

# **Density Based Traffic Signal System using Microcontroller**

A PROJECT REPORT

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**BONAFIDE CERTIFICATE**

This is to certify that the project report entitled “**DENSITY BASED TRAFFIC CONTROL SYSTEM**” submitted by

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Technology in “**ARTIFICIAL INTELLIGENCE ENGINEERING**” is a bonafide record of the work carried out under my(our) guidance and supervision at Amrita School of Engineering, Bangalore.

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## **ABSTRACT**

Present era controlling traffic became very arduous because of increase in the automobiles such as cars, bikes, etc. Due to this, there is a longer time delays in the signalling systems. In order to overcome this problem, we have designed the density based traffic signal with a delay of 1000ms to control the traffic based on density at the crossings or four-side lane or roads system using Arduino Uno ATmega 328P.

## CHAPTER 1

### INTRODUCTION

#### 1.1 Density Based Traffic Signal System:

The main concept of **Density Based Traffic Signal System** is to combine hardware and software components. In some cases, mechanical components are also combined to perform a specific task. It is a micro controller-based software driven real time control system. It is not a computer system which is mainly used for processing, not a software system, not a traditional business application. Generally, there are two kinds of embedded systems namely High-end embedded systems and Low-end embedded systems. Highend embedded systems deal with 32- & 64-bit controllers while Low-end embedded systems work with 8- & 16-bit controllers.

## 1.2

### **Applications of AI (Artificial Intelligence):**

- Personalized Shopping. ...
- AI-powered Assistants. ...
- Fraud Prevention. ...
- Administrative Tasks Automated to Aid Educators. ...
- Creating Smart Content. ...
- Voice Assistants. ...
- Personalized Learning. ...
- Autonomous Vehicles.

### **1.3 AI (Artificial Intelligence):**

**Artificial intelligence** (AI) is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence and discernment.

### **1.4 Background Knowledge on AI:**

**AI was a term first coined at Dartmouth College in 1956.** Cognitive scientist Marvin Minsky was optimistic about the technology's future. The 1974-1980 saw government funding in the field drop, a period known as "AI winter", when several criticised progress in the field.

## **1.5 Benefits of AI:**

Now-a-days, every household has at least one internet connected device that can be part of IoT. Even big manufacturers around the world are using IoT in building their mobile phones, gadgets etc. which comes in handy to one's life every day, so IoT has been crucial in the daily life



## **1.6 IssuesAI:**

The main problem comes around with AI enabled devices is privacy of personal data. Our personal information like our location, health related data, personal chats, streaming over wireless display can be a potential risk to tracking and suggestions.

## **1.7 Conclusion**

Embedded Systems and IoT plays a vital role in every field. The future is dependent on these two aspects in developing technology. As it says, Both Embedded Systems and IoT have a major part in our project where it helps form transmitting the data between the two systems to displaying the messages over the internet

## CHAPTER 2

### LITERATURE SURVEY

## 2.1

### Extensive Surveys:

[1] R. Bhargav Devi, E. Sravani, Gaddam Srujan, Shiv Shankar “Density Based Traffic Signal System using Arduino Uno” International Conference on Inventive Computing and Informatics (ICICI) 2020.

- This paper discusses about the difficulties faced in regulating the uneven and irregular traffic and proposes a working miniature model to tackle it out .
- They have packed the code with basic logics that emphasises operations on the circuit

[2] Zhang Yuye & Yan Weisheng, (2021) “Research of Traffic Signal Light Intelligent Control System Based On Microcontroller”, First International Workshop on Education Technology and Computer Science, pp301- 303.

- Describes how the traffic signals could be made to get the maximum efficient useful output.
- They have made use of bunch of sensors that are precise with its calculation values

[3] Kaushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy “Road Traffic Congestion Monitoring & measurement using RFDI & GSM Technology” , IEEE/Annual Conference on Intelligent Transportation System, 2020.

- They have executed their project with the use of RIDF technology , which uses electromagnetic waves to capture the images could track.
- [4] J. Jasmine, Deva Priya, G. Ram Swathi, P. Nathiyar "Intelligent Traffic Control System Using Arduino Uno" IJEAIS Vol. 3 Issue 3, March – 2019, pp. 51-56
- Described about how a smart traffic light setup and functions should be.
- The codes and logics were of higher tier so it was a bit difficult for us to understand and execute it

## 2.2 Conclusion

The survey gave a brief idea of the existing technology and its social impact on the poorly maintained traffic system and also gave a clear idea on how the project can be helpful to the particular patients.

# CHAPTER 3

## DESIGN AND COMPONENTS

### 3.1 Introduction

The project works based by the signals that is passed by the ultrasonic(HC-SR04) sensors that calculates the distance of the object namely D1 and D2.

### 3.2 Hardware Unit

The hardware unit consists of a Microcontroller(Arduino UNO ) two ultra-Sonic Sensors(HC-SR04), bunch of LEDs and a LDR (Light Dependent Resistor)sensor.

### 3.2.1 Microcontroller:

A microcontroller is a small computer on a single metal-oxide-semiconductor VLSI integrated circuit chip. A microcontroller contains one or more CPUs along with memory and programmable input/output peripherals.

Arduino UNO(6inputs)



### 3.2.2 Ultrasonic sensor (HC-SR04):

This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

There are only four pins that you need to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). You will find this sensor very easy to set up and use for your next range-finding project!

This sensor has additional control circuitry that can prevent inconsistent "bouncy" data depending on the application.



### 3.2.3 Photoresistor:

A photocell or photoresistor is **a sensor that changes its resistance when light shines on it**. The resistance generated varies depending on the light striking at his surface. A high intensity of light incident on the surface will cause a lower resistance, whereas a lower intensity of light will cause higher resistance.



Fig [3.3] – Pin Diagram of AT Mega 328P Microcontroller

### 3.2.4 LEDs

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with **electron holes**, releasing energy in the form of photons (Energy packets). The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting <https://en.wikipedia.org/wiki/Phosphor> phosphor on the semiconductor device.



### **3.2.5 Conclusion**

The above points give an overview on what all components are used in the project and how the components play a key role in the working of the prototype. It even explains technical data of the components.

## **CHAPTER 4**

### **METHODOLOGY**

#### **4.1 Introduction**

This chapter just gives the overview of the methodology that was used to implement this project. The following figures shows the block diagram of **Density Based Traffic Signal System using Microcontroller**

#### **4.2 Block Diagram of Density Based Traffic Signal System:**

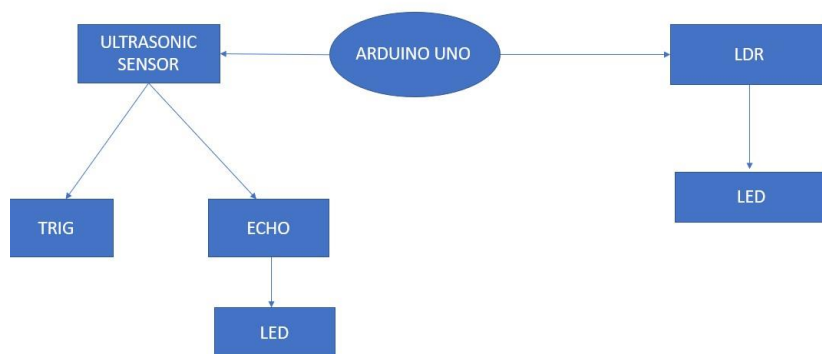


Fig [4.1] – Block diagram of Density Based Traffic Signal System using Microcontroller

### 4.3 Conclusion

The Block Diagrams shown above gives an overview of how the system actually works and how the data is transferred between the Patient System and Care Taker System. Also, it talks about the effective usage of IoT which can be used in many other projects.

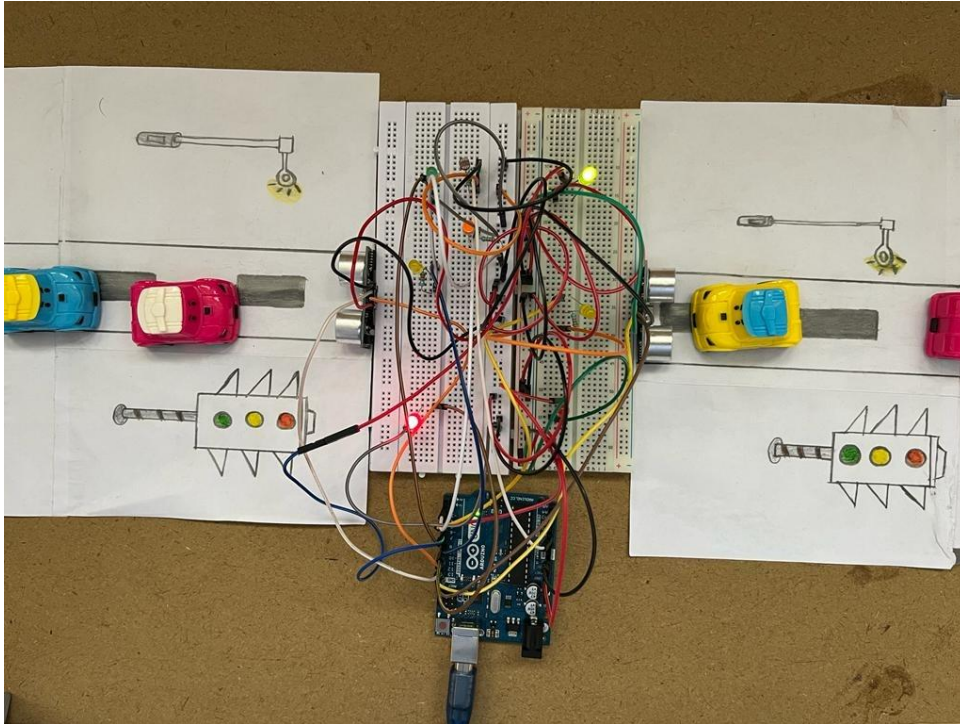
## CHAPTER 5

### RESULT AND ANALYSIS

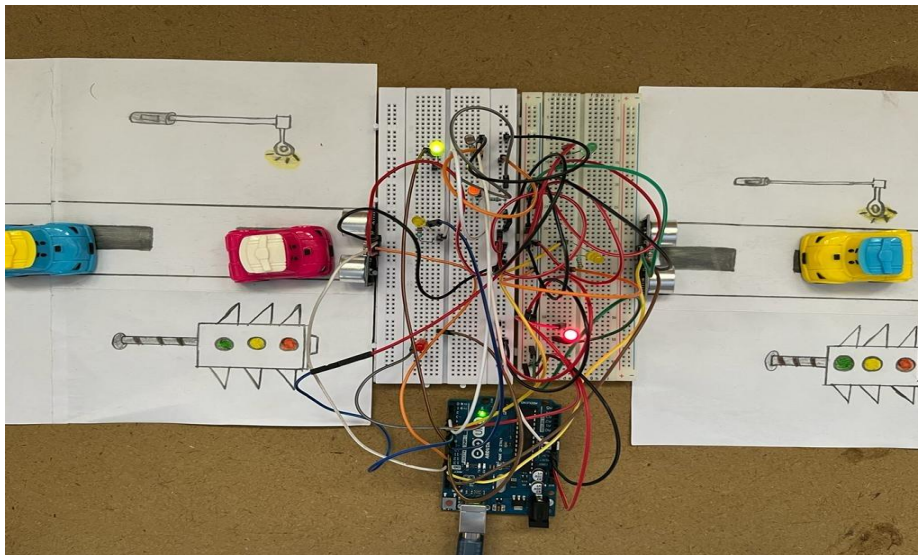
#### 5.1 Introduction

The entire schematic was designed in Tinker cad Professional and verified whether everything was connected. Then generated the circuit Layout files using the built-in option available in Proteus. Even tested each component before soldering them on realtime to make sure that everything is proper working condition. After that, coded the Microcontroller using Arduino IDE and verified the output.

1)when  $D1 < D2$



2)when  $D2 < D1$



## 5.2 Conclusion

All the hardware components were successfully soldered on PCB and each component was tested properly for the better functioning of the system. The output given by the hardware units were as expected.



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## **CHAPTER 6**

### **CONCLUSION**

#### **6.1 Conclusion**

We have successfully developed a system where people will be able to have a safe and organised road traffic and a disciplined driver. We have used two ultrasonic sensors and named the distance they measure as D1 and D2 integrated with a small microcontroller

**6.2****Advantages**

- Reduce human work using AI's automation
- No time wasted unnecessarily in the traffic signals
- Disciplined and pacified traffic system
- Systematic and free flowing vehicles with the rules followed up

**CHAPTER 7****FUTURE SCOPE**

- Could be incorporated with IR sensors to get a more accurate result
- Speed trap guns could be added on the post to catch the over speeding or the vehicles on the wrong lanes
- The sound recognizers could be added to the post which could turn the signal green to the emergency lifeline vehicles
- We can add up HI-RES cameras to identify and track the vehicles by tracking them this could solve the crime

## REFERENCES

- [1] R.Bhargav Devi, E.Sravani,Gaddam Srujan, Shiv Shankar “Density Based Traffic Signal System using Arduino Uno” International Conference on Inventive Computing and Informatics (ICICI) 2017. [2] Zhang Yuye & Yan Weisheng, (2009) “Research of Traffic Signal Light Intelligent Control System Based On Microcontroller”, First International Workshop.
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- [4] <https://www.semanticscholar.org/paper/Density-based-traffic-signal-system-using-Arduino-Devi-Reddy/c89e7e070b6ccee887418474de910b1b26c448bc>