

# Smart Traffic Management System Using Arduino and Sound Sensor

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**Abstract-** Even today in some places the traffic drivers are still dependent on the traffic police to control the traffic based on the traffic density. There had been a lot of research for controlling the traffic automatically like using image processing technique, IR sensors, laser sensors. These are cost efficient and are complex. So in order to avoid the traffic congestion we use Arduino and ultrasonic sensor which is simple and less cost. Ultrasonic sensor is a type of sensor, it measures the distance of an object with the help of transducer and receiver. Arduino is referred as a microcontroller. It is available for both hardware and software companies, projects and it is also used to manufacture a single board of microcontroller or the microcontroller kits for the building of the digital devices. Arduino device is mainly used to collect the signals from the ultrasonic sensors and these signals of sensors again interact with other Arduino device which helps in handling traffic light signals.

## I. INTRODUCTION

Nowadays technology is growing at a faster speed, people are addicted to a luxurious life everyone is having their own vehicles. Especially if there are members in a house everyone is having their own vehicles. Cars are more often used by everyone as it is luxurious and reflects their status. Traffic congestion is a widespread issue in urban areas worldwide characterized by the excessive and slow-moving flow of vehicles on road networks. It occurs due to several factors, including a rapidly growing population, increased urbanization, and there is an increase in more and more vehicles on the road used by the people. The traffic system that is currently in use has become very problematic for people and where the traffic police handles and controls. In problematic traffic situations there will be no traffic police to control the traffic situation which has become a very serious issue for people. People are busy in going to their work. Students face problems to go to college in time due to traffic. In this paper we introduce solutions to overcome the traffic congestion problems. With the help of Arduino Uno and Ultrasonic sensor we are going to achieve this.

## II. LITERATURE REVIEW

In order to complete this activity quickly and accurately, we looked over and tried to grasp some reference material before we started. The study we studied before beginning this research project is known as the literature review. It is clear from reading these publications that academics have put forth a number of reliable ideas for smart traffic controllers using Arduino Uno and ultrasonic sensors.

Ahmed et al., 2017[1], In this the author used an Arduino-based traffic light control system that uses ultrasonic sensors to detect vehicle presence at intersections. The system optimizes the traffic light timings based on the real-time data, that reduces the congestion of traffic and improves traffic flow. The authors emphasize the affordability and flexibility of Arduino platforms for traffic control applications.

Sheth et al., 2018[2], In this research the author explores the use of Arduino Uno and ultrasonic sensors in a smart traffic control system designed to prioritize the passage of emergency vehicles. The system identifies approaching emergency vehicles and modifies traffic signals to provide them with a clear path, potentially saving lives during emergencies.

Arasu and Kavitha, 2019[3], In this paper the authors introduced a smart traffic light control system utilizing Arduino and ultrasonic sensors. It focuses on reducing traffic congestion and delays by dynamically adjusting the traffic signal timings in response with the real-time traffic conditions. The authors also discuss the advantages of using low-cost Arduino platforms for traffic management.

Akinwale et al., 2020[4], In this paper the author designed and implemented an Arduino-based traffic light control system that employs ultrasonic sensors for vehicle detection. It emphasizes the simplicity and cost-effectiveness of this system, making it more appropriate for deployment in developing countries with limited resources.

Singh et al., 2021[5], In this paper the authors explore the development of a traffic management system based on Arduino Uno and ultrasonic sensors. The system aims to reduce traffic congestion by optimizing traffic signal timing

The authors highlight the potential for scalability and adaptability of Arduino-based solutions in urban traffic management.

### III. PROPOSED METHODOLOGY

Our main aim is to control the traffic. To avoid traffic congestion, we develop a prototype system of traffic signalling which is based on ultrasonic sensor and Arduino Uno. In this we took 4 ultrasonic sensors and connected it to Arduino uno. The trigger pin in ultrasonic sensor takes input and sends a signal return as echo signal which indicates detection of a vehicle. These ultrasonic sensors communicate with Arduino uno and controls traffic light signal. Which means the ultrasonic sensor checks the density of traffic in which place it high and displays output on LCD. Suppose if we take d1, d2, d3, d4 as 4 lanes these sensors checks in which lane the density is high, based on that it gives directions to move, which is displayed on LCD.

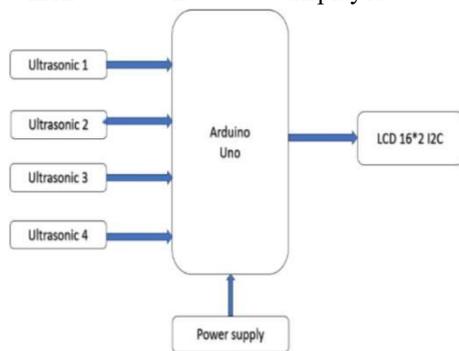


Figure1 Block diagram

#### A. Arduino Uno

It is a 8-bit ATmega328P microcontroller. It has serial communication, voltage regulator, crystal oscillator etc. It contains everything to work as microcontroller we doesn't require to implement any code particularly. It is integrated microcontroller. It has 14 digital pins and 6 analog pins. We can use this microcontroller for doing various projects and it is very simpler to use. Simply we need to connect it to ac or dc power supply.



Figure 2 Arduino Uno

#### B. Ultrasonic Sensor

Ultrasonic sensor is a type of sensor, it measures the distance of an object with the help of transducer and receiver. When barrier or object is present, the simple 40kHz ultrasonic pulse used by this module will bounce back to the sensor.



Figure3 Ultrasonic sensor

This ultrasonic sensor is better than IR sensor because IR sensor works only when there is a light signal it is not reliable to use. So we used Ultrasonic sensor instead of IR sensor.

#### C. Lcd 16\*2 I2C

Liquid Crystal Display 16x2 (LCD) and Inter Integrated Circuit (I2C). It works as an intermediary between the LCD and MCU (here Arduino).

### IV. RESULTS

This paper discusses the creation of a smart traffic controller using Arduino Uno and ultrasonic sensors. We have used Arduino as the heart of the device to control as per the commands given. Ultrasonic sensor is used at each road at 500 meters down the street away from the traffic light where there is obvious traffic congestion that needs to be solved.



Figure 4 Lcd16\*2 I2C

SOFTWARE A. Arduino IDE

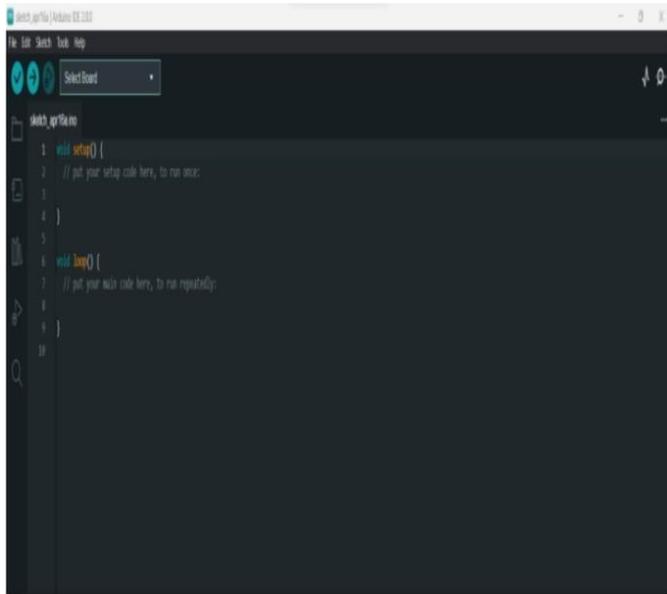


Figure 5 Arduino IDE

For writing and uploading code to Wi-Fi module board, open-source software known as the Arduino IDE is employed. The IDE includes a text editor where you write your Arduino sketches (programs). It supports syntax highlighting, auto-indentation, and other features to make coding easier.



Figure 6

The ultra-sonic sensor would detect the density of traffic and communicate to Arduino that is responsible for acquiring signals from sensors on the roads which in turn will communicate with other Arduino which is responsible for manipulating the traffic light signals accordingly. The ultrasonic sensor sends the ultrasonic waves the waves will detect the object by reflecting the waves. The output is

displayed on the lcd. Based on the results it was therefore a successful system in controlling traffic congestion.

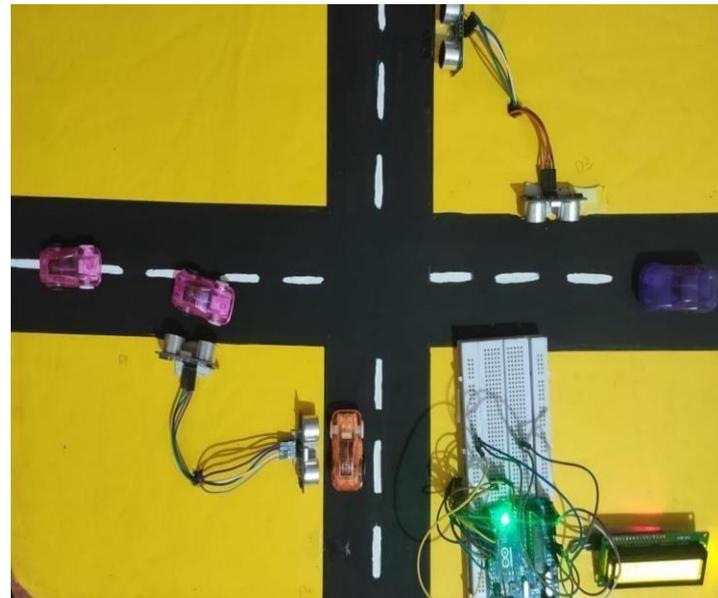


Figure 7 Result

V. CONCLUSION & FUTURE SCOPE

The implementation of smart traffic control using Arduino and ultrasonic sensors offers promising benefits. By utilizing real-time data from ultrasonic sensors to detect vehicles and adjust traffic signal timings accordingly, the system enhances traffic flow, reduces congestion, and improves overall road safety. This cost-effective and efficient solution has the potential to transform traditional traffic management into a more intelligent and responsive approach, contributing to smarter and sustainable cities of the future.

VI. REFERENCE:

[1] Creator:Razib Shahadat.Title of video:Density Based 4 Way Traffic Signal Control System Using Arduino and IR Sensor Released date : Dec 10, 2018 [Online Video] Available : <https://www.youtube.com/watch?v=CFMzBt3ta4o>

[2] Konstantin Dimitrov. Instructables. Making LCD Thermometer With Arduino and LM35/36 Autodesk. <https://www.instructables.com/id/Electronic-Thermometer-with-Arduino-UNO/>

[3] Roboindia. Tutorial Portal. Sending and Receiving Data with HC-05 - MIT App Inventor <https://roboindia.com/tutorials/sending-receiving-with-hc05-mit-app-inventor>