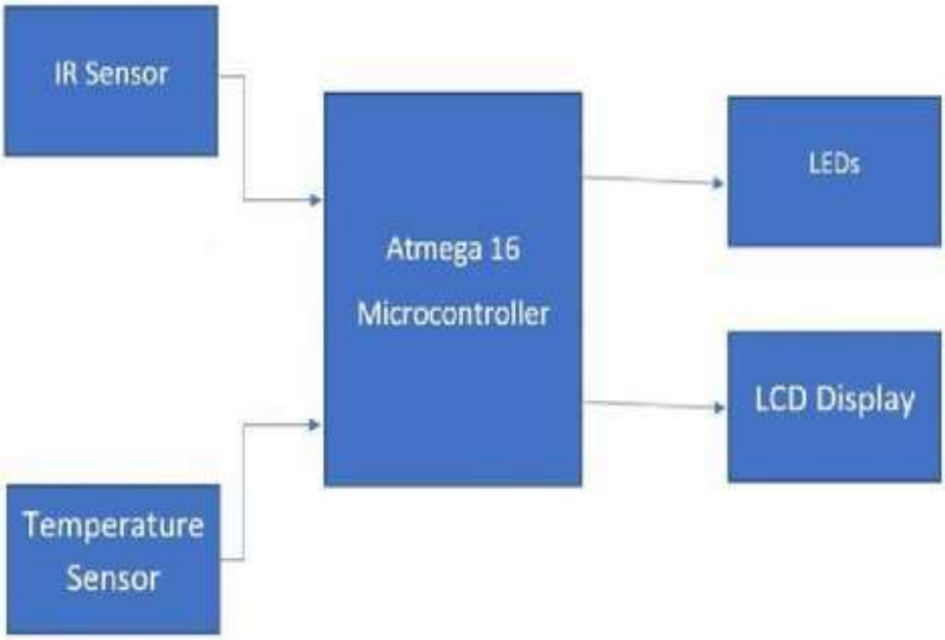


Fig 4.2 Block Diagram

There are different devices/components used in our model. It can be seen that the Arduino UNO is interconnected with different components which function based on their task. Each component used has its impact on the overall working of the model and also not having a specific component could bring a major difference in the overall performance results.

4.3 CIRCUIT DIAGRAM

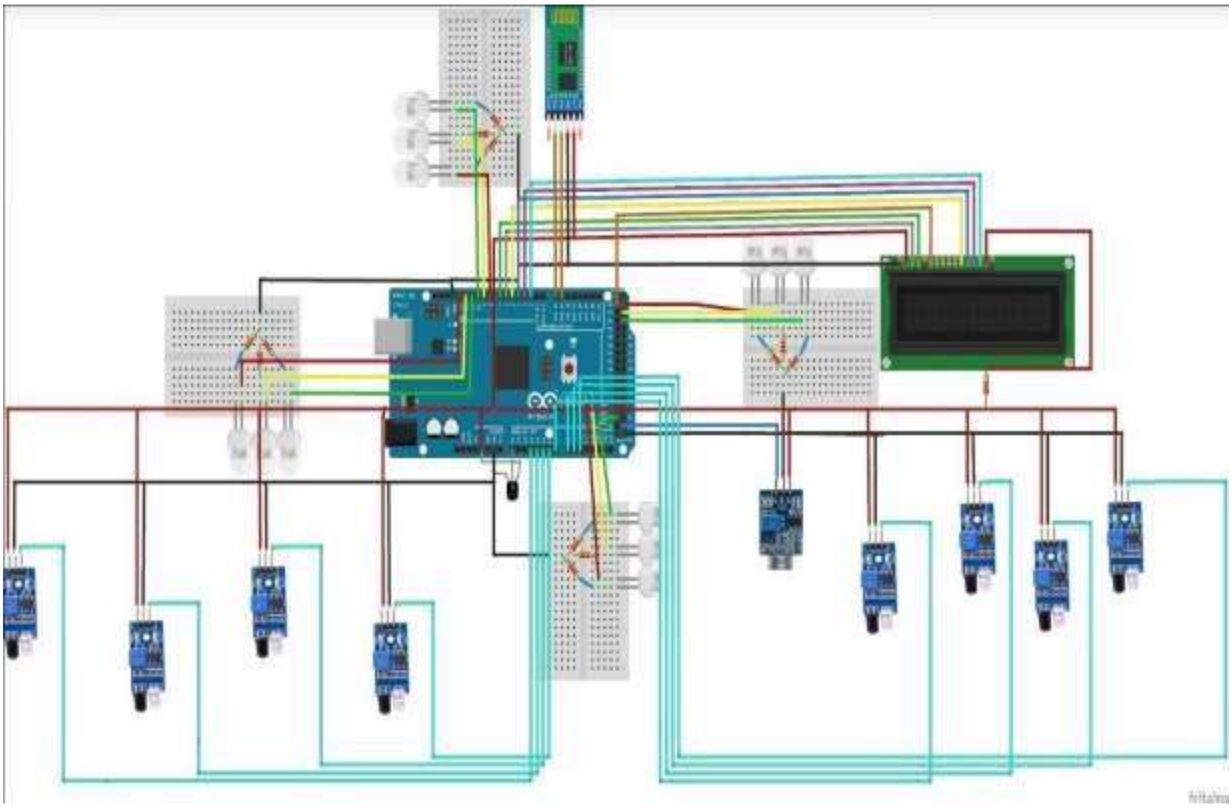


Fig 4.3: Circuit Diagram

4.4 FLOW CHART

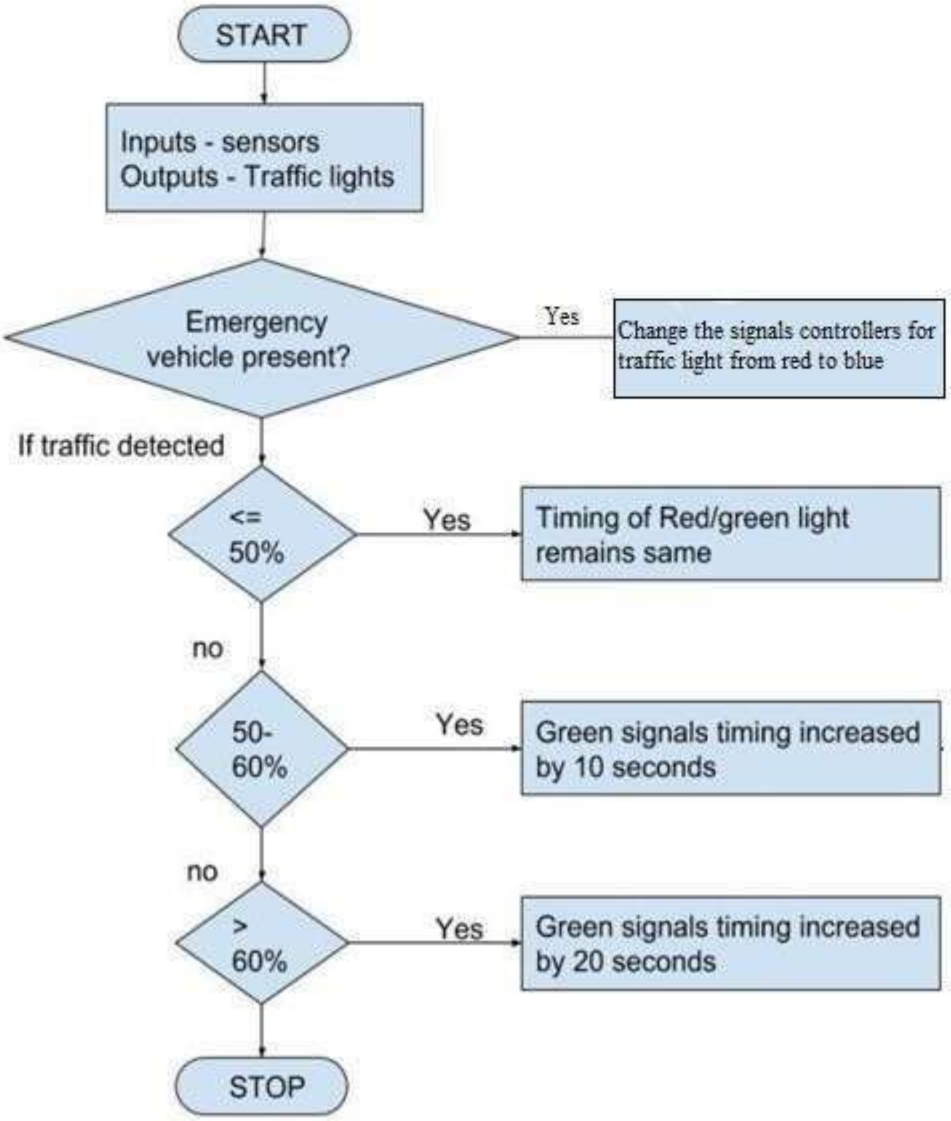

START
Inputs - sensors
Outputs - Traffic lights
Emergency vehicle present?
Yes
Change the signals controllers for traffic light from red to blue
If traffic detected
<= 50%
Yes
Timing of Red/green light remains same
no
50-60%
Yes
Green signals timing increased by 10 seconds
no
> 60%
Yes
Green signals timing increased by 20 seconds
STOP

Fig 4.4 Flowchart

- At beginning the hardware is initialized and in the junction the traffic signals run as usual according to the timer.
- After that if there are more number of vehicles on any lane the for that particular road signal is set to green to reduce the traffic congestion.
- This density of vehicles is identified by the IR sensors.

- Along with density detection suppose if there is an emergency vehicle on any lane even though there is heavy traffic on the other side, first priority is given to

- Ambulance and signal is set to green for that particular way.

4.5 UML DIAGRAM

Unified Modelling Language is popular for its diagrammatic notations. Any complex system can be easily understandable by making some kind of pictures or diagrams. These diagrams have a better impacton our understanding in a better and simple way.

To understand the UML, you need to form a conceptual model of the language, and this requires learningthree major elements: the UML's basic building blocks, the rules that dictate how those building blocks may be put together, and some common mechanisms that apply throughout blocks may be put together, and some common mechanisms that apply throughout the UML. Once you have grasped these ideas, youwill be able to read UML models and create some basic ones. As you gain more experience in applying the UML. You can build on this conceptual model, using more advanced features of the language.

4.5.1 Use case Diagram

A use case diagram is a dynamic or behaviour diagram in UML. Use case diagrams model the functionality of a system using actors and use cases. Use cases are a set of actions, services, and functionsthat the system needs to perform. In this context, a "system" is something being developed or operated, such as a web site. The "actors" are people or entities operating under defined roles within the system.

Use case diagrams are valuable for visualizing the functional requirements of a system that will translate into design choices and development priorities.They also help identify any internal or external factors that may influence the system and should be taken into consideration.

They provide a good high-level analysis from outside the system. Use case diagrams specify howthe system interacts with actors without worrying about the details of how that functionality is implemented.

The purpose of use case diagram is to capture the dynamic aspect of a system. However, this definition is too generic to describe the purpose, as other four diagrams (activity, sequence, collaboration,and state chart) also have the same purpose. We will look into some specific purpose, which will distinguish it from other four diagrams.

Use case diagrams are used to gather the requirements of a system including internal and externalinfluences. These requirements are mostly design requirements. Hence, when a system is analysed to gather its functionalities, use cases are prepared and actors are identified.

These diagrams are used at a very high level of design. This high-level design is refined again andagain to get a complete and practical picture of the system. A well-structured use case also describes thepre-condition, post condition, and exceptions. These extra elements are used to make test cases when performing the testing.

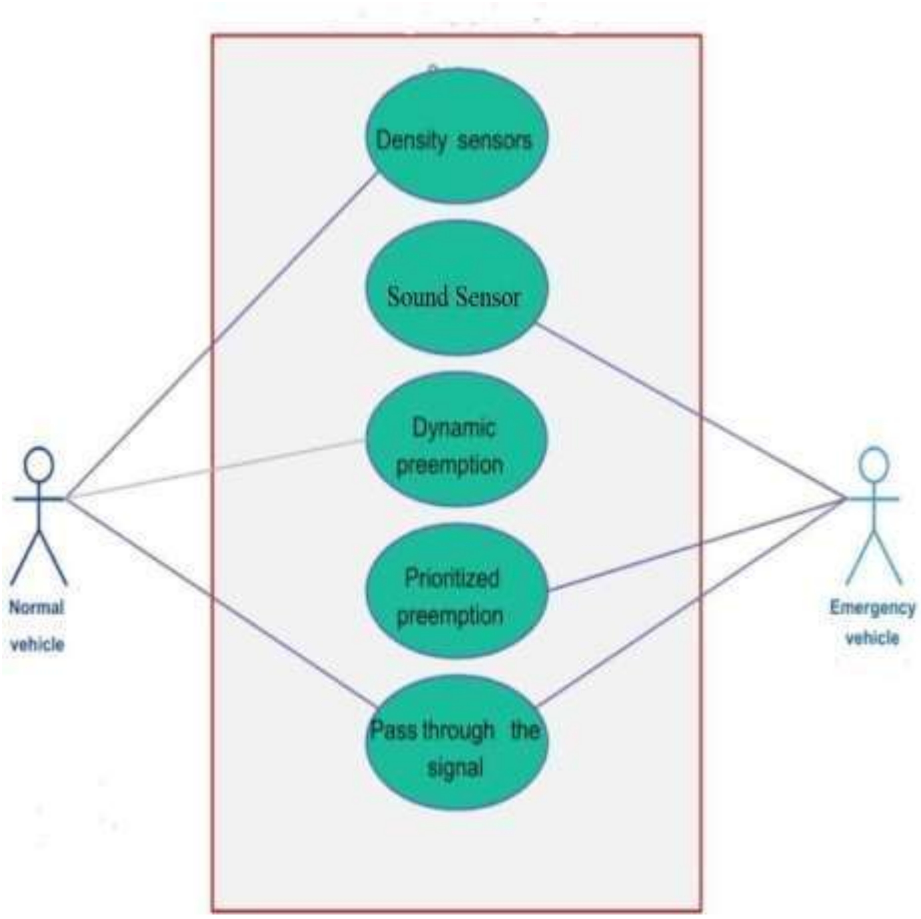


Fig 4.5.1 Use case diagram

4.5.2 Activity Diagram

Activity Diagram An activity diagram is a special kind of a state chart diagram that shows the flow from activity to activity within a system. Activity diagrams address the dynamic view of a system. They are especially important in modeling the function of a system and emphasize the flow of control among objects. When the user inputs the file name the program searches for the specified path of the file. If the path is not available an exception is thrown which eventually stops the execution of the program. They are especially important in modeling the function of a system and emphasize the flow of control among objects. When the user inputs the file name the program searches for the specified path of the file. If the file is available then the algorithm is applied to the content of the data and the data of the file is encrypted. The activity diagram for the proposed algorithm is as shown in the figure.

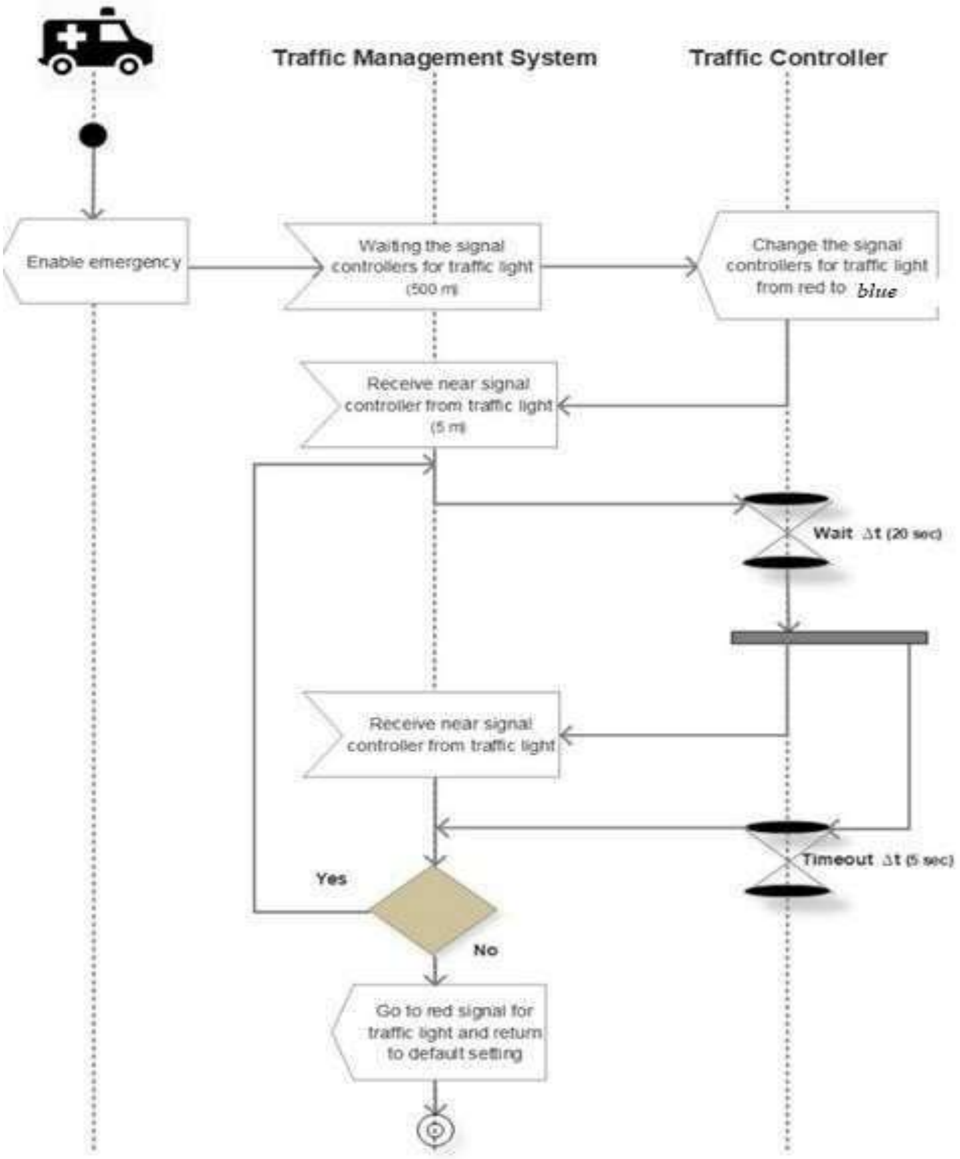

Traffic Management System
Traffic Controller
Enable emergency
Waiting the signal controllers for traffic light (500 m)
Change the signal controllers for traffic light from red to blue
Receive near signal controller from traffic light (5 m)
Wait Δt (20 sec)
Receive near signal controller from traffic light
Timeout Δt (5 sec)
Yes
No
Go to red signal for traffic light and return to default setting

Fig 4.5.2 Activity Diagram

4.5.3 STATE DIAGRAM

State machine diagrams are similar to activity diagrams although notations and usage changes a bit. One way to characterize the changes in a system is to say that its object changes their state in response to events and time. When the user inputs the file name the program searches for the specified path of the file. One way to characterize the changes in a system is to say that its object changes their state in response to events and time.

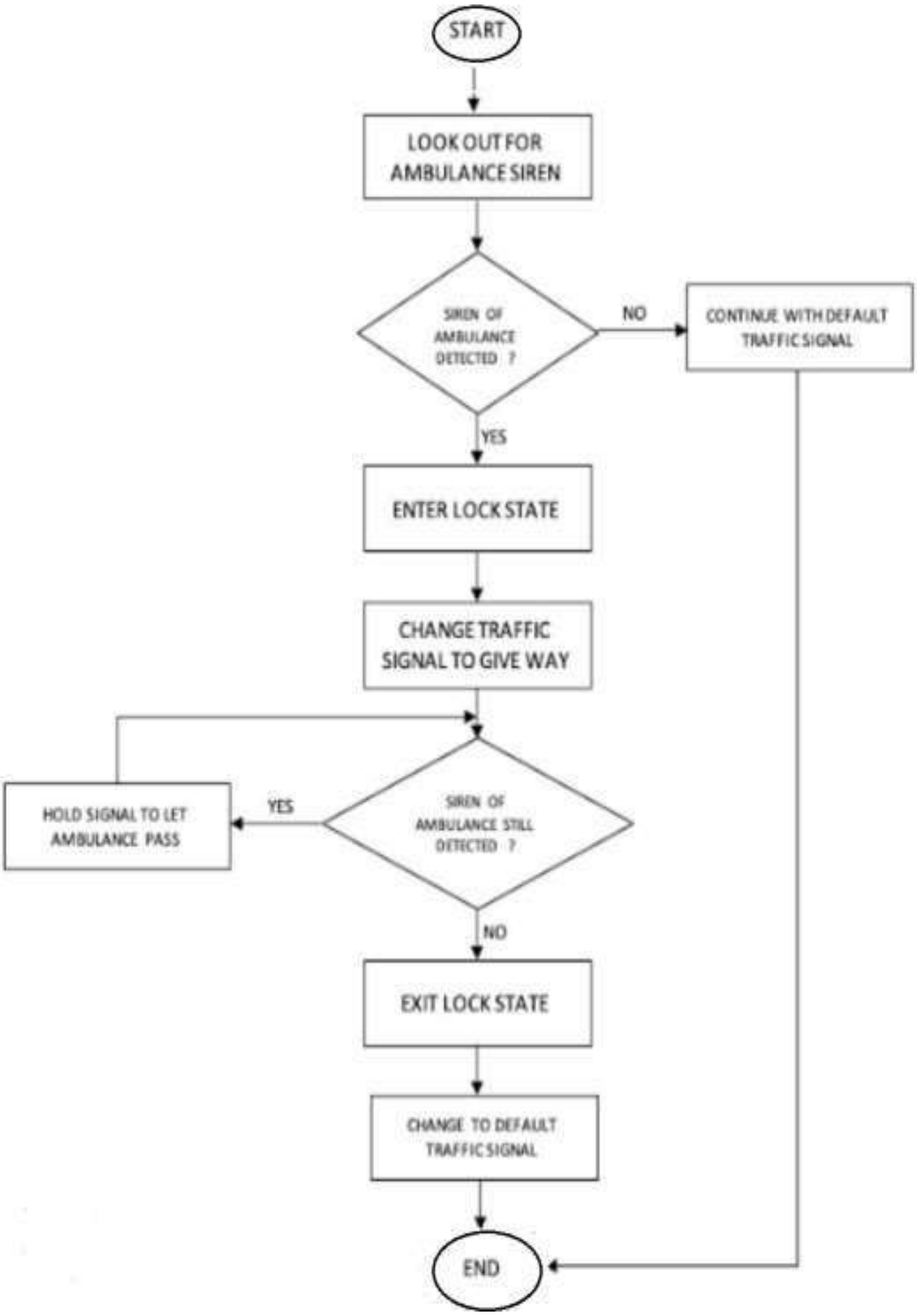

START
LOOK OUT FOR AMBULANCE SIREN
SIREN OF AMBULANCE DETECTED ?
NO
CONTINUE WITH DEFAULT TRAFFIC SIGNAL
YES
ENTER LOCK STATE
CHANGE TRAFFIC SIGNAL TO GIVE WAY
SIREN OF AMBULANCE STILL DETECTED ?
YES
HOLD SIGNAL TO LET AMBULANCE PASS
NO
EXIT LOCK STATE
CHANGE TO DEFAULT TRAFFIC SIGNAL
END

Fig 4.5.3 State Diagram

4.6 CONCLUSION

We gain enough knowledge through design. With the help of content diagram, block diagram we are able to design the data flow diagrams easily. Using these data flow diagrams, it is easy for us to implement our protocol and obtain positive results from it.

CHAPTER – 5
IMPLEMENTATION AND RESULT

5.1. INTRODUCTION

Implementation is the stage of the project when the theoretical design is turned out intoa working system. Thus, it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the new system will work and effective. The implementation stage involves careful planning, investigation of the existing system and its constraints on implementation, designing of methods to achieve changeover and changeover methods.

5.2 EXPLANATION OF KEY FUCTIONS

- **Void setup ():** Will be executed only when the program begins or (resetbutton is pressed).
- **void loop ():** In this function the conditions for the traffic clearance and considering density on road are placed based on that it decides which road is to be cleared.
- **read Sensor ():** This is to connect the IR sensors outputs to Arduino

.

5.3 METHOD OF IMPLEMENTATION

5.3.1 Algorithm

```
Algorithm for MEGA_Board:
  {
       1) Create objects of the Software serial class.
       2) Declare lane functions each having 3 attributes for 3 light emitting diode
      signals
        3) Declare signal variables.
        4) Declare LED variables.
        5) Function setup()
  {
```

a) Pass the created instances of the Servo class by passing the desired pin to the attach() method.

attach(int):

b) Set the signal variable values as Input.

c) Enable the SPI interface.

d) Initiate the serial communication.

```
e) Corresponding to number of roads, repeatedly do:-
    {
      i)  Enable digital pins corresponding to lane function as output.
      ii)  Go to next lane.
            pinMode (LaneNumber[int], OUTPUT)
    }

    Corresponding to number of roads, repeatedly do:-
    {
    i)        Set enabled pins corresponding to lane function off.
    ii)       Go to next lane.
             digitalWrite (LaneNumber[int], LOW);
    }
    }
Function Loop()
{
    a)      When current state of the system is that green light associated with that road do:-
    b)       {
    a.  Set the enabled pins associated with lane functions as on.
             digitalWrite (LaneNumber[int], HIGH);
    b.   Rotate the Servo motors for both lanes of that road and open signal.
    c.  Repeatedly do:-
             {
        a.  Read corresponding signal value and check if it is enabled:-
                  {
             i.   Turn on RED signal for all roads.
             ii.  Open left road with associated to the signal value.

             iii.  Until the signal value is enabled do:-
                         {
                          1. Disable the pins associated to the lanes repeatedly.
                         2. Enable the pin associated to the signal value.
                         }

             iv.  Read the signal value.
             v.  }
                  b.  Close the left barricade with the road associated to the signal value.
                  c.  Check current state of the system.
                  d.  Repeat this step for all signal values.
                  }
          d.  Wait for a few seconds.
          e.  Set pin value corresponding to that lane as High.
    }
             a)  When current state of the system is that yellow light associated with that road
                  perform:-
        {
                  i)      Set the enabled pins associated with lane functions as off.
                  ii)     Repeat step "C" to check if emergency vehicle has arrived or not.
                  iii)    Wait for a few seconds.
                  iv)     Set enabled pins associated with lane functions as off.
                  v)      Rotate and close both the barricades associated with that road.
                  vi)     }
             b)  Repeat above both steps for all remaining green and yellow light variables
                  which to correspond to the roads.
          }
          End Algorithm
    }
```

5.2.1 Sample Code

```
#include <SoftwareSerial.h>
#include<LiquidCrystal.h>
SoftwareSerial BTserial(0,1);
const int rn=12,en=11,d4=2,d5=3,d6=4,d7=5;
LiquidCrystal lcd(rn,en,d4,d5,d6,d7);
const int inPin = 8;
const int S1E=2; ///////////////L1 const
int  S2E=3;  ///////////////L2  const  int
S3E=4; ///////////////L3 const int
```

```
S4E=5;  ////////////////L4

#define ledA1 22
#define ledA2 23
#define ledA3 24
#define ledB1 25
#define ledB2 26
#define ledB3 27
#define ledC1 28
#define ledC2 29
#define ledC3 30
#define ledD1 31
#define ledD2 32
#define ledD3 33 int
sensorPin = A9; int
sensorValue = 0;
int a1, a2, b1, b2, c1, c2, d1, d2; int
led = 35;
int state; int
S2E=0;


int  S3E=0;  int
S4E=0;       int
S5E=0;


int  S1Ealert=1;  int
S2Ealert=1;       int
S3Ealert=1;       int
S4Ealert=1;
void setup() {
BTserial.begin(9600);
Serial.begin (9600);
pinMode(led, OUTPUT);
pinMode(ledA1, OUTPUT);
pinMode(ledA2, OUTPUT);
pinMode(ledA3, OUTPUT);
pinMode(ledB1, OUTPUT);
pinMode(ledB2, OUTPUT);
pinMode(ledB3, OUTPUT);
pinMode(ledC1, OUTPUT);
pinMode(ledC2, OUTPUT);
pinMode(ledC3, OUTPUT);
pinMode(ledD1, OUTPUT);
pinMode(ledD2, OUTPUT);
pinMode(ledD3, OUTPUT);
lcd.begin(16,2);
}
void loop() {
int value = analogRead(inPin); //reading pin 8
lcd.setCursor(0,1); //setting cursor at 0th row and 1st column of lcd float
millivolts = (value / 1024.0) * 5000; //calculation of temperature float
celsius = millivolts / 10; //temperature in celsius
lcd.clear();
lcd.setCursor(0,0); //setting cursor at 0th row and 0th column of lcd
lcd.print(celsius);
lcd.print("C");
lcd.setCursor(0,1); //setting cursor at 0th row and 1st column of lcd
delay(1000); //delay
readSoundSensor(); //calling function sound sensor which reads value of sound sensor
readSensor(); //calling function readSensor which reads values of 8 ir sensor. if(a1==1
&& a2==1){ //High traffic on A
roadState(); //calling function readState roadAopen();
//Opening road A
}
else if((b1==1 && b2==1) && (a1==0 || a2==0)){ //High traffic on B
roadState();
roadBopen(); //Opening road B
}
```

```
  else if((c1==1 && c2==1) && (a1==0 || a2==0) && (b1==0 || b2==0)){
 //High traffic on C roadState();
 roadCopen(); //Opening road C
}
else if((d1==1 && d2==1) && (a1==0 || a2==0) && (b1==0 || b2==0) && (c1==0
||c2==0)){ //High traffic on D
roadState();
roadDopen(); //Opening road D
}
else if((a1==1 && a2==0) && (b1==0 || b2==0) && (c1==0 ||c2==0) && (d1==0 &&
d2==0)){ //Moderate traffic on road A and zero traffic on other road
roadState();
roadAopen(); //Opening road A
}
else if((b1==1 && b2==0) && (a1==0 || a2==0) && (c1==0 ||c2==0) && (d1==0 &&
d2==0)){ //Moderate traffic on road B and zero traffic on other road
roadState();
roadBopen(); //Opening road B
}
else if((c1==1 && c2==0) && (a1==0 || a2==0) && (b1==0 ||b2==0) && (d1==0 &&
d2==0)){ //Moderate traffic on road C and zero traffic on other road
roadState();
roadCopen(); //Opening road C
}
else if((d1==1 && d2==0) && (a1==0 || a2==0) && (b1==0 ||b2==0) && (c1==0 &&
c2==0)){ //Moderate traffic on road D and zero traffic on other road
roadState();
roadDopen(); //Opening road D

}
else if((a1==1 && a2==0) && (b1==1 || c1==1 || d1==1) && (b2==0 && c2==0 &&
d2==0)){ //Moderate traffic on road A and zero or moderate traffic on other road
roadState();
roadAopen(); //Opening road A
}
```

```
else if((a1==0 && a2==0) && (b1==1 && b2==0) && (c1==1 || d1==1) && (c2==0
&&
d2==0)){
//Zero traffic on road A , moderate traffic on road B and moderate or zero traffic on
road C and D
roadState();
roadBopen(); //Opening road B
}
else if((a1==0 && a2==0) && (b1==0 && b2==0) && (c1==1 && c2==0) &&
(d1==1
&& d2==0)){ //Zero traffic on road A and B , moderate traffic on road C and moderate
or zero traffic on road D
roadCopen(); //Opening road C
}
else if(a1==0 && b1==0 && c1==0 && d1==0){
//Zero traffic on all the roads
roadState();
roadAopen(); //Opening road A
if (a1 == 0 && b1 == 0 && c1 == 0 && d1 == 0)
{
roadState();
roadBopen(); //Opening road B
}
if (a1 == 0 && b1 == 0 && c1 == 0 && d1 == 0)
{
roadState();
roadCopen(); //Opening road C
}
if (a1 == 0 && b1 == 0 && c1 == 0 && d1 == 0)
{
roadState();
roadDopen(); //Opening road D
}
}
}
void readSoundSensor(){
sensorValue = analogRead (sensorPin); //reading value of sound sensor
if(sensorValue > 800){
//if detected sound is greater than 800 then road A will be opened.
digitalWrite(led, HIGH);
roadAopen();
}
digitalWrite(led, LOW);
}
void readSensor()
{
a1 = analogRead(A7); a2 =
analogRead(A6); b1 =
analogRead(A4); b2 =
analogRead(A5);
c1 = analogRead(A1); //reading values of ir sensor c2 =
analogRead(A0);
d1 = analogRead(A3); d2 =
analogRead(A2);
if (a1 < 400) a1 = 1; else a1 = 0; if (a2 < 400) a2 = 1; else a2 = 0; //assigning values to
ir
if (b1 < 400) b1 = 1; else b1 = 0; if (b2 < 400) b2 = 1; else b2 = 0; if
(c1 < 400) c1 = 1; else c1 = 0; if (c2 < 400) c2 = 1; else c2 = 0; if (d1
< 400) d1 = 1; else d1 = 0; if (d2 < 400) d2 = 1; else d2 = 0;
}
void roadAopen()
{
Serial.println(msg1); // printing value of msg1 for passing it on bluetooth
lcd.setCursor(0,11); //setting cursor on 0th row and 11th column of lcd lcd.print("Road
A Open"); //displaying on lcd
digitalWrite(ledA3, LOW);
digitalWrite(ledA1,       HIGH);
digitalWrite(ledB3,       HIGH);
digitalWrite(ledC3,       HIGH);
digitalWrite(ledD3, HIGH);
delay(5000); //Green led is high and red leds of other road are on for 5s
digitalWrite(ledA1, LOW);
digitalWrite(ledA2, HIGH); //turning on yellow led with delay of 1 second delay(1000);
digitalWrite(ledA2, LOW);


}
void roadBopen()
`{
Serial.println(msg2); //printing value of msg2 for passing it on bluetooth
lcd.setCursor(0,11); //setting cursor on 0th row and 11th column of lcd lcd.print("Road
B Open"); //displaying on lcd
digitalWrite(ledB3,        LOW);
digitalWrite(ledA3,       HIGH);
digitalWrite(ledB1,       HIGH);
digitalWrite(ledC3,       HIGH);
digitalWrite(ledD3, HIGH);
delay(5000); //Green led is high and red leds of other road are on for 5s
digitalWrite(ledB1, LOW);
digitalWrite(ledB2, HIGH); //turning on yellow led with delay of 1 second delay(1000);
digitalWrite(ledB2, LOW);

}
void roadCopen()
{
Serial.println(msg3); // printing value of msg3 for passing it on bluetooth
lcd.setCursor(0,11); //setting cursor on 0th row and 11th column of lcd lcd.print("Road
C Open");
digitalWrite(ledC3,        LOW);
digitalWrite(ledA3,       HIGH);
digitalWrite(ledB3,       HIGH);
digitalWrite(ledC1, HIGH);
digitalWrite(ledD3, HIGH);
delay(5000); //Green led is high and red leds of other road are on for 5s
digitalWrite(ledC1, LOW);
digitalWrite(ledC2, HIGH); //turning on yellow led with delay of 1 second delay(1000);
digitalWrite(ledC2, LOW);

}
void roadDopen()
{
Serial.println(msg4); // printing value of msg4 for passing it on bluetooth
lcd.setCursor(0,11); //setting cursor on 0th row and 11th column of lcd lcd.print("Road
D Open");
digitalWrite(ledD3,       LOW);
digitalWrite(ledA3,      HIGH);
digitalWrite(ledB3,      HIGH);
digitalWrite(ledC3,      HIGH);
digitalWrite(ledD1, HIGH);
delay(5000); //Green led is high and red leds of other road are on for 5s
digitalWrite(ledD1, LOW);
digitalWrite(ledD2, HIGH); //turning on yellow led with delay of 1 second delay(1000);
digitalWrite(ledD2, LOW);

}
void roadState(){
if(Serial.available()>0){
state= Serial.read(); //printing values of state
}
if(state==97){ state=0;
//setting value of state=0 because bluetooth stores the value of state so we are
making it 0.
roadAopen(); //if state is 97 then open road A
}
else if(state==98){ state=0;
roadBopen(); //if state is 98 then open road A
}
else if(state==99){ state=0;
roadCopen(); //if state is 99 then open road A
}
else if(state==100){ state=0;
roadDopen(); //if state is 100 then open road A
}
  }
```

OUTPUT SCREENS

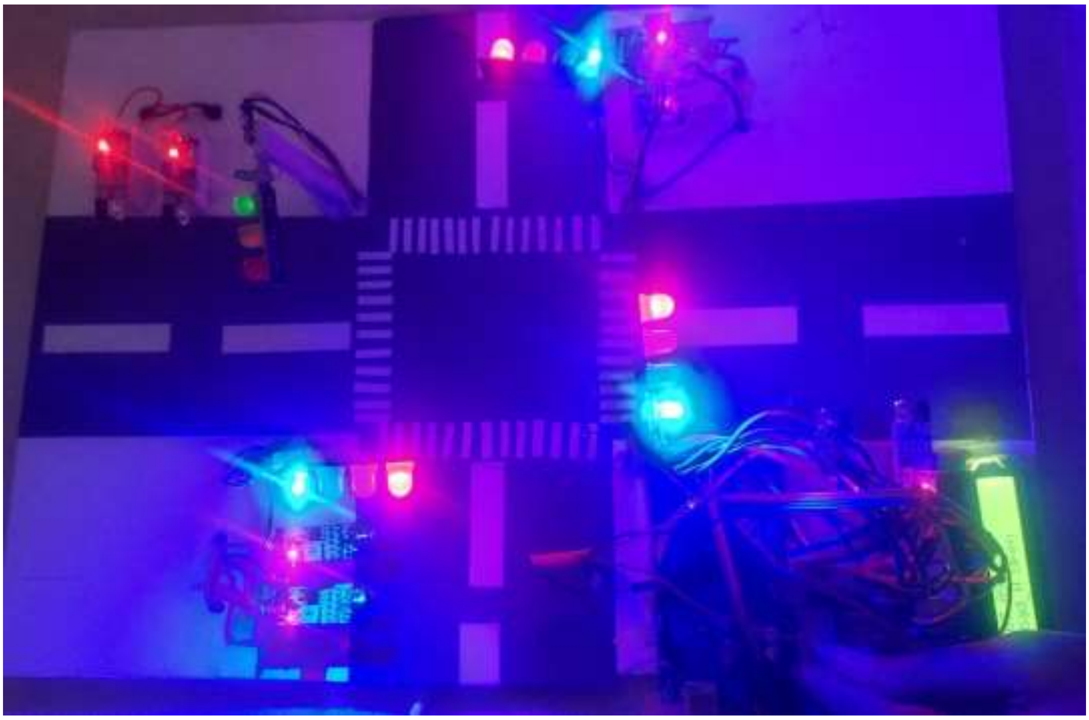


Fig 5.1 Ambulance Detection

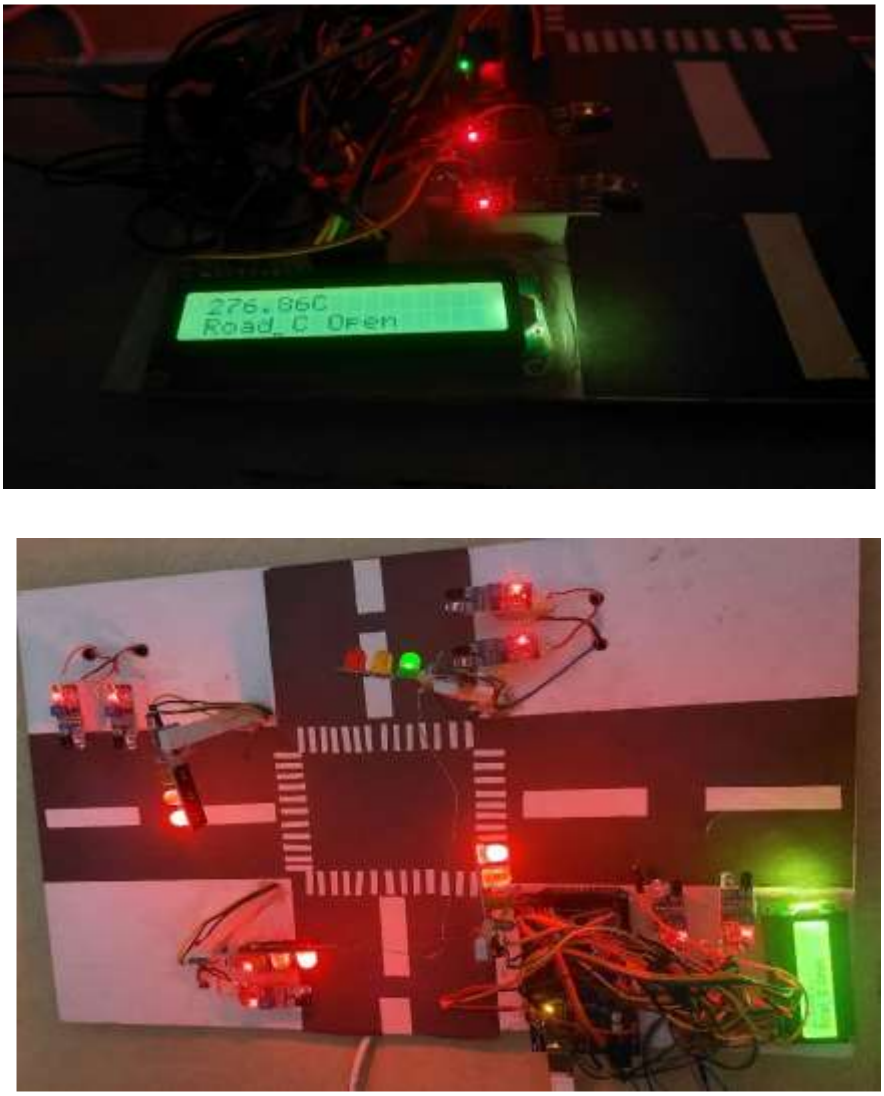
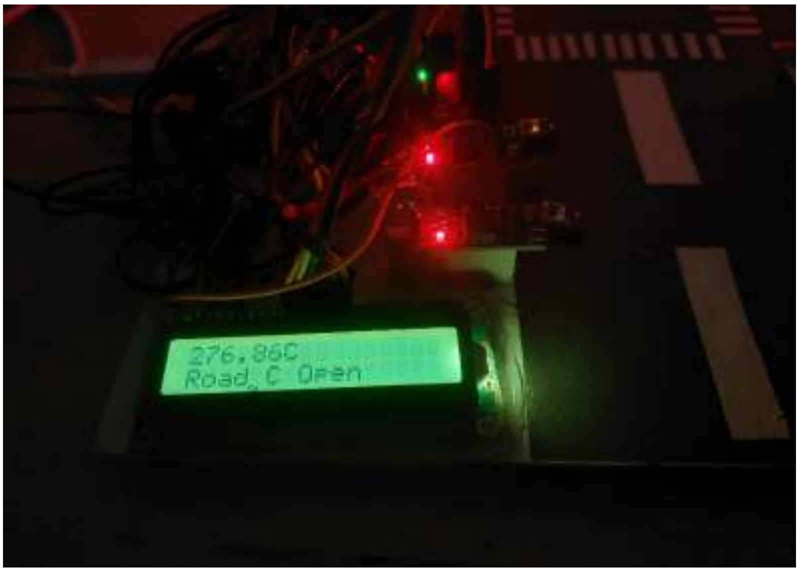


Fig 5.2: Density Detection

DISPLAYING



5.3 CONCLUSION

In this chapter, implementation of our project is done and the results are evaluated. Here we have successfully implemented the Traffic control system of Ambulance detection. The results obtained will be useful for testing.

CHAPTER – 6
TESTING AND VALIDATION

6.1 INTRODUCTION

6.1.1 System Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies and/or a finished product. It is the process of exercising the software with the intent of ensuring that the software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various of testing's. Each test type addresses a specific testing requirement.

6.1.2 TYPES OF TESTING

6.1.2.1 Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decisions and branches and internal code flow should be validated. It is the testing of individual software units of application. It is done after the completion of an individual unit and before integration. This is the structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, and or system configuration. Unit tests ensure that unique part of business process performs accurately to the documented specification and contains clearly defined inputs and expected result.

6.1.2.2. Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfied, as shown by successfully unit testing, the combination of component iscorrect and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.1.2.3 Functional testing

Functional tests provide systematic demonstration that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered one the following items:

Valid Input: Identified cases of valid input must be accepted. Invalid

Input: Identified classes of Invalid input must be rejected. Functions:

Identified functions must be exercised.

Output: Identified classes of application output must be exercised.

System/Procedures: Interfacing systems or procedures must be invoked.

Organization and Preparation of functional tests is focused on requirements, key functions or special test cases.

System Testing:

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is configuration-oriented system integration testing.

6.2 DESIGN OF TESTCASES AND SCENARIONS

A test case is a document, which has set of test data, preconditions, expected results and post conditions, developed for particular test scenario in order to verify compliance against a specific requirement.

Scenario testing is software testing activity that uses scenarios: Hypothetical stories to help the test a work to a complex problem or test system. The ideal scenario test is a credible, complex, compelling or motivating story the outcome which is easy to evaluate.

Test Case1: AMBULANCE DETECTION		
Test Objective: To verify the arrival of Ambulance and clearing Traffic		
Test Description: Ambulance Detected		
Requirements Verified: Yes		
Test Environment:		
ACTION	**EXPECTED RESULT**	
Ambulance Arrival	Ambulance Detected	
Pass: Yes	**Condition Pass**: Yes	**Fail**: No
Problems/Issues: NILL		
NOTE: Successfully executed		

Table 6.2.1 Test Case

Output of Ambulance Arrival

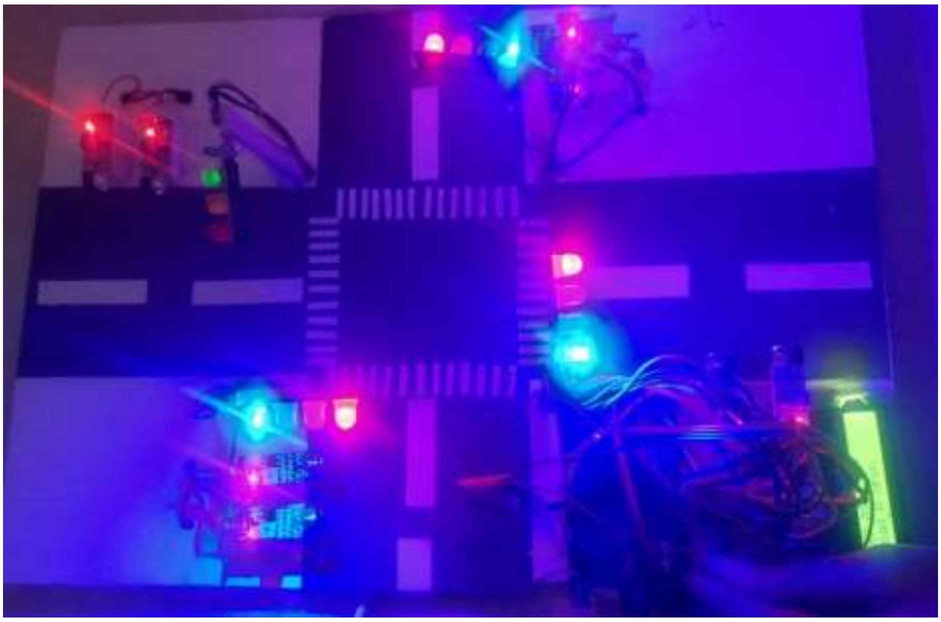


Fig 6.2.1 Ambulance Detection

Test Case2: DENSITY DETECTION		
Test Objective: To verify whether the highest road with density is cleared or not		
Test Description: Traffic Clearance for highest density road		
Requirements Verified: Yes		
Test Environment:		
ACTION	**EXPECTED RESULT**	
Detection of Vehicles	Road Density Detected	
Pass: Yes	**Condition Pass**: Yes	**Fail**: No
Problems/Issues: NILL		
NOTE: Successfully executed		

Table 6.2.2 Test Case 2

Output of details displaying

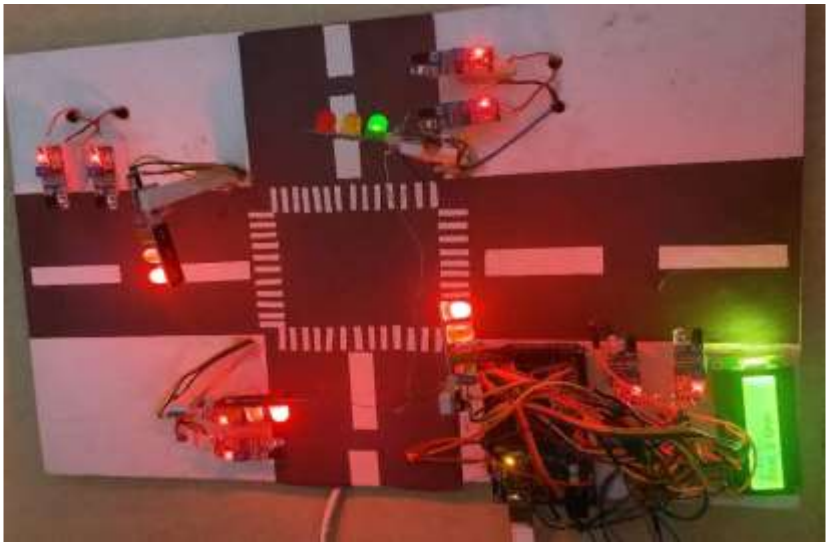


Fig 6.2.2 Ambulance Detection

6.3 CONCLUSION

The main purpose of testing is to check whether the system is working properly and it has met the user requirements. In this phase, we have conducted unit testing and validation of system. This system has cleared majority of the test cases and it is performing well indicating a good software quality.

CHAPTER – 7

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION

Human life is precious and must follow safety measures very conscious in all aspects this of course includes ambulances services too. In this, by using intelligent ambulance system we can achieve the uninterrupted service of the traffic control system by implementing the alternate methods for signal change to Allow flow control. The accuracy of the RFID is more than Camera’s. So our proposed paper also improves the performance of traffic light Violation Detection System.

FUTURE ENHANCEMENT

- The future work of the project is to improve the traffic clearance for detecting the occurrence of ambulance in more than one way. Cloud based Android Application for storing database is also the future enhancement.
- The two readers in each path are placed on opposite sides. If any road needs to be broadened or any other maintenance work needs to be done, then one of the readers can be temporarily removed and the system made to work on a single reader in that road. If any or both of the roads are two-way with a pavement in-between, then the readers can be placed in the pavement.

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