A Short Technical Report towards A7023 – EDT (P) Course

IR BASED TRAFFIC DENSITY DETECTION AND SIGNAL ADJUSTMENT USING MICROCONTROLLER

Submitted in the Partial Fulfillment of the

Requirements

for the Award of the Degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted

By

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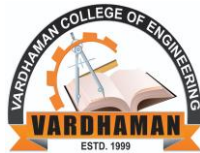
Department of Electronics and Communication Engineering

VARDHAMAN COLLEGE OF ENGINEERING
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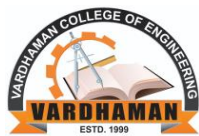
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CERTIFICATE

This is to certify that the short technical report work entitled **"IR BASED TRAFFIC DENSITY DETECTION AND SIGNAL ADJUSTMENT USING MICRO CONTROLLER"** carried out by **Ms.B.ANJALI**,Roll Number **22885A0414**, **Mr.B.SRIKUMAR**, Roll Number **22885A0415**, **Ms.K.ALEKYA** , Roll Number **22885A0416**, **Ms.M.SNEHA**, Roll Number **22885A0417,** **Ms.R.VAISHNAVI**,Roll Number **22885A0418**, **Mr.R.SATISH**, Roll Number **22885A0419,** towards **A7023 – EDT (P)** course and submitted to the Department of Electronics and Communication Engineering, in partial fulfillment of the requirements for the award of degree of **Bachelor of Technology** in **Electronics and Communication Engineering** during the year 2022-23.

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ABSTRACT

The project is designed to develop a IR based traffic density detection and signal adjustment system.The signal timing changes automatically on sensing the traffic density at the junction. Conventional traffic light system is based on fixed time concept allotted to each side of the junction.In today's life we have to face many problems, one of which being traffic congestion and it's becoming more serious day after day. Conventional traffic system does not have proper monitoring system and often requires manual handing at traffic junction.This not only causes mental stress in passengers but also lot of fuel goes wasted due to delay at traffic junction. This requires development of a system to handle traffic in a smart way by automatically adjusting its timing based on traffic density using Arduino Uno ATMega 328.In this, traffic is sense using digital IR Sensors and IR Sensors detect vehicles further based on the signal reflected from them. Sensors placed adjacent to the road to control the traffic density by changing traffic signal appropriately. All IR Sensors are interfaced with Arduino Uno and it reads data from IR Sensors. Traffic Signal for the system is designed using LEDs and each signal consist two LEDs for each lane.Using this system development at traffic junction we need not to worry about handing the traffic manually and also consumes less time as compared to the conventional traffic system.

LIST OF FIGURES

OUTLINE

CHAPTER 1

MOTIVATION

The main aim of this project is controlling vehicles at junction. It has always been a matter of concern for the government in many modern cities around the world. The project is a traffic signal controller system that reacts to the density of traffic. The time required on changing signals adjusts automatically depending on the density of traffic. Well traffic problems contribute a major problem in many cities and also increase fuel consumption as well as pollution. Traffic jam as a tremendous impact on life of people. Traffic signals operating on fixed signal timing delays do not adjust to the changing traffic density.The modern system would decrease the traffic jams to a great extent if implemented and every individual will be able to gain time.As we all know time is more precious than anything saving the time would also help ones nation to develop.

SCOPE

When an emergency vehicle is detected in any lane ,the priority shifts to the lane in which the emergency vehicle is present by using RF transmitter and receiver. By this system ,traffic congestion will be reduced and emergency vehicles is detected.This proposed system reduces the time delay faced by emergency vehicles by using IOT .It uses IR sensors and surveillance to instruct the traffic signal about the arrival of an emergency signal. Helps in traffic surveillance control. As this application can be planted anywhere hence if the traffic is high at some place then from that area, an officer can monitor it and forward the information to next toll officer so that they could be prepared beforehand. The Future scope includes Profiling of the traffic by storing the data and managing the traffic lights according to the collected data. The Profiling can also be used for Traffic study and the variation in traffic density throughout the day, week, month or a year. Further, we can optimize this system for the emergency Vehicles such as Ambulance. The Traffic data collected can be used to locate different routes for a specific daily vehicle to avoid the congestion problem .

OBJECTIVE

The main purpose of introducing this smart traffic system is that for every minute the vehicles at the junction will be dense and the traffic lights shall be changed to each side for some fixed time. Even though there are no vehicles at particular side, the traffic signals will glow for a given fixed time. Due to that there is time wastage & vehicles on the other side have to wait for the time to complete the process. So to reduce the wastage of time, we can implement the system that controls the traffic based on the heavy flow of vehicles at any particular side. With this system, we shall count the number of vehicles at each side at the junction and give path to the particular side which has denser traffic and keeping the other sides stopped.

EXPECTED DELIVERABLES

Form this project development of this traffic control system using IR sensors is done very well. By applying this system, It can reduce traffic congestion especially during peak hour and hence, also can reduce road accidents in the present and future since traffic density will increase as the population increase. The usage of Arduino UNO microcontroller contributes a very appropriate model in order to implement the embedded control system because it is easy to modified to any possibility in meeting future requirements quickly LED light also can be use in future for the traffic light since it will decrease the energy consumption which can save up to 90% of energy an cut cost too. Besides, LED light have longer service which can minimize the operating and maintenance cost.

CHAPTER 2

HISTORY

India has the second-largest road network in the world. The traffic signal system was first introduced in 1868 in london.Before traffic lights, traffic police controlled the flow of traffic. On 1868, the first non-electric gas-lit traffic lights were installed . In 1912, the first electric traffic light was develope with four- way, three-colour traffic light.The first traffic light in India wasinstalled in 1953. One of the principal challenges in traffic control is to accommodate the traffic in a safe and efficient way.

Traffic signal rules are put in place to ensure the safety of all road users and to regulate the flow of traffic. The most common traffic signals in India are the red, yellow, and green lights, which are used to indicate when to stop, slow down, and proceed, respectively. Traffic signals in India are controlled by a traffic management system, which uses sensors, cameras, and other devices to monitor traffic flow and adjust the timing of traffic signals.

The red light is the most important signal and indicates that a vehicle must come to a complete stop. The yellow light is a warning signal and indicates. This signal is used to alert drivers that they need to slow down and prepare to stop. The green light is set to go while on the start of move.

The first automatic traffic lights were timed to changed at fixed intervals, but drivers soon realized that this caused quite a bit of unnecessary waiting. To remedy this, our project design is the best solution. controlling the traffic becomes major issue because of large time delays between traffic lights.

COMPONENTS

ATMEGA8 Microcontroller

ATmega8 is a 28-pin, 8-bit AVR microcontroller, based on RISC architecture, designed by Microchip and is mainly used in the embedded systems and industrial automation projects. The ATmega8A is a low-power CMOS 8-bit microcontroller. The main feature of atmega microcontroller is that all the pins of microcontroller support t two signals except 5-pins.It has 1k byte internal SRAM .There are 3-internal timers are accessible.A microcontroller is a tiny computer on a single chip and it is termed as a control device.

UNO ARDUINO
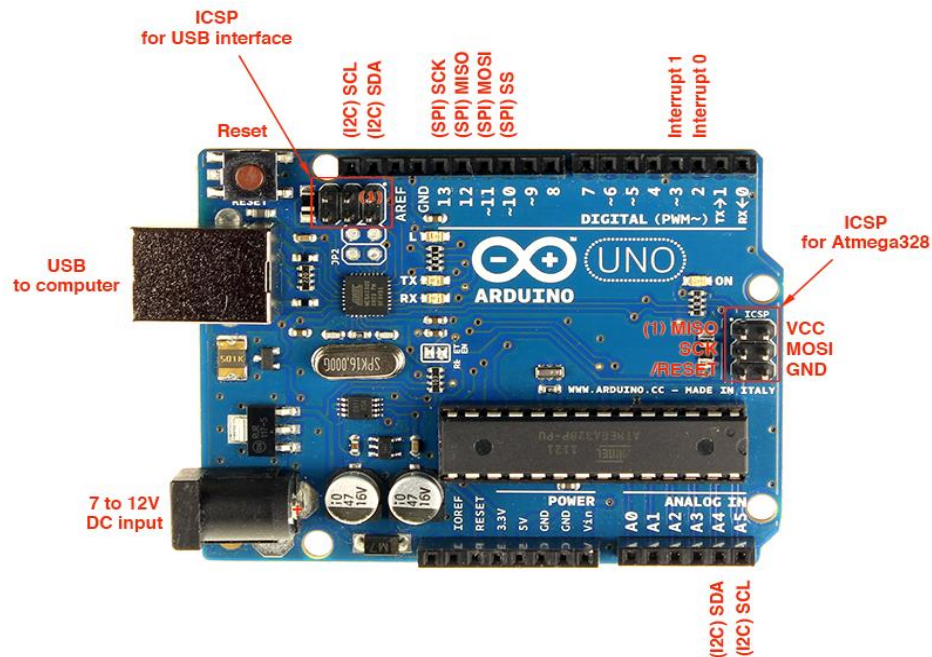
Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. The Arduino Uno power supply can be done with the help of a USB cable or an external power supply. The external power supplies mainly include AC to DC adapter otherwise a battery. The adapter can be connected to the Arduino Uno by plugging into the power jack of the Arduino board. Similarly, the battery leads can be connected to the Vin pin and the GND pin of the POWER connector. The suggested voltage range will be 7 volts to 12 volts. Arduino Uno can detect the surroundings from the input. Here the input is a variety of sensors and these can affect its surroundings through controlling motors, lights, other actuators, etc.

LED(Light Emitting Diode)

A light emitting diode is a semiconductor device that emits light when current flows throught it. In our project we used 3 different types of led colours , which are smiliar to traffic light signals. Leds are very small in size and easily replacable in applications. Leds requries very less power.we used 10mm size led lights.

BREADBOARD

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit. A breadboard is used for building temporary circuits or proto types. It is used to designers because it allows components to be removed an replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action ,then to resue the components in another circuit breadboards are two types solder and solderless, we preferred in our project solderless.

IR SENSOR
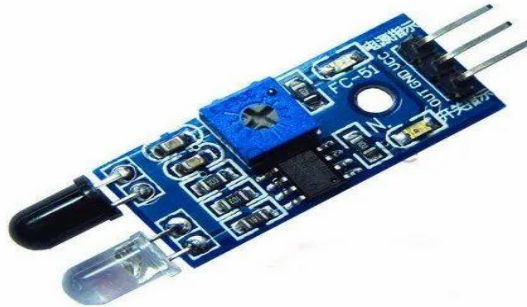
An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. There are two types of infrared sensors: active and passive. Active infrared sensors both emit and detect infrared radiation. In our project we used Active IR sensors ,It have two parts: a light emitting diode (LED) and a receiver. When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver.

APPLICATIONS

- Control traffic in metropolitan cities.
- Edge detection.
- Robot operations.
- Emergency.
- No parking detection.
- Vehicles collision detection.

ADVANTAGES

➢ Traffic control signals provide for an orderly movement of traffic.

➢ They help in reducing the frequency of an accident of an accident of some special nature i.e, of right angles accidents.

➢ They provide authority to the rivers to move with confidence.

➢ They intercept heavy traffic to allow other traffic to cross the road intersection safety.

➢ They control the speed of vehicles on main as well as on secondary roads.

➢ They direct traffic on different routes without excessive congestion.

➢ They provide economy over manual control of the intersection.

DISADVANTAGES

➢ It may result in a re-entrant collosion of vehicles.

➢ They may cause a delay in the quick movement of traffic.

➢ Counting of number of vehicles on the road gives fault result.

CHAPTER-3

METHODOLOGY

In this relationship, the microcontroller is the core component. The only gadget that monitors and controls the whole interaction. We will use a regulator in Atmega328 format, also called ARDUINO UNO. The Arduino module is an open-source plug-and-play controller. The regulator includes the advanced converter, the generator of pulse duration, and EEPROM memory.

The LCD and ESP modules are fasted after the Arduino microcontroller is charged them on the LCD, then directly via them. The knowledge is transferred to the worker in a crucial time frame. The regulator also monitor the customer contribution from the cloud track The ESP8266 is an affordable Wi-Fi module with TCP/IP functions. The module is used to provide the web worker with details. The module only requires the legal agreement of AT orders for communication with the web worker Previously, Arduino was revised for under sets for the board.

The solar panel and windmill voltage are significantly higher than the basic normal voltage of the controller Simply stated, the working voltage of the regulator surpasses the fundamental reference voltage In our case it is half the voltage produced by the regulator, to reduce voltage, we need a voltage divider before it is forwarded to the regulator.

The working voltage of the controller inadequate to directly drive the hand off, so the lay bop can be guilted by driver it. The driver circuit requires a high low signal so power the hand off module. The trans male feed the AC load. The AC axis is supplied by the Only AC Load.

COMPONENTS WEIGHT LIST

S.NO	COMPONENTS	VALUES	COST
1	ATMEGA8 MICROCONTROLLER	-	250/-
2	IR TRANSMITTER RECEIVER	-	300/-
3	ADAPTER	12V	100/-
4	RESISTORS	1KΩ	20/-
5	CONNECTORS AND CABLES	30no.	80/-
6	BREAD BOARD	2no.	120/-
7	LED	12no.	50/-
8	ARDUINO	-	750/-

PROPOSED DESIGN

DESCRIPTION

As per our process diagram, initially the signals are started by giving the power supply. The first step is to make sure that the signals are all in on condition. During this all the traffic signals will blink in yellow light . This indicates That they are all in the working condition.

The next step is to check for the density of traffic in these roads. By density what we are trying to mean in that the number of vehicles available in a particular a certain period of time, the density is calculated. Over here by means of using an IR circuit. Depending on the number of vehicles that cut the light travelling from the receiver to transmitter of the IR circuit, the count of the vehicle is registered in the microcontroller.

This is followed by the next step in which the microcontroller decides as to which road should be given the highest priority. This is based on the density of traffic on each road and also it depends on the speed at which an IR Circuit register the count.

The next step is to assign time delays for each road. The time delays have already. Being set for certain specific counts in the microcontroller. As soon as the microcontroller receives the counts from the IR circuit, it will immediately detect the density of each road and accordingly allot the time delays for which each. Signal will shows the green light. The higher the traffic density, the longer will be the time delay allotted.

In the final step, the microcontroller makes sure that the lowest density road is also opened and that the delay of the green light for that particular signal also come to an end. Once all the roads are opened in a sequence them the. Microcontroller again goes back to the second step where it checks for the density of traffic in each road. The whole process is repeated like a cycle. The main point that is to noted regarding this process is that whenever a particular road has no traffic, correspondingly, the yellow light in the traffic signal will glow.

BLOCK DIAGRAM

FLOW CHART

```
                    ┌─────────────┐
                   (    START     )
                    └─────────────┘
                           │
                           ▼
  ┌──────────────────────────────────────┐          ┌────────────────────────┐
  │ Sensor detecting vehicle on each      │◄─────┐   │ Traffic light change    │
  │ junction                              │      │   │ to another junction     │
  └──────────────────────────────────────┘      │   │ after 1 second          │
                           │                     │   └────────────────────────┘
                           ▼                     │              ▲
  ┌──────────────────────────────────────┐      │              │
  │   Counting number of vehicle in       │      │              │
  │   each junction                       │      │              │
  └──────────────────────────────────────┘      │              │
                           │                     │              │
                           ▼                     │              │
                    ╱────────────╲      NO       │              │
                   ╱  If number of ╲─────────────┘              │
                   ╲  Vehicle >0   ╱                            │
                    ╲────────────╱                             │
                           │  YES
                           ▼
  ┌──────────────────────────────────────┐
  │ Adjusting time delay of the traffic   │
  │ light basedOn the number of vehicles  │
  └──────────────────────────────────────┘
                           │
                           ▼
             ┌──────────────────────────┐
             │ Traffic light delay based │
             │ on number of vehicle      │
             │ simultaneously with       │
             │ LED of matrix display     │
             └──────────────────────────┘
                           │
                           ▼
                    ┌─────────────┐
                   (     END      )
                    └─────────────┘
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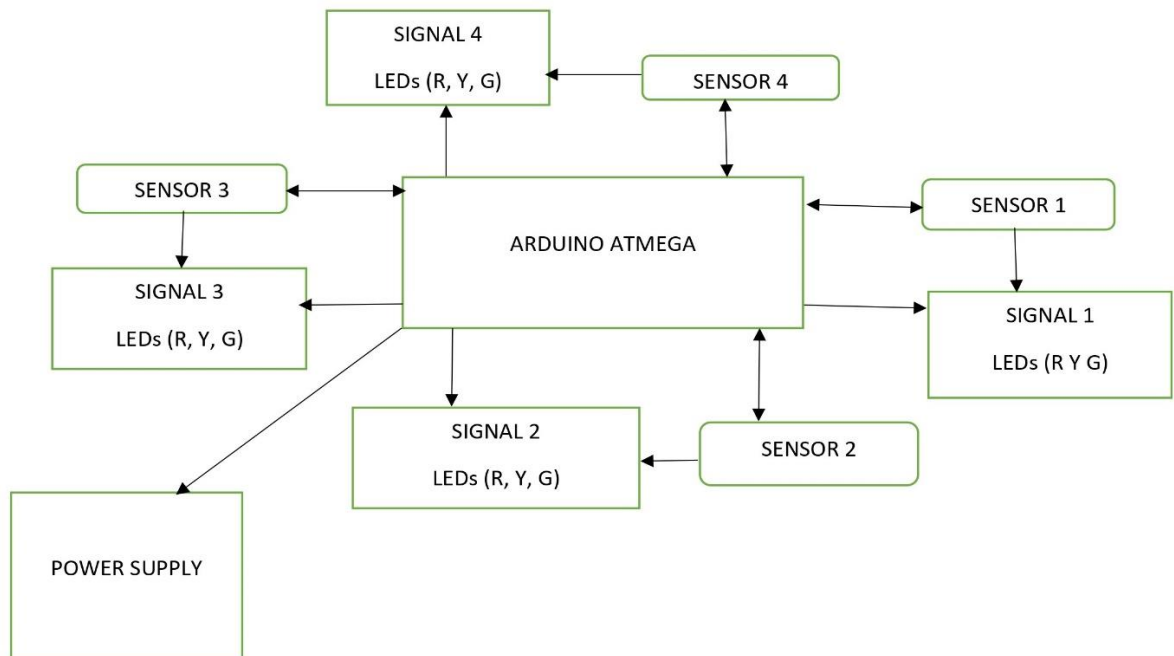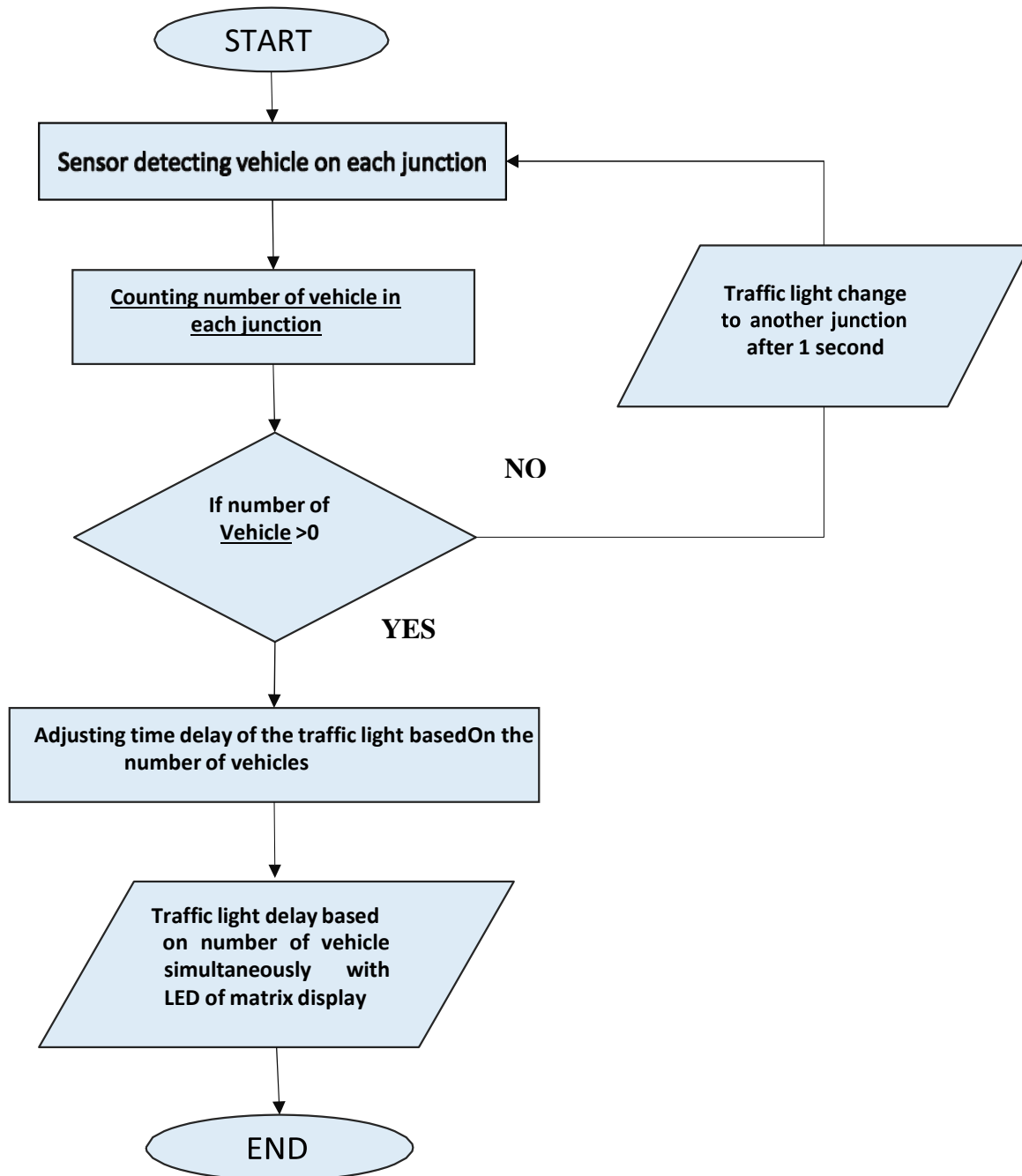
OBSERVATION

The project is a traffic signal controller system that reacts to the density of Traffic. The time required on changing signals are just automatically depending depending on the density of traffic. Well traffic problems contributes a major problem in many cities. And also increases fuel consumption as well as pollution.

Traffic signals operating on fixed signal time delays do not adjust to the changing traffic density. When the traffic density increases more than a limit at one particular site, it needs longer green light duration to ease traffic flow.

Our system uses a microcontroller of the 8051 family that is interfaced with IR sensors. These IR sensors are used for line of sight objective detection, using which the system gets an input of the traffic density. Traffic density is. Measured as low medium and high. Based on this density reading the system adjust and varies the traffic signal duration for that particular way.

This system can also be further enhanced by using multiple such that system across. City and synchronising them throw a network.

3.5 CHALLENGE TOWARDS IMPLEMENTATION

- The main concept of our project to reduce time energy, reduce sound pollution and air pollution.
- Some people have any Urgent work Or any other problems, they cannot move quickly in traffic.
- In traffic areas we face on pollution and air pollution also because in traffic area the vehicles release polluted air and makes sound horn.
- These problems faced so many peoples in traffic. To reduce these problems we are implemented a project that is IR based traffic density detection and signal adjustment using microcontroller.

CHAPTER-4

RESULTS AND DISCUSSION

The traffic control system which is controlled by Arduino UNO microcontroller is setup. It is placed at each traffic light at the intersection road to count the timing period. Three LED lights; green, yellow and red are installed at each traffic light named Traffic Light 1, Traffic Light 2, Traffic Light 3 and Traffic Light 4 together with IR sensors which installed at a 100 meter distance from each traffic light. Arduino UNO will provides flexible timing period of traffic light depending on the density of the traffic at each traffic light. Each vehicle is set to 3 seconds. All vehicles passing through the junction is measured and processed accordingly to delays. If there is no vehicle on road for 1 second it will change to another junction. The IR sensor starts its function to detect the number of vehicles on the road. Arduino UNO is the main module controlling all operations in producing the output. The counting of the vehicles is then analysed by the microcontroller.
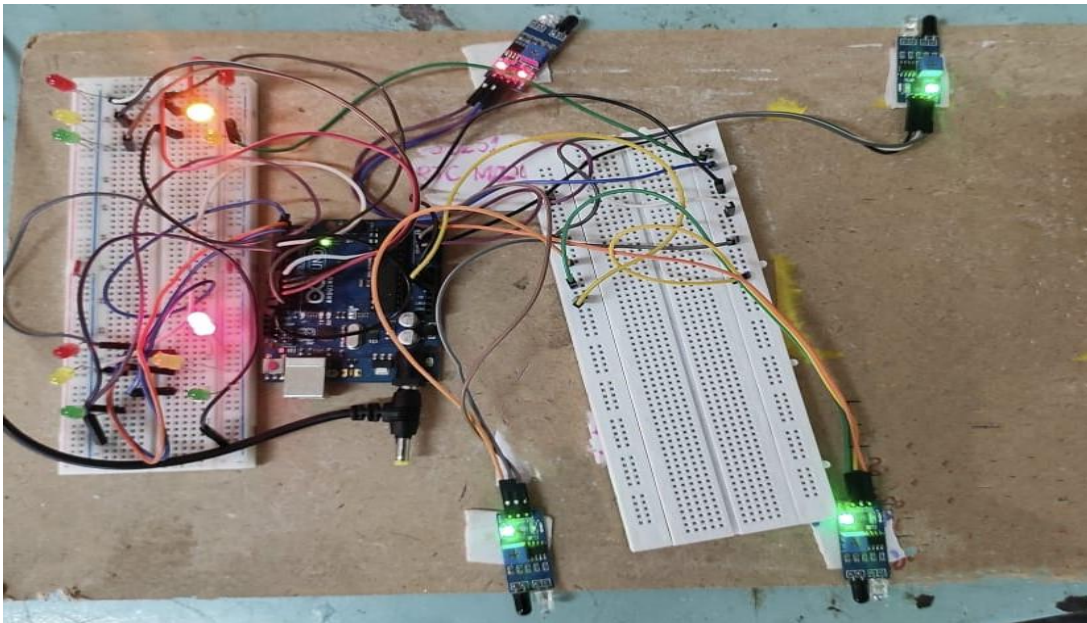
The hardware part of this project is depicted in Figure . Figure shows circuit of this density based traffic control system using IR sensor on a breadboard . In the circuit LEDs which are „ON" represent the traffic lights at the intersection. Time delay for LED green to switch on is according to the traffic density which is measured by how many vehicles sensed at the IR sensor.

CHAPTER-5

CONCLUSION

In this design work, a ir based traffic signal system was developed for traffic control at + road intersection to reduce unnecessary time wastage and minimize road traffic .The time required on changing signals adjust automatically depending on the density of the traffic. Well traffic problems contribute a major problem in many cities and also increase fuel consumption as well as pollution.

To reduce the congestion and unwanted time delay, an advanced system is required. One such advanced technology is automatic signaling using IR sensors. The sensors help in keeping count of vehicles entering the time delay thereby giving accurate priority to each road for the time being. With this technique, we have entered a new era of automatic traffic signal control.

REFERENCES

1. G. Lakshminarasimhan, V.Parthipan, Mohammed Irfan Ahmed, 2017. Traffic Density Detection and Signal Automation Using IOT 116(21), 389 - 394.

2. AspenCore, 2018. 7-segment Display. Electronics Tutorials [online] Available from: https://www.electronics-tutorials.ws/blog/7-segment-display-tutorial.html [Accessed 19th Sept., 2018]

3. K. Vidhya, A. Bazila Banu, 2014. Density Based Traffic Signal System. International Journal of Innovative Research in Science, Engineering and Technology 3(3), pp. 2218 - 2223.

4. Moyer, S. "Mr. Trafficlight". Motor News. Automobile Club of Michigan: pp.14-15, 1947.

5. Day, L. and McNeil, I. Biographical dictionary of the history of technology, Taylor and Francis, 1996

6. F. E. Idachaba, J. O. Olowoleni, A. E. Ibhaze, and O. O. Oni, "IoT Enabled Real-Time Fishpond Management System," 2017

7. O. U. Chinyere, O. O. Francisca, and O. E. Amano, "Design and simulation of an intelligent traffic control system," International journal of advances in engineering & technology, vol. 1, p. 47, 2011

8. Vahedha, Naga J 2016. Smart Traffic Control System for Clearance to Emergency Vehicles Using Arduino Software, International Journal of Technical Research and Applications, 4(3), pp. 307-309

9. Thakare VS, Jadhav SR, Sayyed SG, and Pawar PV 2013. Design of Smart Traffic Light Controller Using Embedded System, Journal of Computer Engineering 10(1) pp. 30-33.

10. H. Wei, G. Zheng, H. Yao, and Z. Li, "Intellilight: A reinforcement learning approach for intelligent traffic light control," in Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining, 2018, pp. 2496-2505.