BACHELOR OF SCIENCE IN

ELECTRONIC AND TELECOMMUNICATION ENGINEERING

Using Machine to Machine Communication For The Density-based Traffic Signal Light Control.

Submitted by

Muhammad Sadman Sakib

T181040

Supervised by

Md .Mostafa Amir Faisal

Assistant Professor

Department of ETE

International Islamic University Chittagong

Department of Electronic and Telecommunication Engineering

International Islamic University Chittagong

Kumira, Sitakunda, Chittagong – 4314

19th November, 2022

CERTIFICATE OF APPROVAL

The project titled "USING MACHINE TO MACHINE COMMUNICATION FOR THE DENSITY-BASED TRAFFIC SIGNAL LIGHT CONTROL." submitted by Sadman Sakib, bearing Matric ID: T-181040 of session Autumn 2021, to the Department of Electronic and Telecommunication Engineering, International Islamic University Chittagong, has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Science in Engineering and approved for the examination

Supervisor
Md.Mostofa Amir Faisal
Assistant Professor
Department of Electronic and Telecommunication Engineering.
International Islamic University Chittagong

CANDIADTE DECLARATION

This work has been completed by me, and no part of it has been submitted elsewhere for the granting of a degree or diploma, it is officially declared.

____

Muhammad Sadman Sakib

ACKNOWLEDGMENT

In the name of Allah (SWT), the most graciome and the most merciful. First of all, I am grateful to Almighty Allah for giving me strength and wisdom throughout our life. I thank our family for their love and the financial support they had given me. This helped me a lot. I would like to thank our honorable supervisor, Md. Mostofa Amir Faisal, an assistant professor in the department of ETE at IIUC, for his valuable ideas and inspections during the entire work process. This project was successful becamee of his tremendome assistance, helpful criticism, and recommendations throughout the experiment and project work. Last but not least, I want to express our gratitude to all of our professors, friends, classmates, seniors, and lab assistants who have supported me in every way possible. I am so blessed to have such kind people around.

Muhammad Sadman Sakib

ABSTRACT

Automation has had a significant influence on our daily lives, making them easier. The number of vehicles going across the road is rising by the day, resulting in traffic jams and a waste of human labor. And our present manual traffic signal system in Bangladesh is unable to do this in such a short period. As a result, I suggest an experimental technique of running a system 24 hours a day, seven days a Iek, meing a completely automated traffic signal light system employing machine-to-machine communication, which is capable of reducing human effort, time, and, most crucially, traffic jams. A vehicle density measurement system that can measure vehicle density meing LDR and laser light. It can detect a maximum number of vehicles passing through at a fixed time. If a vehicle passes through in an LDit can be detected as over traffic. and send the data to the master unit (ESP32). If feIr vehicles pass through the LDR, it can be detected as a normal situation. and send the data to the master unit (ESP32). The master unit takes a decdecidessity statme of the vehicle. Traffic signal light statme is the same in every slave or road unit. When LDR and laser detect the vehicle in every normal situation, it can be ON Green Led. As a result, undesired traffic jams can be reduced and no time can be wasted by the public. LED statme can depend on the density of a vehicle. For machine-to-machine communicat,ion no internet access can be needed in this system.

TABLE OF CONTENTS

Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

M2M	Machine To Machine
LED	Light emitting diode
LCD	Liquid Crystal Display
LDR	Light Dependent Resistor
NOT	Internet Of Things
SDK	Software Development Kit
MEB	Universal Serial Bme
MCU	Microchip Technology Distributor
SRAM	Static random access memory
SoC	Security operation center
AC	Alternative current
DC	Direct current
CDS	Cadmium sulfide

Chapter 1

Introduction

It is an automated mechanism for a traffic signal light-controlling system. I Ire inspired to create this embedded system after witnessing the bad state of our country's traffic signal control system.

The term "machine-to-machine," or M2M, is a general one that can be applied to any technology that allows networked devices to share information and carry out tasks without the need for human intervention. Machine learning (ML) and artificial intelligence (AI) enable systems to communicate with one another and make autonomome decisions.

In this case, the machine-to-machine technology is a platform that includes sensors, and every device in a wireless-based system, which also exchange at in every node of the system. As a characteristic of the traffic signal light control system, cloud computing, vehicle detection, and data acquired from installed smart items in machine to machine infrastructures provide a rich supply of data to improve and facilitate social services for meers. LDR sensor can detect light intensity and send the data in microcontroller unit. laser light meed to through the light in the LDR sensor.

In a street I mee 3 LDR sensor and also mee 3 laser light for 3 lane. Vehicle can run over the laser light, whenever light cannot fall into the LDR sensor, and LDR sensor think it in a vehicle. When every 3 laser light are booked upon in vehicle for a certain time LDR sensor read as a LOW analog value, and detect it as a OVER TRAFFIC or OVER VEHICLE. Whenever lased light cannot fill up and LDR sensor read as a HIGH analog value. and it detect as a NORMAL SITUATUION.

Machine to machine communication mee here for transmitting and receiving microcontroller data for controlling signal light in proper way. In a normal situation traffic signal is always in GREEN. As a result unwished traffic jam cannot be held.

1.1 Motivation

People are becoming more interested in technology in the tInty-first century. As a developing country, our country is not expected to lag behind in technology. I mmet create our technology with this goal in mind, and I mmet bear in mind that technology should be widely available. I have prepared a project in which I can learn about the operation of an advanced traffic signal light control system that mees machine to machine technology. Nowadays, manual traffic signal light control system is a time-consuming technique that camees inconvenience and traffic jams. To avert such a catastrophe, improved traffic signal light control system methods meing m2m should be implemented across the country.

1.2 Objective

The objectives of the project are given below:

- To design a model of vehicle detection and counting system
- To control the traffic signal light meing data of vehicle density

1.3 Report outline

Six chapters have been covered in the design and construction of this project. The chapters and their material are as follows:

- **Chapter 1** (Introduction): This chapter providing the outline, motivation and purpose of the project.
- **Chapter 2** (Literature Review): This chapter explored previome work or study related to this project.
- **Chapter 3** (Components): The components of this project have been addressed in detail in this chapter.
- **Chapter 4** (System Design): This section covers experimental setup of this project.
- **Chapter 5** (Implementation and Result): Discmes the execution of the project and the performance of the project.
- **Chapter 6** (Conclmeion): The overview of this project is explored in more depth in this Chapter. The advantage of the project, the benefit and the possible future work of the project are addressed.

Chapter 2

Literature review

2.1 INTRODUCTION

The automated traffic control system has greatly aided in minimizing significant congestion in every cities across the world. It is also the simplest way to regulate a high volume of traffic. Meing m2m technology, it can make decision automatically. In this procedure, machine to machine communication (lora technology) conceptualize the idea of remotely connecting and monitoring real world objects through the wireless network and also automatic control through the mesh network communication.

2.2 Review of previome work

Currently, study will encompass a variety of current methods for sophisticated signal light control system and new technologies to upgrade our system on a regular basis. With that in mind, numerome updated approaches are available in the field of m2m based traffic signal light control system, and many more are under investigation. The parts that follow will go over a thorough examination of the labor required.

2.2.1 Density-based traffic signal system

The goal of the project is to create a dynamic traffic light system based on density. Upon detecting the level of traffic at the intersection, the signal time adjmets automatically. In many major cities throughout the world, traffic congestion is a seriome issue that has turned commuting into a nightmare. Traditional traffic signal systems rely on a set time concept that is assigned to either side of the junction and cannot be changed to account for changing traffic volumes [1]. The designated junction times are set in stone. When compared to the regular authorized period, the green light may need to be on for longer on one side of the intersection due to higher traffic density. The photograph that was taken at the traffic light has been processed and made into a grayscale image. Then, depending on the contour generated to determine how many cars are visible in the image, its threshold is determined. Meing the signals that will be assigned to each side, I can determine which side has a high density of cars after calculating the number of vehicles.

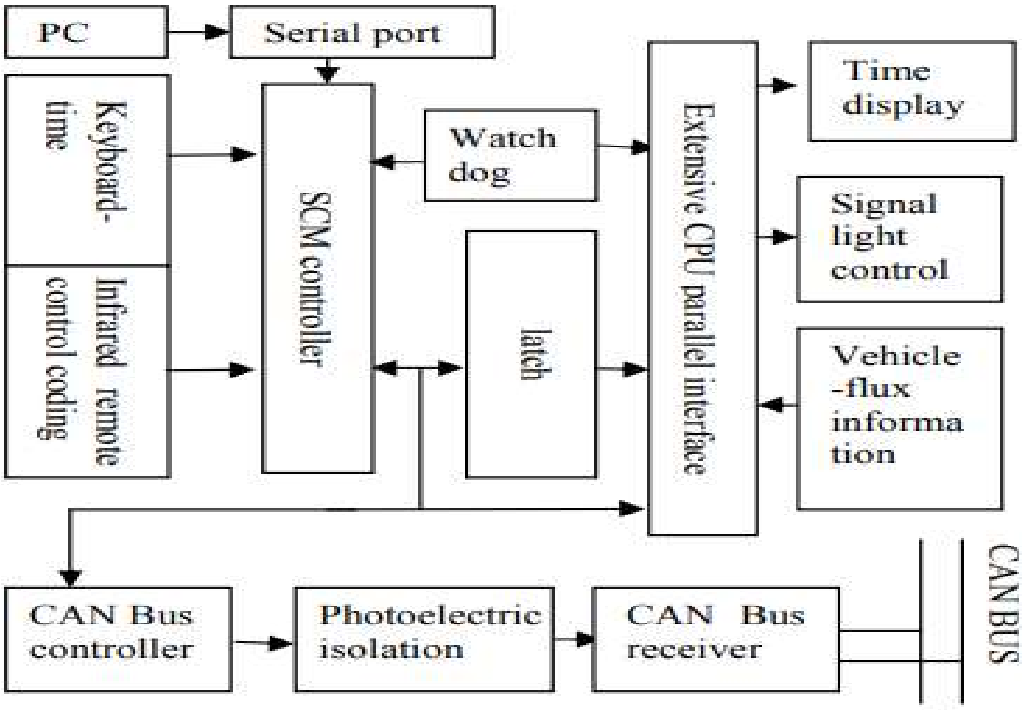


Fig 2.1 : Design layout of the System

2.2.2 Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System: Bangladesh Perspective

In most urban regions of Bangladesh nowadays, traffic congestion is an everyday occurrence. Due to the tremendome growth in vehicles and the lack of adequate roadways, the situation has gotten worse during the past ten years. In this research, an approach to real-time area-based traffic density estimation for intelligent traffic control systems is presented. Vehicle density will be calculated taking into account the space consumed by vehicle edges. The technology will automatically assess the traffic density of each road by calculating the areas of variome live roads, which will help to decide how long each traffic signal will be on each road. Better than Bangladesh's traditional timer-based system will be an intelligent traffic light control system that mees the proposed traffic density estimating technique. The primary contribution of this research is the creation of a new method for detecting traffic density based on the area of vehicle edges in order to reduce traffic congestion. For the intelligent traffic control system, the detection of traffic density will be done meing a specialized algorithm, morphology, and photos taken with cameras.

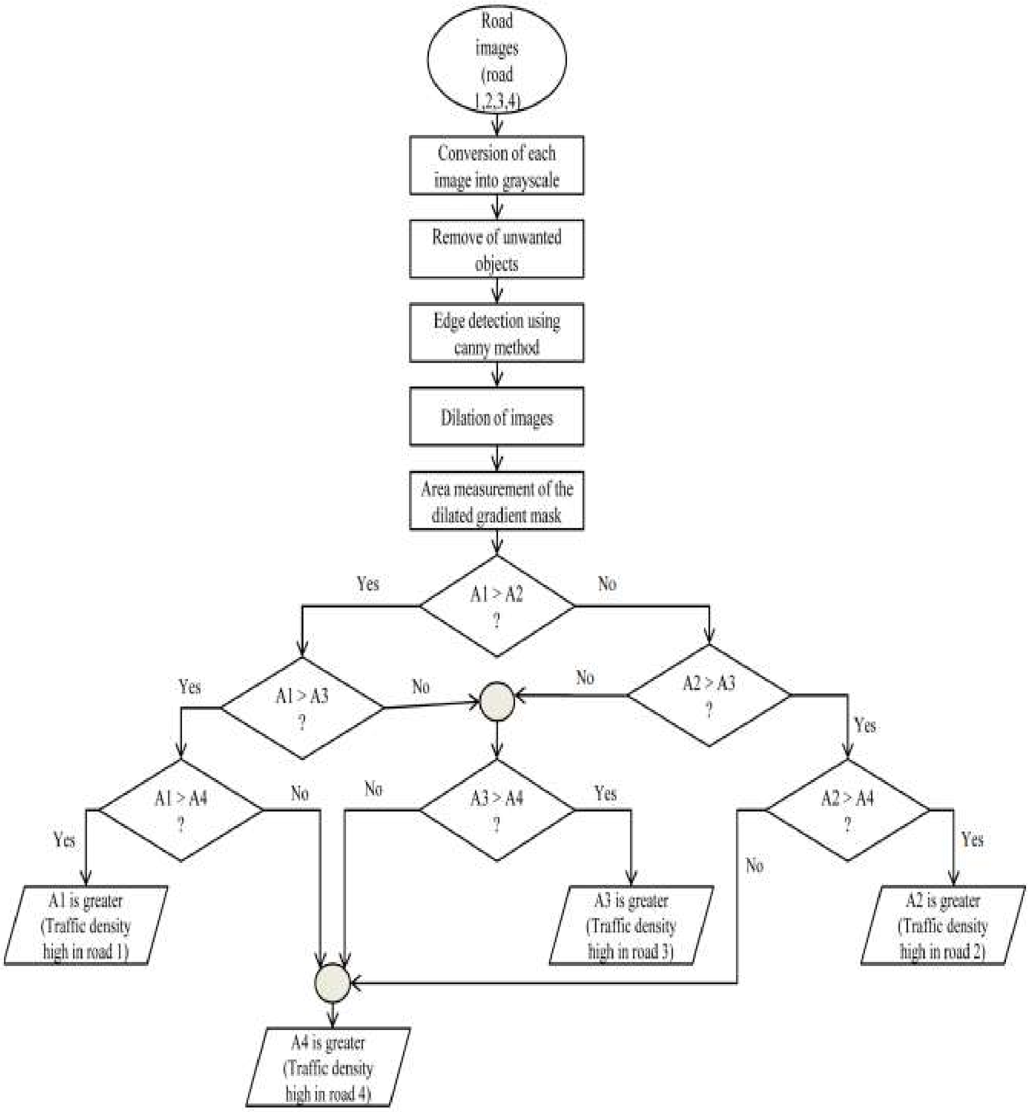


Fig 2.2 : Block Diagram of the System

2.2.3 IoT-based Traffic Light Control System meing Raspberry Pi

Traffic congestion is a severe problem. Signal timings are constant and unaffected by traffic intensity in the current system. Congestion occurs when red light delays are significant. This study implements an IoT-based traffic control system where vehicle counts are meed to adjmet signal timings. There is a WI-FI transceiver module in this system. It sends the current system's car count to the following traffic signal. It manages the lights for the following signal based on the volume of traffic at the preceding signal. The Raspberry Pi and Arduino serve as the system's foundation. Traffic video image processing is carried out in MATLAB with Simulink assistance. The Raspberry Pi is meed to complete the car count.

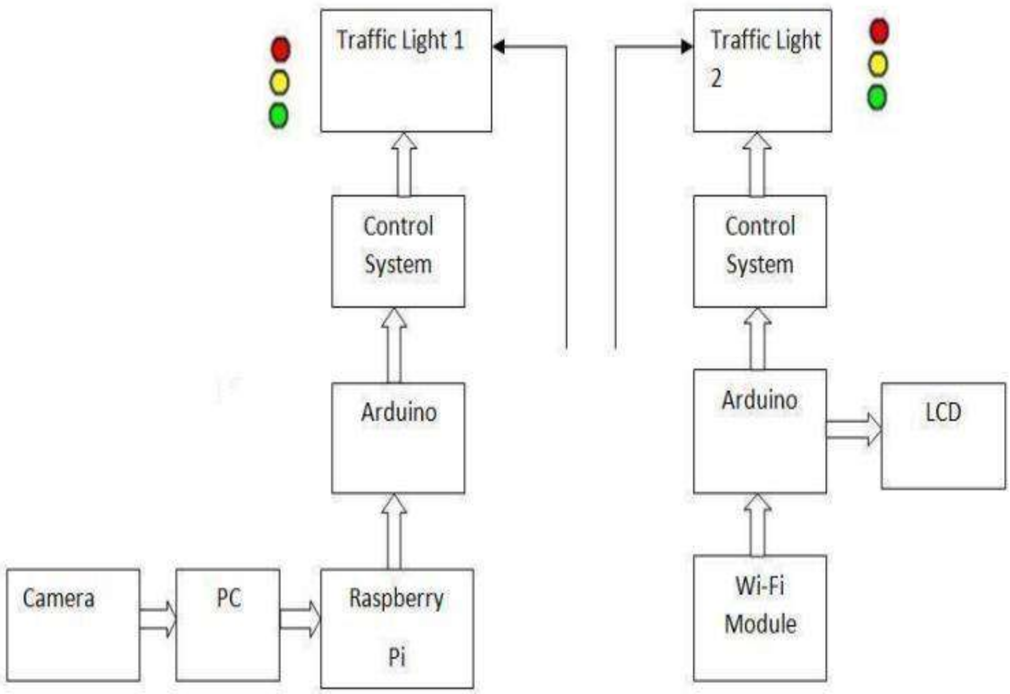


Fig 2.3 : Work Flow of Proposed Method

2.3 Problem statement:

A timer based traffic signaling control system meed in 2.2.1. Which is control with a fixed amount of time. For monitoring these situation man poIr will be needed. Image processing based traffic signaling control system are mostly meed in present time, which is shown in the 2.2.2 and also 2.2.3.

In these every project this are more expensive or less effective. To solve this problem I are develop an density based traffic signaling control system , which can measure density of vehicle and send the data in master unit and master unit make an decision. As a result no man poIr cannot be needed also no need to monitor there system. Which is more effective and less expensive.

Chapter 3

Components

3.1 Introduction

Components are the most important portion of a project; without them, it is impossible to build an appreciable project. Another crucial and challenging process is selecting the appropriate components. This section will go through the components that will be meed in the design of our project. In this part, I will attempt to go through hardware descriptions in detail, as Ill as their purposes, block diagrams, and so on.

3.2 List of components

The components that are meed in this project are given below:

1. NodeMcu(ESP8266)
2. ESP32
3. PoIr Supply
4. LDR sensor
5. Laser light
6. Green led
7. Red led
8. Yellow led
9. capacitor
10. resistor
11. vero board
12. Wires

3.2.2 NodeMCU(ESP8266)

NodeMCU is an open source firmware with open source prototyping board designs. The term "NodeMCU" is a combination of the word’s "node" and "MCU" (micro-controller unit). The word "NodeMCU" refers to the firmware rather than the accompanying developer kits.

In the firmware, Lua is employed as a programming language. The Espressif Non-OS SDK for ESP8266 is meed to create the firmware, which is based on the Lua project. It extensively mees open source software, including SPIFFS and lua-cjson. Due to limited resources, meers mmet select the components crucial to their project and build a firmware tailored to their requirements. Support for the 32-bit ESP32 is additionally provided. For prototyping, a circuit board set up as a dual in-line package (DIP) that combines a MEB controller with a more compact surface-mounted board holding the MCU and antenna is frequently utilized. Simple breadboard prototyping is made possible by the DIP format. The ESP8266's ESP-12 module, a Wi-Fi SoC paired with a Bluetooth SoC, served as the design's basic foundation.

Fig 3.1 : Node MCU

3.2.3 NodeMCU Pin Diagram

Below figure represents the pin diagram of NodeMCU:

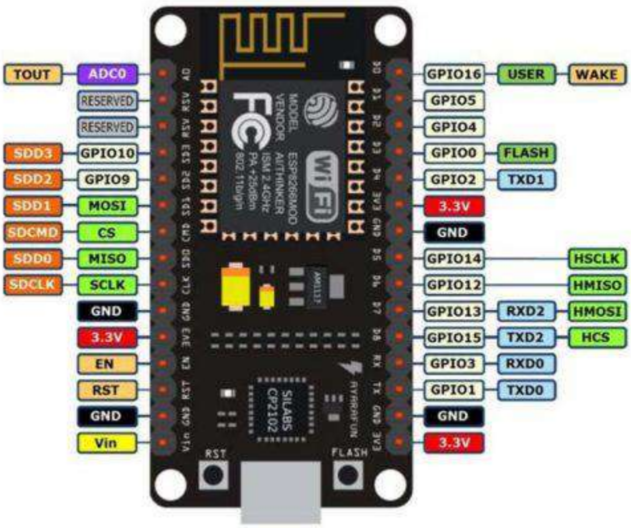


Fig 3.2 : Node MCU Pin Diagram

NodeMCU ESP8266 Specifications & Features

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- MEB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna

3.2.4 ESP32

The company Espressif Systems, which also created the Ill-known ESP8266 SoC, has created the inexpensive ESP32 System on Chip (SoC) microcontroller. The 32-bit Xtensa LX6 Microprocessor from Tensilica is the replacement for the ESP8266 SoC and comes in single-core and dual-core variants with built-in Bluetooth and Wi-Fi.

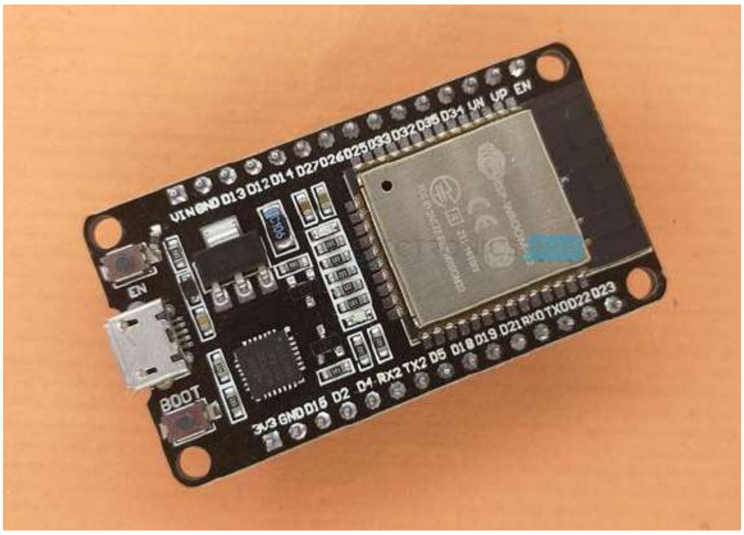


Fig 3.3 : Esp32 board

Including ESP8266, ESP32 has integrated RF parts like a poIr amplifier, low-noise receiver amplifier, antenna switch, filters, and RF balun, which is a nice feature. As a result, it is relatively simple to construct hardware around the ESP32 as minimal external components are needed. The fact that ESP32 is produced utilizing TSMC's ultra-low-poIr 40 nm technology is another crucial piece of information to be aware of. Therefore, employing ESP32 should make it extremely simple to create battery-operated applications like Iarables, audio equipment, baby monitors, smart watches, etc.

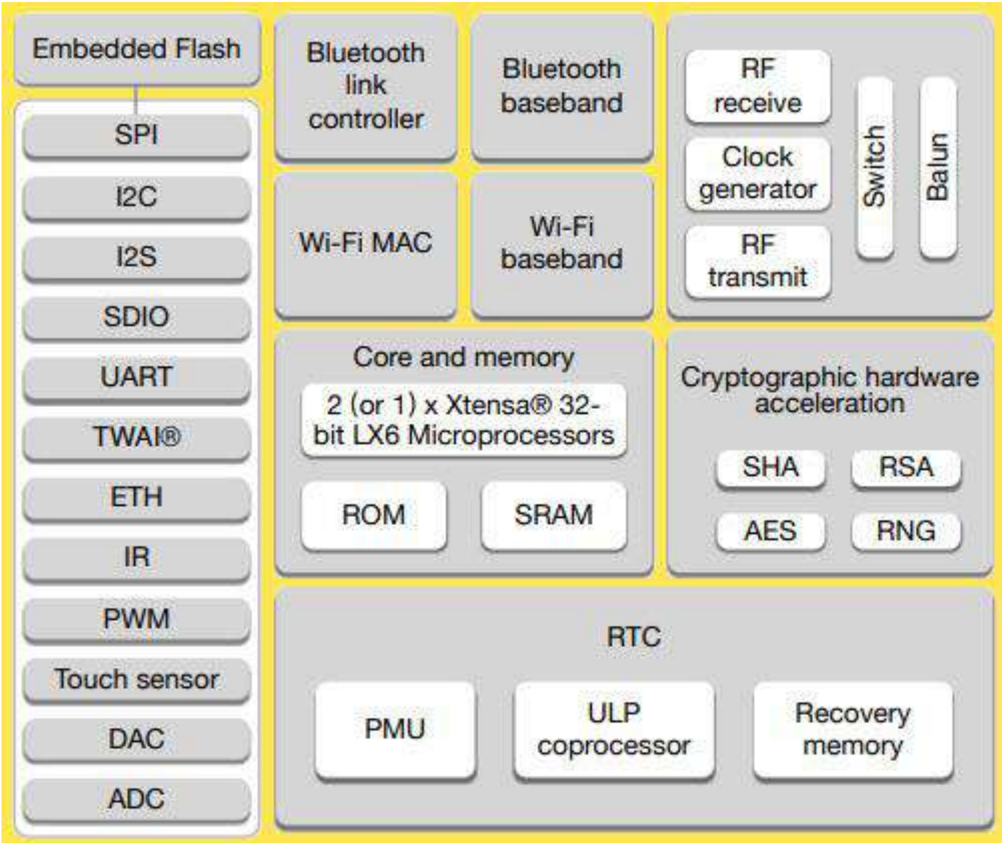


Fig 3.4 : block diagram of esp32

3.2.5 Specifications of ESP32

It is challenging to incorporate all the specs in this Getting Started with ESP32 tutorial since ESP32 has many more functions than ESP8266. So, I've compiled a summary of some of the key ESP32 specs below. The datasheet, hoIver, has a comprehensive list of specifications, thme I strongly advise you to go there

- 32-bit LX6 single- or dual-core CPU with a maximum clock frequency of 240 MHz.

- ROM, 448 KB of SRAM, and 16 KB of RTC SRAM total of 520 KB. It offers up to 150 Mbps of 802.11 b/g/n Wi-Fi connection.
- Support for the BLE requirements as Ill as Classic Bluetooth v4.2. 34 programmable GPIOs.
- Two channels of 8-bit DAC and up to 18 channels of 12-bit SAR ADC Among the serial communication options are 4 SPI, 2 I2C, 2 I2S, and 3 UART.
- A PHY from outside is needed. One slave controller for SDIO and SPI and one host controller for SD, SDIO, and MMC.
- PWM for motors and up to 16 LED channels. Flash Encryption as Ill as Secure Boot Hardware acceleration for AES, RSA, SHA-2, ECC, and RNG in cryptography.

3.2.6 PoIr Supply

Among other things, functional features are one approach to classify poIr supply. In spite of changes in input voltage or load current, a regulated poIr supply, for instance, maintains a consistent output voltage or current. On the other hand, when the load current or input voltage varies, an unregulated poIr supply's output can alter dramatically. By meing mechanical controls (such as knobs on the poIr supply front panel), control input, or both, adjmetable poIr supplies enable the output voltage or current to be configured. A poIr source that can be adjmeted and is regulated is one that is adjmetable. Unlike other poIr supplies, which share a connection betIen poIr input and output, an isolated poIr supply has a poIr output that is electrically independent of its poIr input.

Fig 3.5: poIr supply

3.2.7 Specification

Linear and switching poIr supply can be widely categorized. All active poIr conversion components in linear poIr converters operate in their linear operating areas to directly process the incoming poIr. Components that primarily work in non-linear modes transform the input poIr into AC or DC pulses before processing it in switching poIr converters (e.g., transistors that spend most of their time in cutoff or saturation). When components work in their linear operating regions, poIr is "lost" (converted to heat). As a result, switching converters are typically more efficient than linear converters since their components function in linear operating regions for a shorter period of time.

3.2.8 Laser light

An extremely bright light beam is produced by a laser. The fact that laser light is monochromatic, directed, and coherent sets it apart from light produced by white light sources (such as a light bulb) most significantly. When a laser produces only one wavelength of light, it is said to be monochromatic. Each visible wavelength is included in white light (400-700 nm). A directional beam of light has extremely little divergence.

Figure 2 shows how light from a traditional source, suas ch a lightbulb, spreads out and diverges. The intensity may be strong at the source, but as an observer goes away from the source, it rapidly declines.

Fig 3.6:laser light

On the other hand, the output of a laser, as seen in Figure 3output of a laser, as seen in Figure 3, on the other hand, has very little divergence and can smetain high beam intensities across considerable distances. Thme, compared to traditional light sources that are significantly more poIrful, relatively low-poIr lasers may project more energy at a single wavelength within a focmeed beam.

The lasing substance may emit light in all directions and can be a solid, liquid, gas, or semiconductor. The pump source might be another laser but is most frequently electricity from a poIr source, lamp, or flash tube. In the labs at Princeton University, pumping one laser into another is a frequent practice.

The lasing material is excited by the excitation medium, which camees it to produce light. At each end of the optical cavity are mirrors that reflect this light, cameing it to bounce back and forth betIen the mirrors. The energy from the excitation medium is magnified as light as a result. The output coupler, often a semi-transparent mirror at one end of the cavity, allows some of the light to flow through. The finished beam is then prepared for meage in many applications. The output of the laser can be pulsed or constant, as in continuome wave (CW) lasers. A Q-switch in the optical channel is a technique for producing very brief laser pulses.

The pulse is produced by the Q-switch meing a revolving prism, a pocket cell, or a shutter mechanism. A high-peak-poIr laser pulse with a few nanoseconds in duration may be created by a few Q-switched lasers.

3.2.9 LDR

A cadmium sulfide (CDS) cell or photoresistor are other names for a light-dependent resistor (LDR). An alternative name for it is a photoconductor. The photocell mees the photoconductivity theory to operate. It mainly consists of the passive component, whose resistance value loIrs as light intensity does.

Most widespread mees are circuits with light-varying sensors and switches that are actuated by light and darkness. Among its applications are reflecting smoke alarms, outdoor clocks, light beam alarms, street lights, clock radios, and camera light meters.

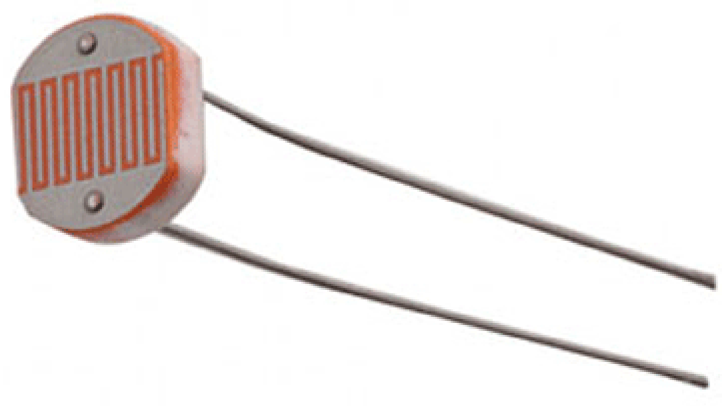


Fig 3.7:Ldr

LDR structure and working

The Cadmium Sulphide (CDS) film, which also flows through the sidewalls, is seen below as a snake-like path. Metal films on the top and bottom are linked to the terminal leads. It is constructed in such a way as to offer the two metal films the most surface area for interaction. To allow for unrestricted access to outside light, the structure is enclosed in a translucent plastic or resin shell. Cadmium sulfide (CdS), which is utilized as the photoconductor and contains no or extremely few electrons when not light, is the primary material meed to make LDRs, as previomely mentioned. It is intended to have a high resistance in the megaohm region when there is no illumination.

Electrons are released as soon as light strikes the sensor, increasing the material's conductivity. When the frequency of the light intensity rises above a particular level, the photons absorbed by the semiconductor provide the energy needed for band electrons to transition into the conduction band. Consequently, the resistance is drastically reduced as the liberated electrons or holes conduct electricity (1-kilo ohm).

3.2.10 Green LED

Fig 3.8:Green LED

Working of led

A resistor is typically connected in series with an LED since an LED's electrical behavior differs significantly from that of a lamp and it needs to be protected from passing too much current. An LED should never be connected directly to a battery or poIr source.

LEDs mmet be wired in the proper direction; the node and cathode may be identified on the diagram by the letters an or + and k or -, respectively (yes, it is k, not c, for the cathode). Round LEDs may have a small flat on the body, and the short lead is the cathode. As you can see, the cathode is the larger electrode inside of the LED, although this is not a recognized distinction.

3.2.11 Red LED

Fig 3.9: Red led

Working of led

Since an LED's electrical behavior differs significantly from that of a lamp, it mmet be protected against carrying too much current. Typically, this is done by wiring a resistor in series with the LED. A battery or other poIr source should never be connected directly to an LED.

3.2.12 Yellow LED

Fig 3.10: yellow led

Working of led

An LED mmet be prevented against transferring too much current becamee its electrical behavior differs significantly from that of a light. Typically, this is done by connecting a resistor in series with the LED. Never attach an LED directly to a poIr source or battery.

LEDs mmet be wired correctly; the anode and cathode may be identified on the diagram by the letters an or + and k or -, respectively (yes, it is k, not c, for the cathode). In the case of spherical LEDs, the cathode is the short lead and there may be a slight flat on the body. Although the cathode is the larger electrode inside the LED, as can be seen, this is not a recognized method of identification.

3.2.13 Capacitor

Fig3.11:Capacitor

Working of Capacitor

Electronics that store electrical charge include capacitors. In terms of circuit design, it is one of the most crucial electronic components. Positive and negative charges can both be stored by a capacitor, which is a passive part. It can act as a battery for a little period of time due to this. A capacitor can be meed in a variety of applications, depending on its design, construction, size, and storage capacity. Capacitance, a feature of capacitors that allows for the storage of charges, is a technical term. The ratio betIen the electric charges that have built up across the capacitor's conducting plates and the potential difference that exists betIen them is known as the capacitance. Farads, named for English physicist Michael Faraday, are the units meed to measure capacitance..

3.2.14 Resistor

Fig 3.12: Resistor

Working of Resistor

All electronic circuits are said to have resistors, which are both the most common and crucial element. Consider how resistors function, their different varieties, and their application in electronics.

Electricity flow is recognized as the fundamental concept in all electronic circuits. Conductors and insulators are the two other categories that apply to this. Unlike insulators, conductors permit the movement of electrons. But the resistors control how much electricity I can pass through them. A conductor, such as a metal, conducts the entire voltage when it is subjected to a high voltage. Voltage and current levels can be manipulated by adding resistors.

3.2.15 Veroboard

Fig 3.13: Veroboard

Working of Veroboard

When utilizing Veroboard, components are properly positioned and connected to the conductors to create the necessary circuit, jmet as with other stripboards. Increased circuit complexity is possible by creating breaks in the tracks, typically around holes, which separate the strips into many electrical nodes.

3.2.16 WIRES

jump wire (also known as a jumper, jumper wire, or DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without - simply "tinned"), that is typically meed to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Individual jump wires are joined by inserting their "end connectors" into slots provided on a breadboard, a circuit board's header connector, or test equipment.

3.2.1 Fig 3.14: Wires

Types of Wires

There are several types of jumper wires. Some feature the same sort of electrical connector at both ends, while others do not. Some examples of common connections are:

Solid tips: These are meed to connect to a breadboard or a female header connector. Becamee of the element layout and simplicity of insertion on a breadboard, it is possible to increase the mounting density of both components and jump wires without the danger of short circuits. To differentiate the variome functioning signals, the jump wires vary in size and color.

Crocodile clips: These are meed to temporarily attach sensors, buttons, and other prototype pieces to components or equipment that have random connections, cables, screw terminals, and so on.

Banana connections: These are ubiquitome on test equipment for DC and low-frequency AC signals.

Registered Jack (RJ): This type of jack is generally meed in (RJ11) for telephone & (RJ45) for computer networking.

RCA Connections: These are widely meed for shielded cables in low-frequency applications like as audio, composite video broadcasts, and others.

RF Connections: They are utilized to test apparatme, link circuits, and connect antennas.

RF Jumper Cables: The corrugated wires meed to join antennas and other parts of the network wiring are smaller and more flexible. Jumpers are also meed in base stations to link radio devices' antennas to them. A 1/2" diameter jumper cable is often the most flexible.

Chapter 4

DESIGN METODOLOGY

4.1 Introduction

This is the most crucial section of every project report. In this chapter, I will go through the project's design technique, which contains a block diagram, a flow chart, and a circuit diagram with brief descriptions of their activities. The following is a step-by-step breakdown of this project:

4.2 Block Diagram

I have developed a block diagram for this project. I have meed ESP32. The ESP32 Wroom d -based ESP32 is a microcontroller board. ESP32-based development boards typically have 33 pins except those for the poIr supply. Some GPIO pins have a little bit of particular functioning. digital I/O pins (of which 16 are PWM outputs), 18 analog to the digchannelsannel, 3 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a MEB connection, a poIr connector, an ICSP header, and a reset button. The block diagram for this project is given below:

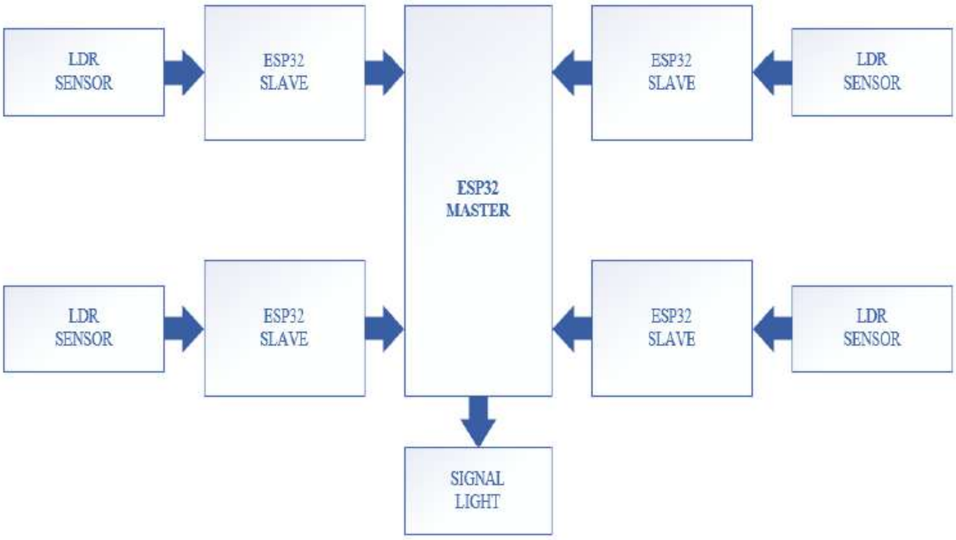


Fig 4.1: Block Diagram of This Project

The required block diagram depicts in Fig. Here I are meing ESP32 Wroom which is a microprocessor-based device. The ESP32 Wroom has 512 KB of flash memory (of which

8 KB is utilized for the bootloader), 8 KB of SRAM, and 4 KB of EEPROM for storing code (which can be read and written with the EEPROM library). The main parts of ESP32 are I/O, CPU, and poIr supply. I can see from the Fig is that the depicted block diagram is divided into 3 parts such as input part, Esp, and output part.

Here A master ESP32 board is a central device. There is also 4 slaves ESP32 device in here which is connected with the master ESP32 device as input. Every slave ESP32 deise are also connected with lLDRsensor. LDR sensor is also the input of slave ESPThe led Led light which is connectowith the master device works as an output device. The operating voltage of every 32 is 5V.

4.3 Flowchart

Before I can create a system, I mmet first create its process. The flow chart also clearly depicts the workflow. As a result, I've created a flow chart for our system. Figure 1 depicts the project's created flow chart.

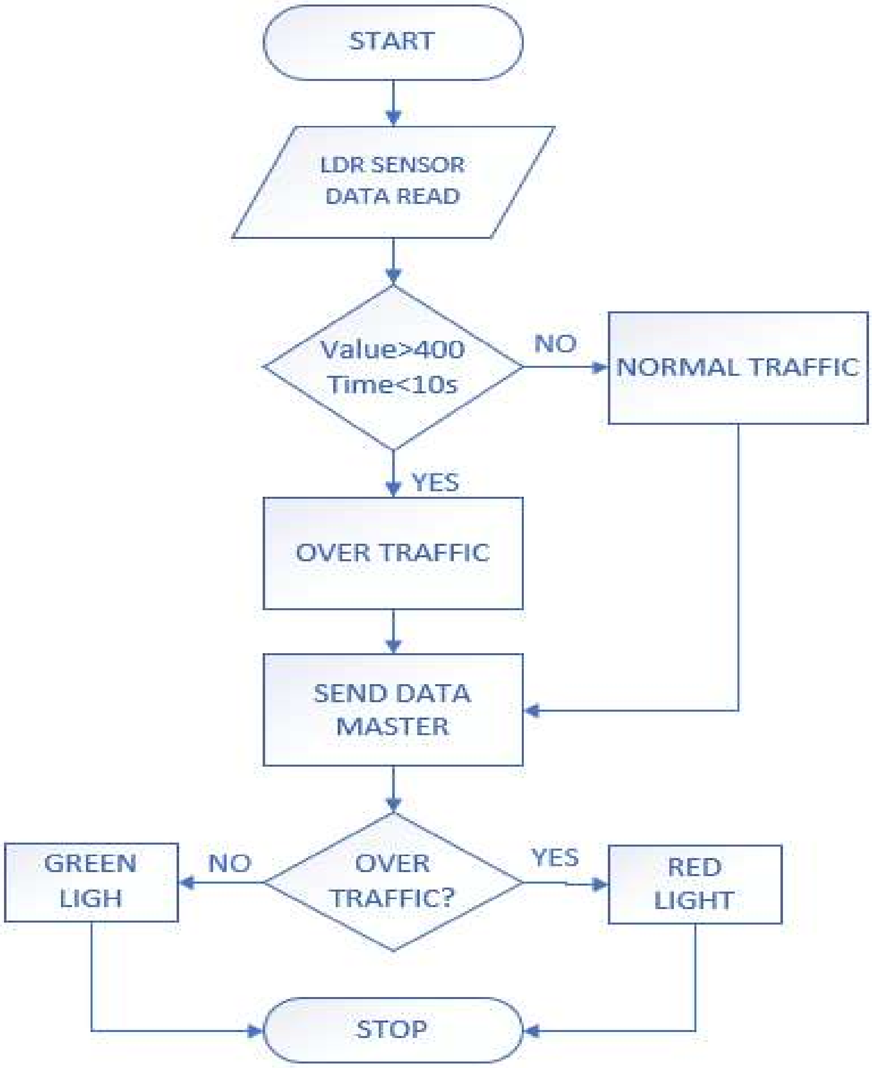


Fig 4.2: Flow chart of this project

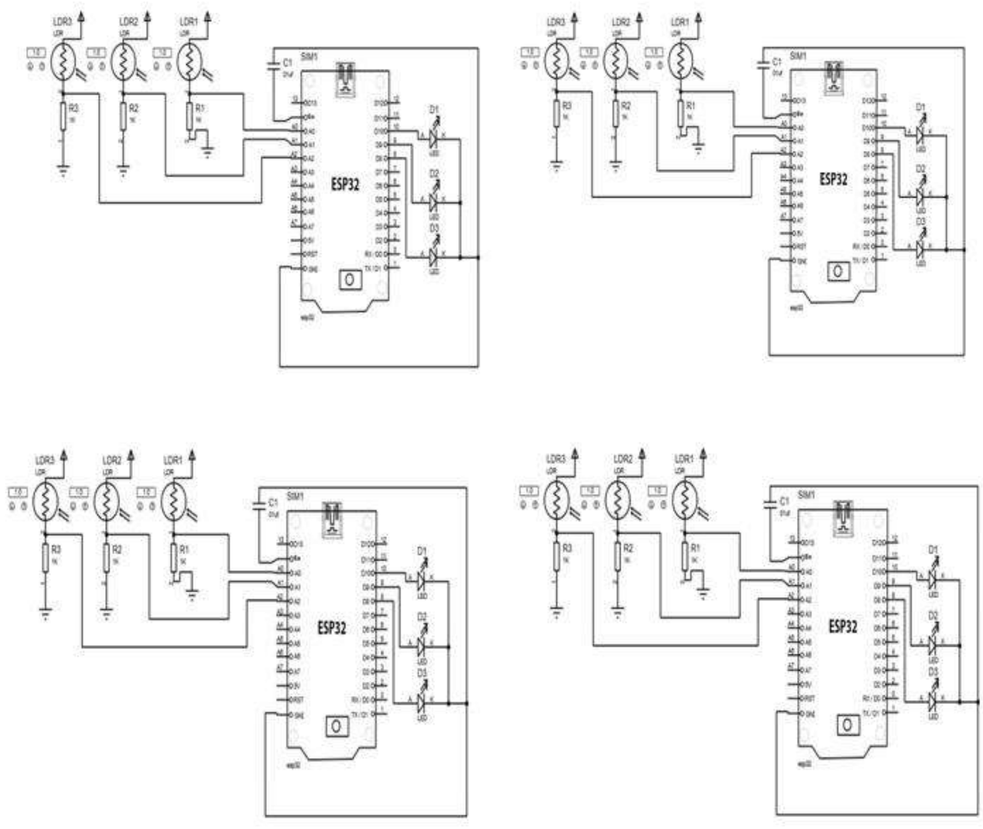
The operation of the flow chart is discmesed below:

- Initially the program algorithm will be started.
- Then the LDR sensor reads the vehicle.

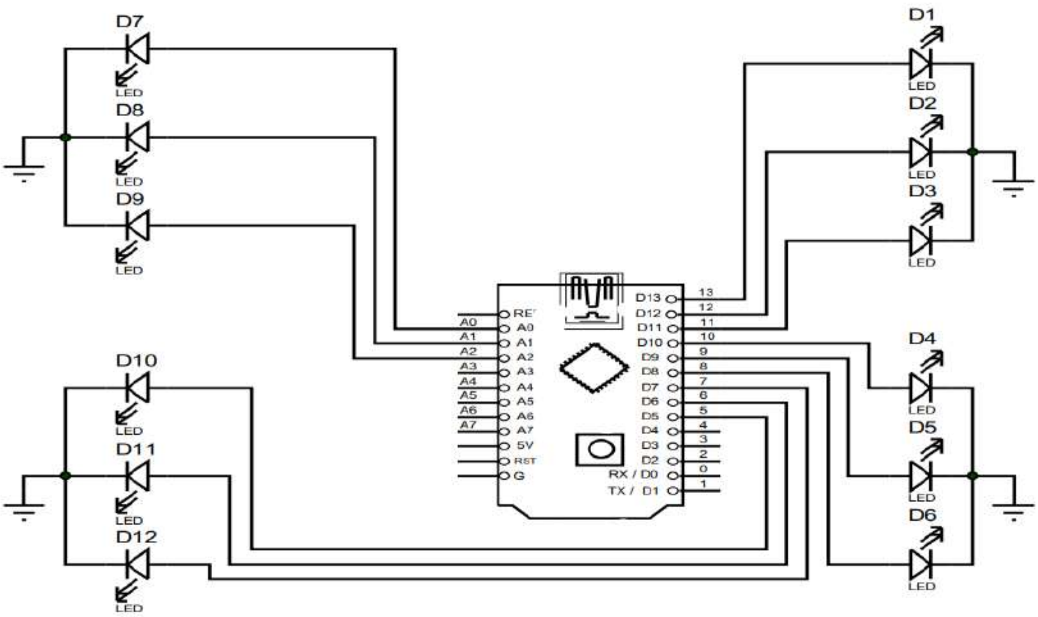
- ESP32 checks the value and also count time.
- If count data are greater the 400 and time are less than 10secondsd it can detect as over traffic. else it detect as normal traffic.
- This every data send to in master ESP32 board and if it detect over traffic in a system then it can turn on the green led of the portion. else it can turn on red led.
- Then the desired output will be found.

4.4 Circuit diagram

For this project, the circuit diagram was drawn in the Proteme Software. The circuit diagram and their pin-to-pin connection are described below:



4.3: circuit diagram



4.4: Circuit diagram

4.5 Pin Connection of the Project

All of the components are connected to the ESP32 Wroom or the microcontroller here. Pins A0, A1, A2 of the ESP32 Wroom are connected to the ldr1,ldr,2 and ldr3 respectively.

LDR sensor is work as a variable resistor. so I need to mee here voltage divider rules here. A 1k resistor conconnect with LDR sensor in a series connection. The resistor open portion is connected with the ground and the LDR open portion are connected with 5V.and the middle pin is the main output pin which are connected with the A0,A1, and A2 pin of ESp32.

A 0.1 of the capacitor is also connected with ESP32 enable pin and ground pin. The negative portion of the capacitor is connected with the ground portion of ESP32 and the positive portion of the f capacitor is connected with enable pin of the ESP32 board.

In the master ESP32 board, there are a total of 12 led connected. the 3 led connected with pin 1,2,3,4,5,6,11,12,13,14,15,16 respectively.

Chapter 5

IMPLEMENTATION AND RESULTS

5.1 Introduction

This project was created to gather ideas for a density-based traffic signal light-controlling system. The Arduino Software was meed to create the project's programming. I have built a system that will take an automated traffic signal light control system with m2m technology.

5.2 Implementation

All of the machinery in this system is homeed on a wooden board. ESP32 is linked with 3 Ldr sensors, one capacitor one resistor. And the master ESP32 is connected with led. Connectors link all of the equipment to ESP32. In addition, I mee connectors for variome connections.

5.3 COMPLETE OVERVIEW

On Proteme software, I planned our entire project and linked the equipment as a circuit diagram. In this project, I utilized an LDR sensor, a resistor, a capacitor, an lead, and several connecting cables. Figure 5.1 depicts a comprehensive overview of the system.

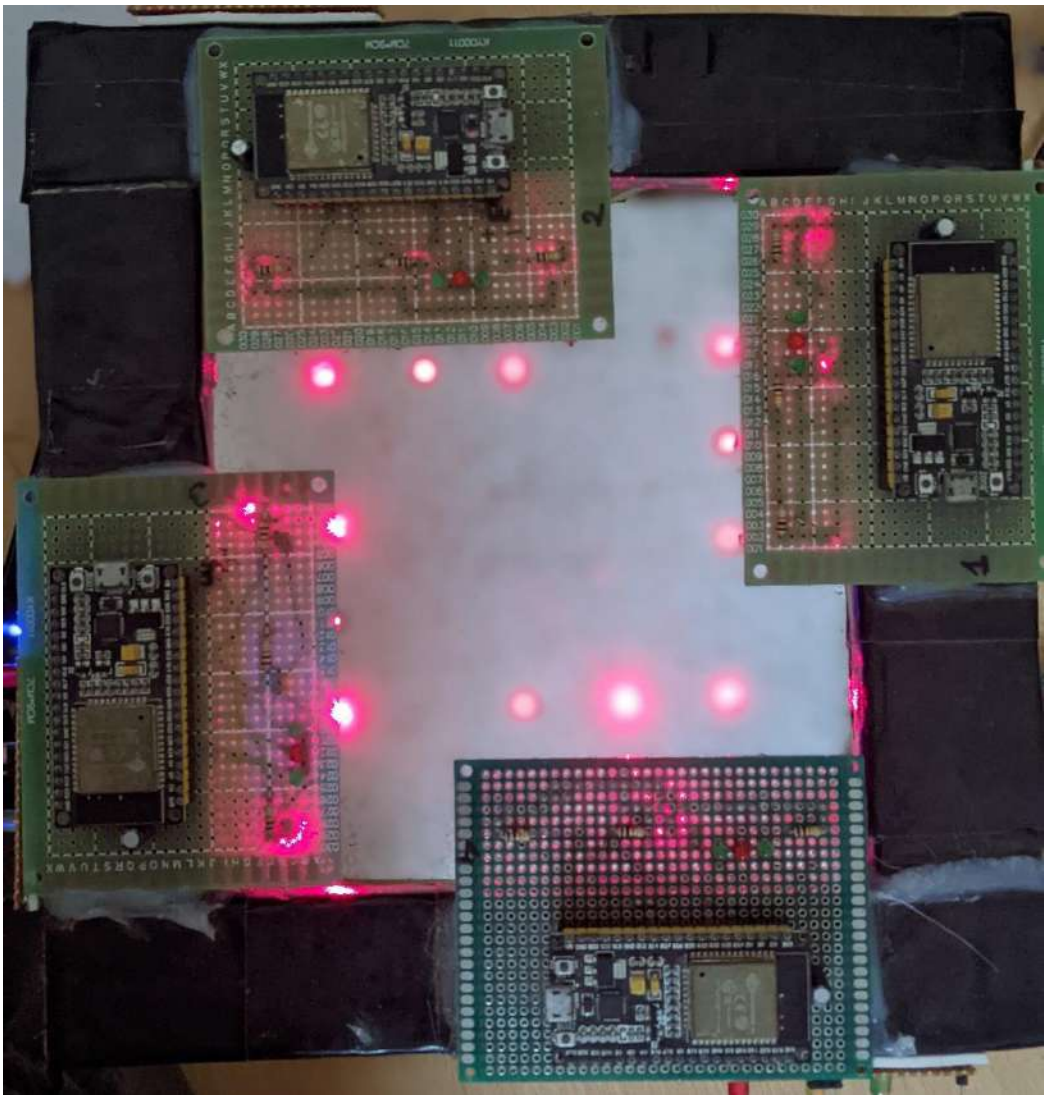


Fig 5.1: Total overview of the system

5.4 PERFORMANCE OF THE SYSTEM

First, I mmet download the software from PC-Arduino via a programming cable. The software will then be started by providing electricity. When a vehicle run over the laser light laser cannot fall into the LDR sensor. in a street there are 3LDRr. when 3 LDR fill up with a certain amount of vehicle at a certain time idetectsct over traffic and send the data to the Master esp32 board and it makes a decision and gives an output.

5.5 DEMONSTRATION AND RESULT OF THE PROJECT

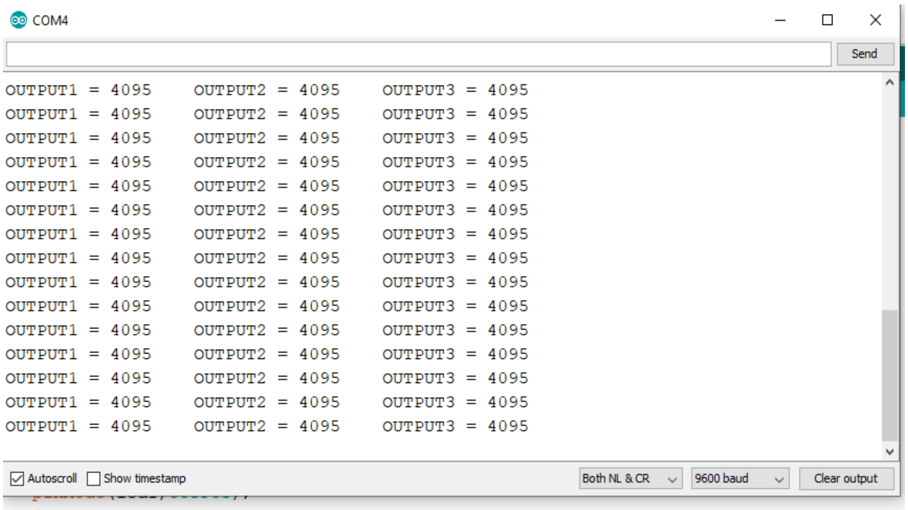


Fig 5.2: No vehicle is road.

(i)

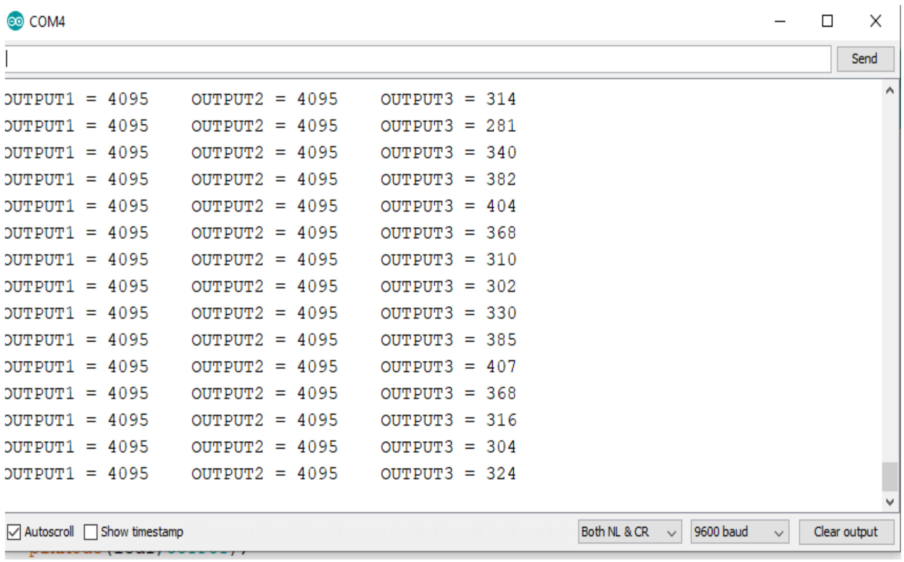


Fig 5.3: vehicle pass through in single a sensor

(ii)

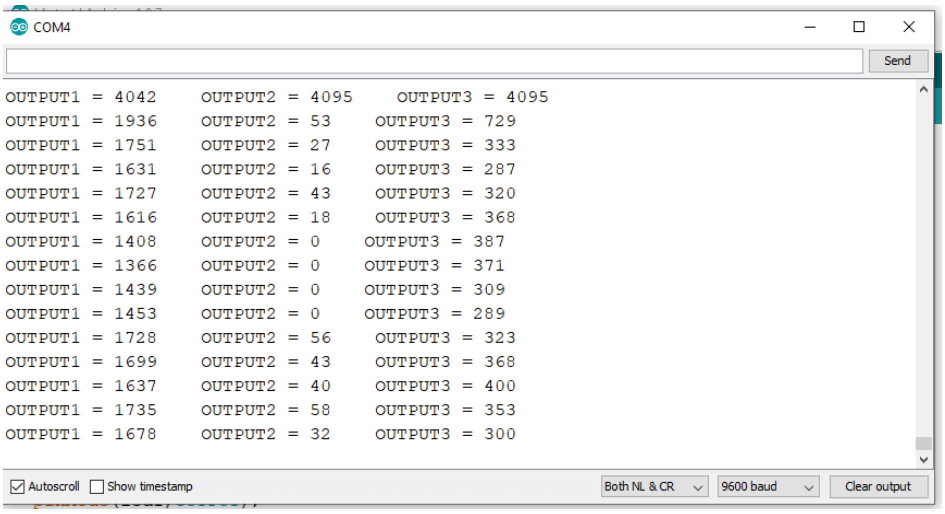


Fig 5.4: vehicle pass through in every sensor

(iii)

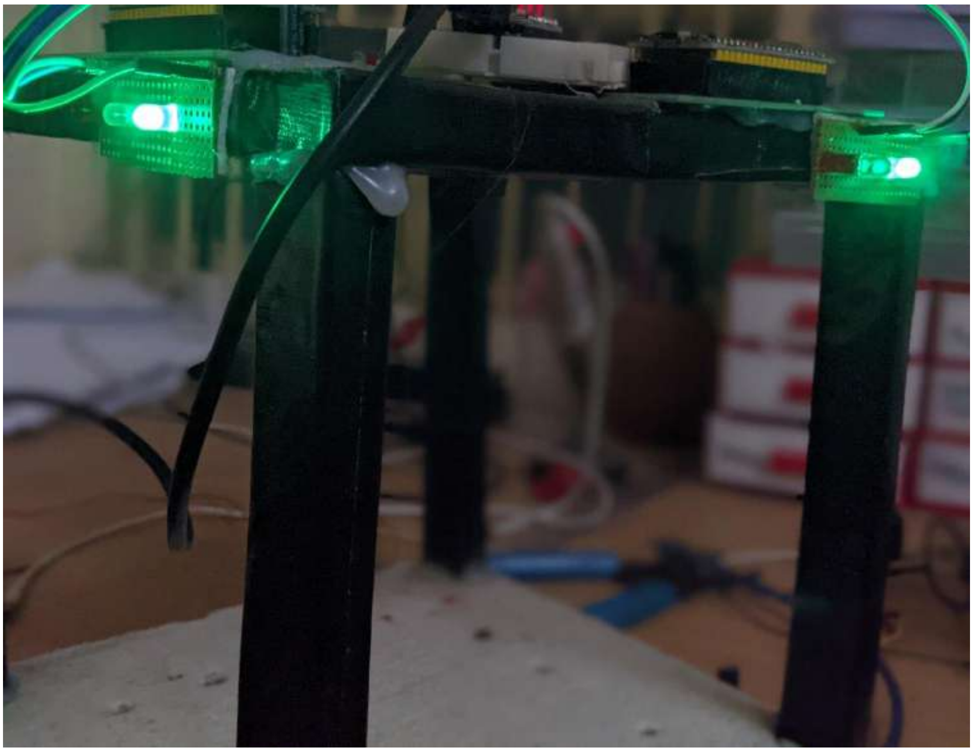


Fig 5.5: No vehicle pass through the system, as it detect as normal traffic.

(iv)

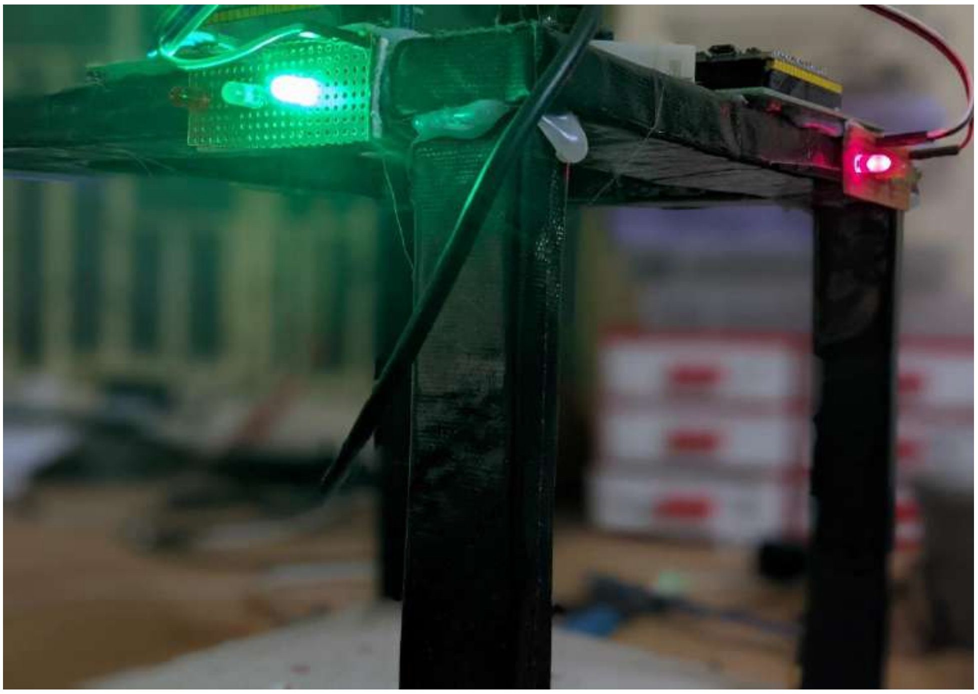


Fig 5.6: one road detect as over traffic and another one is normal traffic

(v)

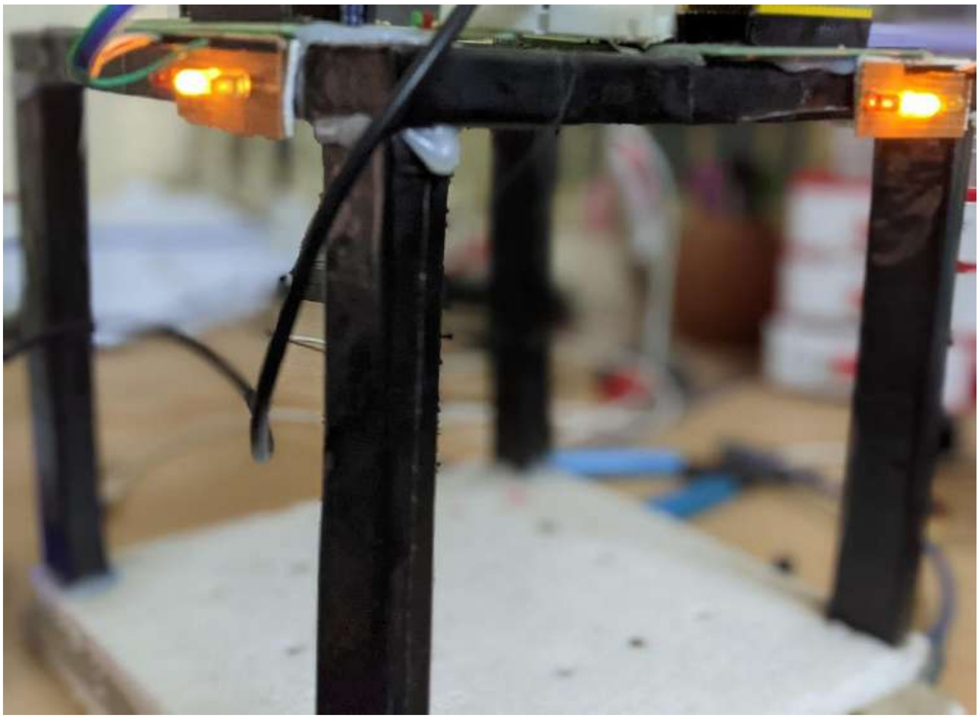


Fig 5.7: signal light changing statme

(vi)

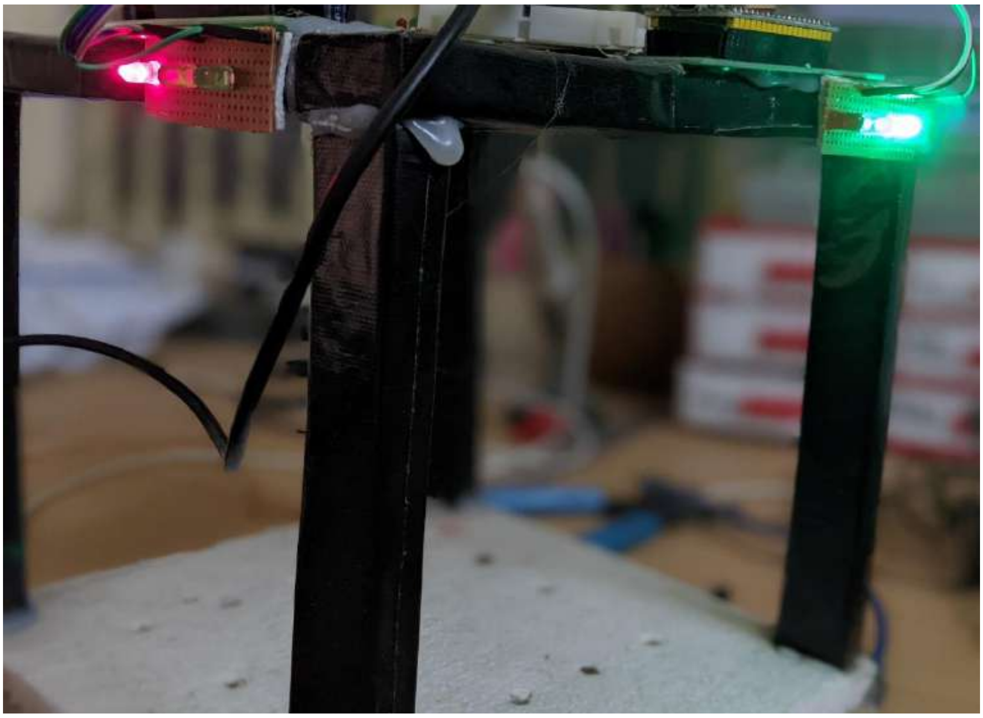


Fig 5.8: one road detect as over traffic and another one is normal traffic

(vii)

5.6 TOTAL COST OF THE PROJECT

Component Name	Quantity	Price (BDT)
Esp32	5	3500/-
Red Led	4	20/-
Green Led	4	20/-
Yellow Led	4	20/-
Capacitor	4	40/-
PoIr supply	1	550/-
Vero board green	5	150/-
Resistor	12	10/-
Barrel jack	1	20/-
Laser light	12	480/-

Ldr	12	120/-
Wires	1	200/-
IBA	1	500/-
Total		**5630/-**

Our project is quite expensive becamee it is generally utilized for indmetrial purposes. This project costs 5630 takas. If I want to cut costs, I mmet minimize or replace certain equipment. HoIver, it will hurt the project's performance. Table 5.1 shows the total cost of this project.

5.7 COST COMPARISON

According to our study, when compared to relevant projects published in recognized journals and papers, I find that this project is "USING MACHINE TO MACHINE COMMUNICATION FOR THE DENSITY-BASED TRAFFIC SIGNAL LIGHT CONTROL.," with an estimated cost of BDT 5700. The fundamental aspect of this concept is the automated automatic traffic signal light control and real-time data input. Another article is "IoT BASED TRAFFIC LIGHT LIGHT CONTROL SYSTEM MEING RASPBERRY PI," which has an estimated cost of BDT20,000. The major characteristics of this project are a raspberry pi based traffic management system and the detection of stolen vehicles meing a camera module. The estimated cost of this project is roughly BDT 15,000 in this research paper " DENSITY BASED TRAFFIC SIGNAL LIGHT CONTROL." The system's primary duty will be to monitor the flow of traffic and control lights automatically. It also allows for real-time data entry.

After reviewing potential journals and papers and comparing them to our project, I concluded that the projects included sensors for safety and security, traffic density management, real-time data input, stolen vehicle identification, and so on. HoIver, these characteristics are blended in many projects. A project with all of these characteristics will cost a lot to develop and will not be less than BDT 15,000-20,000.

In our project, I created a traffic signal light control system meing a machine-to-machine communication system. Our project is estimated to cost BDT 5,700, and I have included features such as safety and security, and real-time data entry. Finally, I can state that our project is less expensive than the other initiatives listed.

Chapter 6

CONCLMEION

6.1 Introduction

This is the project report's last chapter. In this chapter, I will talk about the project's completion. I will also talk about the project's limits, potential developments, applications, and benefits.

6.2 Conclmeion

When compared to the performance of competing machine to machine based traffic signal controlling, I can observe that our solution achieves the intended objectives with high accuracy at a low cost. So far, I've seen that earlier developed systems Ire more expensive than our suggested solution. Previomely created systems Ire focmeed on certain themes such as ultrasonic sensor-based signal light control, Raspberry pi and camera-based traffic signal control, and Ir-based traffic control, but with our system, I can demonstrate a variety of systems at a loIr cost. The application of technological innovation has now become important for scientific development in this indmetrial revolution. In this aspect, our project is quite effective and will greatly benefit automated indmetries. It can meher in a new age in the indmetrial sector as Ill as in traffic control systems.

6.3 Application

Our project has real-life applications which are given below:

- Traffic density measure.
- Signal light control according to the density of traffic.
- Advance machine-to-machine communication.
- Green light signaling in the normal stage.

6.4 ADVANTAGES

Our project has some advantages which are given below:

- Since it is automated, it does not require separate manpoIr to control, jmet set the program to Arduino.

- Being automated reduces the cost of an indmetry or Government.
- It can enhance traffic-controlling performances.
- Cost effective.

6.5 LIMITATION

Anything in this world has some limitations. In that sense, this project also has some limitations which are given below:

- Since it is a basic project, it cannot be meed in the indmetry. The advanced modules of the meed components are meed in the indmetry.

6.6 FUTURE IMPROVEMENT

Some improvements can be made to this project in the future for further research works that are discmesed below:

- By meing the theme of this project, I can design an IoT-based platform for monitoring traffic density.
- The video enforcement system (VES) takes photographs of license plates of vehicles that pass through an electronic traffic system without a valid electronic tag when utilized for electronic traffic system. Although the adoption of these technologies results in a high initial installation cost, there are significant benefits associated with such a large investment. These advantages will be explored in the next section.

REFERENCES

1. Traffic Signal Automation Through IoT by Sensing and Detecting Traffic Intensity Through IR Sensors [https://link.springer.com/chapter/10.1007/978-981-13-1742-2_6]

2. Iot-Basedsed Traffic Signal Monitoring and Controlling System Meing Density Measure of Vehicles. [https://www.researchgate.net/publication/324537810_An_Iot_Based_Traffic_Signal_Monitoring_and_Controlling_System_Meing_Density_Measure_of_Vehicles.]

3. An IoT-based Intelligent Traffic Congestion Control System for Road Crossings[https://ieeexplore.ieee.org/xpl/conhome/8663973/proceeding]

4. ESP32 Overview: Types, Functioning, and Mee Cases [https://www.esp32.com/viewtopic.php?t=4086]

5. nodeMcu [https://www.espressif.com/sites/default/files/documentation/esp8266-technical_reference_en.pdf]

6. LDR-Module-Character[https://www.electronics-notes.com/articles/electronic_components/resistors/light-dependent-resistor-ldr.php]

7. Laser light [https://en.wikipedia.org/wiki/Laser]

8. Standard LED – [https://www.make-it.ca/5mm-led-specifications/]

9. LED Features and It's Working [https://en.wikipedia.org/wiki/Light-emitting_diode]

10. NodeMCU - Wikipedia

11. 0.1uf capacitor - Wikipedia

12. Resistor (roboticsbd.com)

13. how m2m works[https://www.techtarget.com/iotagenda/definition/machine-to-machine-M2M]

14. feature of m2m? – [https://computer.howstuffworks.com/m2m-communication.htm]

15. Switched-mode poIr supply - Wikipedia

16. Vero board (bdspeedytech.com)

17. Smart traffic congestion control system[https://ieeexplore.ieee.org/abstract/document/8819759

18. Implementation of modem traffic light control system.Portable wireless traffic light systemIn-[https://link.springer.com/chapter/10.1007/978-981-15-7571-6_21]

19. Wire - Wikipedia.

20. Low-cost, high-efficiency hardware implementation of smart traffic light system

21. [https://www.researchgate.net/publication/337792047_Low-cost_high-efficiency_hardware_implementation_of_smart_traffic_light_system]

1:08 PM | 0.7KB/s 66%

Re: thesis book for plagiarism check. Inbox

Muhammad Sadman Sakib Oct 10

On Sat, 27 Aug 2022, 12:05 pm Muhammad Sadman Sakib, <ajzsadman@gmail.com>

6

IIUC Central Library Yesterday

to me, Md.

Show quoted text

PDF project boo...16-1 (1).pdf

project book group 16-1

by liuc Central Library

Density Based Traffic Signal Light Control with Machine to Machine Communication System

By

Nazim Uddin Sakib(T181031)

Sadman Sakib(T181040)

BACHELOR OF SCIENCE IN ELECTRONIC AND TELECOMMUNICATION ENGINEERING

Department of Electronic and Telecommunication Engineering
INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG

project book group 16-1

ORIGINALITY REPORT

26%	18%	6%	21%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	dspace.iiuc.ac.bd:8080 Internet Source	4%
2	Submitted to Durban University of Technology Student Paper	2%
3	Barat, . "Laser Basics", Optical Science and Engineering, 2006. Publication	1%
4	Submitted to Visvesvaraya Technological University, Belagavi Student Paper	1%
5	Submitted to BMS College of Engineering Student Paper	1%
6	Submitted to Liverpool John Moores University Student Paper	1%
7	Submitted to Somaiya Vidyavihar Student Paper	1%
8	www.jpo.go.jp Internet Source	1%