A

PROJECT REPORT

ON

“Density Based Traffic Control System”

Submitted in partial fulfillment of the requirements for the award of degree of

BACHELOR OF TECHNOLOGY

in

Electrical And Electronics Engineering

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SCHOOL OF AUTOMATION

BANASTHALI VIDYAPITH RAJASTHAN

DEC - MAY (2022-2023)

BANASTHALI VIDYAPITH RAJASTHAN

SCHOOL OF AUTOMATION

CERTIFICATE

I hereby submit the project entitled **"Density Based Traffic Control System"** in the **School of Automation** of the Banasthali Vidyapith, under the supervision of **"Mr. Sumit Nema"**, School of Automation, Banasthali Vidyapith, Rajasthan, India.

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The project report is hereby approved for submission.

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Date:

ABSTRACT

The project is aimed at designing a density based dynamic traffic signal system where the timing of the signal will change automatically on sensing the traffic density at any junction . Present day traffic signaling system is fixed time based which may render inefficient if one lane is operational than the others.

To optimize this problem we have made a framework for an intelligent traffic control system. Sometimes higher traffic density at one side of the junction demands longer green time has compelled standard allotted time.We ,therefore propose here a mechanism in which the period of green light and red light is assigned on the basis of density of the traffic present at that time .This is achieved by using ultrasonic sensors.Once the density is calculated , the glowing time of green light is assigned by the help of microcontroller(Arduino Mega 2560).The sensors which are present on the side of the road will detect the presence of vehicle on the road and send the information to Arduino where it will decide how long a flank will be open or when to change over the signal lights.

ACKNOWLEDGEMENT

I would like to express my deepest appreciation to all those who provided me the possibility to complete the report.

A special gratitude I gave to my Supervisor. **Mr. Sumit Nema,** whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project for this session.
I sincerely thank our head of department **Ms. Shailly Sharma,** Dean. School of Automation. Banasthali University, for her guidance and encouragement in carrying out this work. I also wish to express my gratitude to other staff members who rendered their help.

My thanks and appreciation also goes to my friends who helped me in my work of the project and people who have willingly helped me out with their abilities.

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CHAPTER - 1

INTRODUCTION

1.1-BACKGROUND :-

A sensor is a device that detects and responds to some type of input from the physical environment. The input can be light, heat, motion, moisture, pressure or any number of other environmental phenomena. The output is generally a signal that is converted to a human-readable display at the sensor location or transmitted electronically over a network for reading or further processing.

Sensors play a pivotal role in the internet of things(IoT). They make it possible to create an ecosystem for collecting and processing data about a specific environment so it can be monitored, managed and controlled more easily and efficiently. IoT sensors are used in homes, out in the field, in automobiles, on airplanes, in industrial settings and in other environments. Sensors bridge the gap between the physical world and logical world, acting as the eyes and ears for a computing infrastructure that analyzes and acts upon the data collected from the sensors.

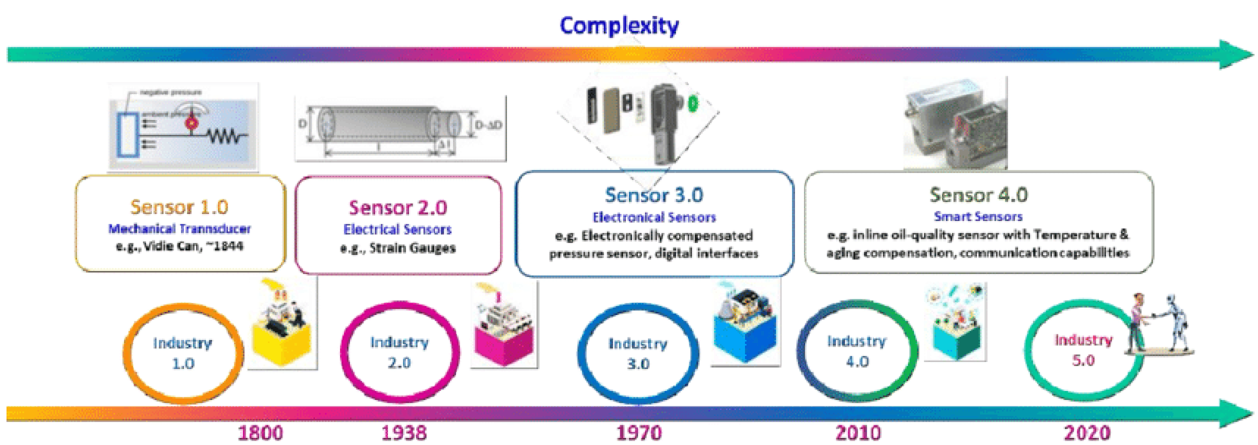
Fig 1.1 Sensor

1.1.1- EVOLUTION OF SENSORS

In the days of no sensor technology, information could only be obtained through human beings, such as the eyes, ears, noses, and feel of people. However, with the advent and evolution of sensors and the development of sensor technology, it has become possible to obtain various information that cannot be obtained by human sense alone. In addition, a large amount of quantified information can be delivered from multiple locations at the same time in an instant.

In addition, although the scope of measurement was limited in the past, the development of sensors is progressing now, and it is possible to measure a wide variety of things.

The evolution of sensors is essential for the evolution of sensing technology, and sensors have become diversified and sophisticated in order to sense all objects.



1.2 Evolution of Sensors

1.1.2 -HOW SENSORS WORKS?

A sensor converts the physical action to be measured into an electrical equivalent and processes it so that the electrical signals can be easily sent and further processed. The sensor can output whether an object is present or not present(binary) or what measurement value has been reached (analog or digital).

1.1.3- SENSOR CONSISTS OF 3 MAIN COMPONENTS:-

1 .The sensing section contains the sensor itself which is based on a particular technology . The variety of technologies means you can select sensor technology which fits your application.

2. The processing circuitry converts the physical variable into an electrical variable.

3.The signal output contains the electronics connected to a control system.

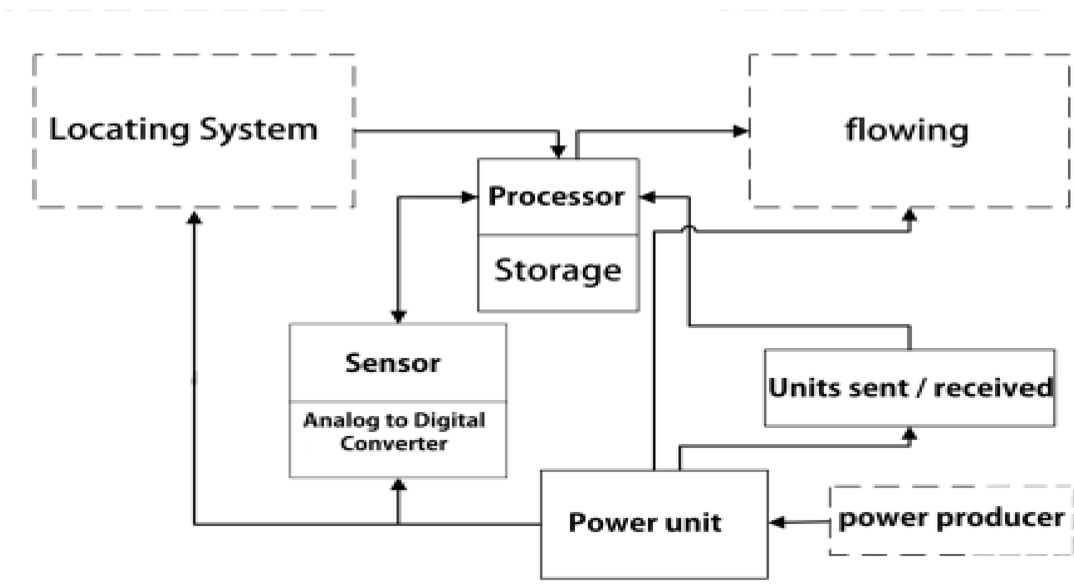


Fig. 1.3 Sensor Working

1.1.4- CLASSIFICATION OF SENSORS:-

1.1.4.1. Active and Passive Sensors

1.1.4.2 Analog and Digital Sensors

1.1.4.1 ACTIVE SENSORS :

Active sensor are the type of sensors that produces output signal with help of external excitation supply. The own physical properties of the sensor varies with respect to the applied external effect. Therefore, it is also called as Self Generating Sensors.

Examples: LVDT and strain gauge.

1.1.4.1 PASSIVE SENSORS :

Passive sensors are the type of sensors that produces output signal without the help of external excitation supply. They do not need any extra stimulus or voltage.

Example: Thermocouple, which generates a voltage value corresponding to the heat, applied. It does not require any external power supply.

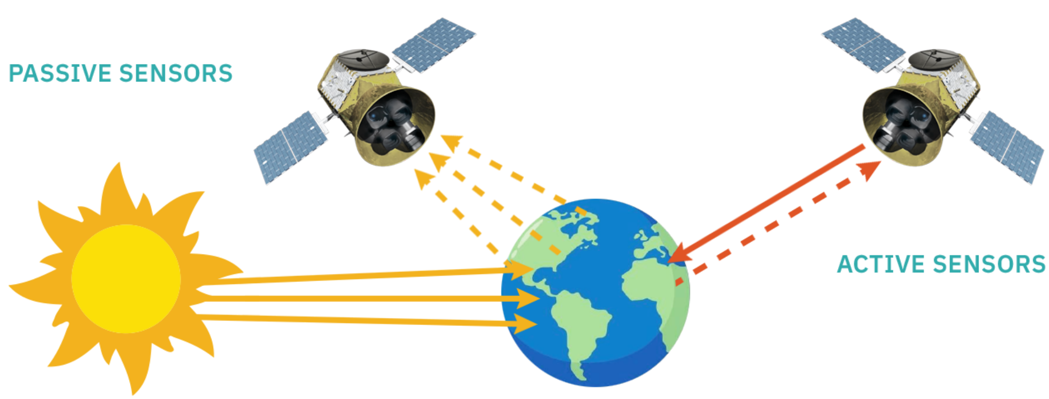


Fig. 1.4 Passive Sensors

1.1.4.2 ANALOG SENSORS

The sensor that produces continuous signal with respect to time with analog output is called as Analog sensors. The analog output generated is proportional to the measured or the input given to the system. Generally, analog voltage in the range of 0 to 5 V or current is produced as the output. The various physical parameters like temperature, stress, pressure, displacement, etc. are examples for continuous signals.

Examples: accelerometers, speed sensors, pressure sensors, light sensors, temperature sensors.

1.1.4.3 DIGITAL SENSORS

When data is converted and transmitted digitally, it is called as Digital sensors. Digital sensors are the one, which produces discrete output signals. Discrete signals will be non-continuous with time and it can be represented in "bits" for serial transmission and in "bytes" for parallel transmission. The measuring quantity will be represented in digital format. Digital output can be in form of Logic 1 or logic 0 (ON or OFF). A digital sensor consists of sensor, cable and a transmitter. The measured signal is converted into a digital signal inside sensor itself without any external component. Cable is used for long distance transmission.

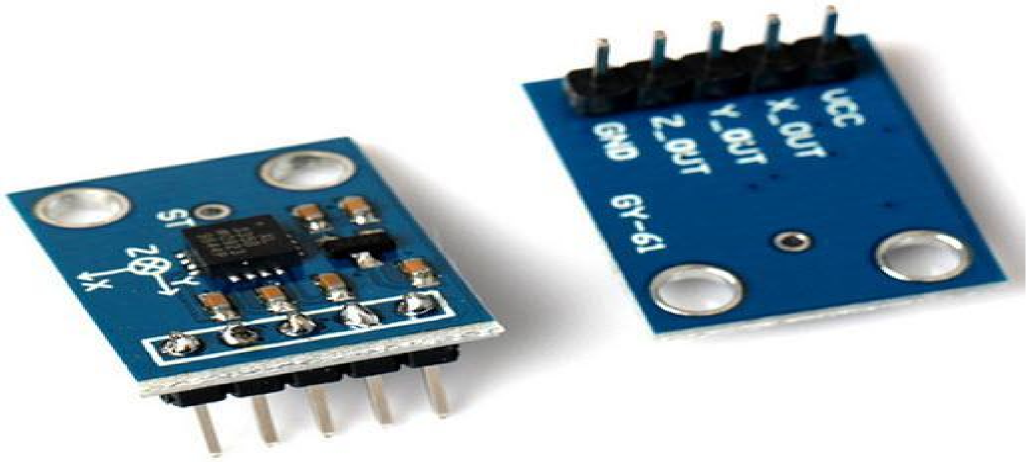


Fig.1.5 Digital Sensor

1.1.5- DIFFERENT TYPES OF SENSORS:-

- Temperature Sensor.
- Proximity Sensor.
- Accelerometer.
- IR Sensor (Infrared Sensor)
- Pressure Sensor.
- Light Sensor.
- Ultrasonic Sensor.
- Smoke, Gas and Alcohol Sensor.

1.1.6- WHERE WILL SENSOR TECHNOLOGY GO IN FUTURE

The relationship between humans and sensing has a long history that cannot be said to have begun at any time. For example, it can be said that primitive sensing is to measure the strength of the wind by the way the flag flaps. In addition, the control device that leads to the next operation by inputting the information sensed by the sensor has walked along with the major transformation of the manufacturing industry and the history of FA. However, the spread of IoT has led to major changes in sensor technology and greatly attracting attention. The Internet of Things has expanded the range of ways information is transported and used, and at the same time, the method of acquiring information and the types of information that can be obtained have also attracted attention, and the demand for sensor technology has increased explosively.

There has also been a significant change in the way we analyze the large amounts of data we get. By accumulating all data acquired by sensing technology, treating it as big data, and combining it with AI, the range of applications will further expand. Edge computing also adds real-time information processing. In this way, the application possibilities are infinitely large by adding time axis elements to the amount and direction of information.By combining sensing technology, IoT, big data, AI, and edge computing, information is expected to create new values, not just numerical values.

The evolution of sensor technology expands the range of information utilization indefinitely. As the type, quantity, and accuracy of information obtained through sensing increase, the technology that applies it has even greater potential. The combination of sensing and IoT, big data, AI, and edge computing has great expectations not only in various industries, but also in medical and space developement.

Fig.1.6 Future of Sensors

1.1.7- Need For Sensors :

Sensors are pervasive. They are embedded in our bodies, automobiles, airplanes, cellular telephones, radios, chemical plants, industrial plants and countless other applications.

Sensors are pervasive. They are embedded in our bodies, automobiles, airplanes, cellular telephones, radios, chemical plants, industrial plants and countless other applications.

1.1.8- WHAT IS ULTRASONIC SENSOR ?

An ultrasonic sensor is an electronic device that can measure the distance of a target object by sending out ultrasonic sound waves, and converting the reflected sound into an electrical signal. Basically, such a sensor uses a transducer to send and get ultrasonic pulses that in turn send back information about an object’s proximity. It is important to note that these ultrasonic waves travel faster than audible sound; i.e. these sensors send out sound waves at frequencies above the range of human hearing.

Ultrasonic sensors have two key components: one is the transmitter that emits the sound using piezoelectric crystals and the other is the receiver that receives the sound after it has traveled to and from the target.

Fig.1.7 Ultrasonic Sensor

1.1.9- APPLICATION OF ULTRASONIC SENSORS IN TRAFFIC CONTROL

In the proposed system ultrasonic sensor will perform a very vital role. This sensor will detect the density of Traffic jam and the system will work accordingly. Ultrasonic waves are created by a device named a piezoelectric at a specified frequency. Piezoelectric will generate ultrasonic waves to an area or a target, and when the wave touches the surface of the target, it will reflect the sensor. The sensor has a timer that can easily calculate the distance traveled by the sound

An ultrasonic sensor is a well-known and very popular sensor to be used, because the distance it covered is up to 400 cm / 4 meters jet and at a relatively low price, and also it is easy to install These sensors are widely used like in construction sites, parking of the car, measuring tapes, and so on. Also in danger zones of working machines or any other places that cannot be reached by a human or it’s too risky .

1.1.10 LIMITATIONS

- Cannot work in a vacuum
- Not designed for underwater use
- Sensing accuracy affected by changes in temperature of 5-10 degrees more
- Having a Limited detection Range

1.2- MOTIVATION :-

This is our third year project, which will draw attention of all the faculties. So, I want to make a project through which everyone can relate to it. Also in our day to day life I am always observing at the crossing of roads that in some lane there are lot of traffic compared to others lane but all the signals in our country is timing based .So we cannot manage our time. Also due to timing based the lighter dense roads are sometimes empty due to which many people start crossing the road but due green signal in that lane vehicle moves at high speed which increases the risk of accident. So, the best solution of these problem is to make traffic control system which control the whole traffic by density. From this we got the motivation to work on this project.

At the starting of the project we were not able to visualize it practically, but slowly we are getting information from the Internet and taking help of some of our faculties of our college to implement it practically. Any random person won't be able to visualize our efforts put in the completion of the project because after completion it looks a bit easy.

Our mentor and played a very important role in the completion of our project. Without their help we won't be able to complete it properly. So, special thanks to our mentor .

CHAPTER - 2

WORK

2.1- ARDUINO MEGA 2560 BOARD

Arduino board is an open-source microcontroller board which is based on Atmega 2560 microcontroller. The growth environment of this board executes the processing or wiring language. These boards have recharged the automation industry with their simple to utilize platform wherever everybody with small otherwise no technical backdrop can start by discovering some necessary skills to program as well as run the aurdino board.

The microcontroller board like “Arduino Mega” depends on the ATmega2560 microcontroller. It includes digital input/output pins-54, where 16 pins are analog inputs, 14 are used like PWM outputs hardware serial ports (UARTs) – 4, a crystal oscillator-16 MHz, an ICSP header, a power jack, a USB connection, as well as an RST button. This board mainly includes everything which is essential for supporting the microcontroller. So, the power supply of this board can be done by connecting it to a PC using a USB cable, or battery or an AC-DC adapter. This board can be protected from the unexpected electrical discharge by placing a base plate.

Fig 2.1 Arduino Mega 2560

2.2 ARDUINO MEGA SPECIFICATIONS :

Tech Specs	Arduino Mega 2560
Board Size	101.52 × 53.3mm
Microcontroller/ Clock Speed	ATmega2560/ 16MHz
SRAM (Main Memory)	8kB
Flash Memory	256kB
EEPROM	4kB
Operating Voltage	+5V
Input Voltage (recommended)	+7~+12V
Output Voltage	+5V, +3.3V
Digital I/O Pins	54
PWM Digital I/O Pins	15
Analog Input Pins	16
Analog Output Pins (DAC)	-
Rated Current per Pin	20mA/Pin
Program Writing Pins	USB Type-B ICSP
Interface	UART I2C SPI

Fig 2.2 Arduino Mega Specifications

2.3 ARDUINO MEGA PINS:

The microcontroller of the Arduino Mega 2560 uses “ATmega2560” .A microcontroller is a very important component in controlling electronic devices that correspond to the human “brain”. In addition, various memories such as SRAM, Flash memory, and EEPROM are also built into the microcontroller.

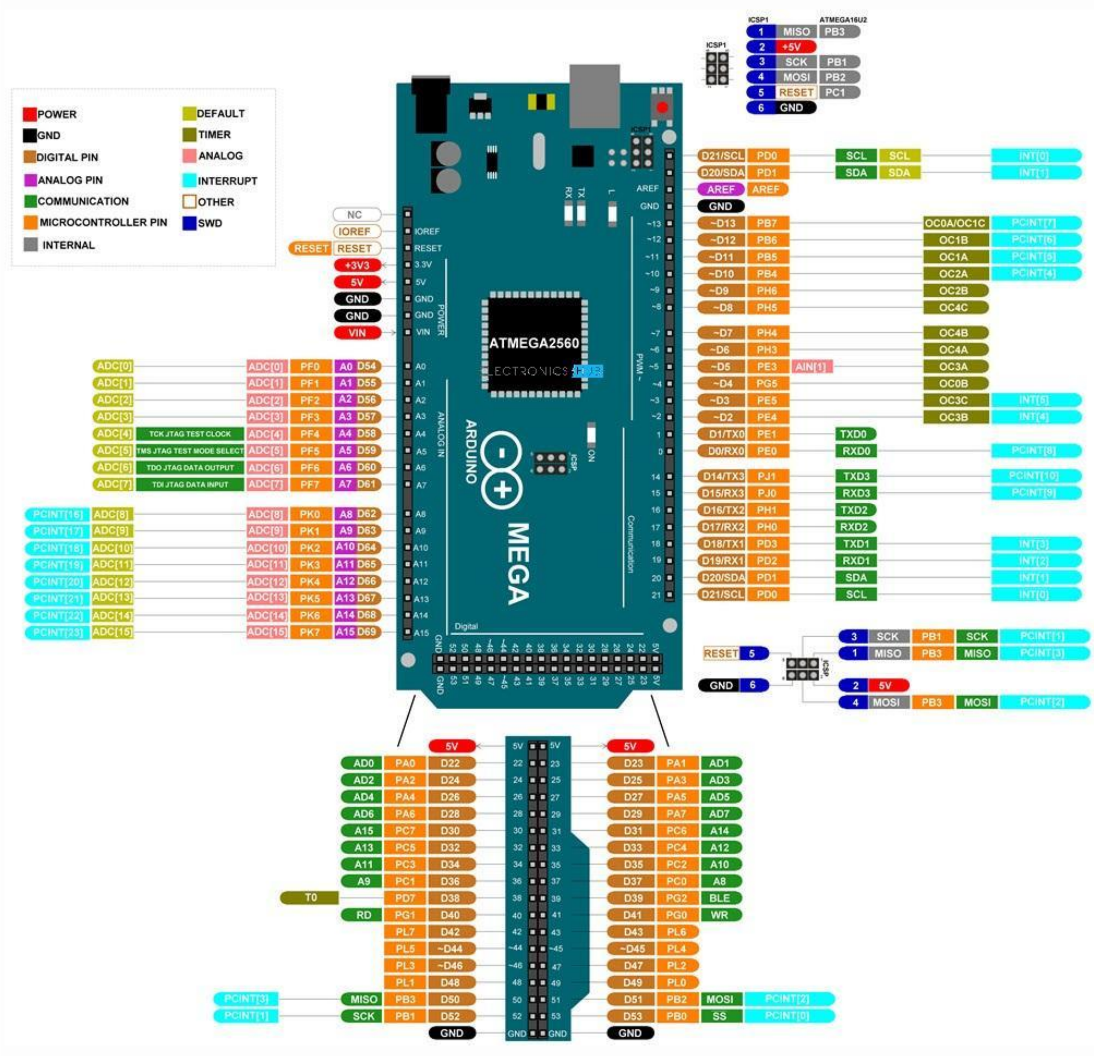


Fig 2.3 Arduino Mega Pins

2.3 POWER JACK

You can connect an AC adapter(outer diameter 5.5mm, inner diameter 2.1mm) to power the Arduino Mega 2560.

2.4 RESET BUTTON

You can restart the Arduino Mega 2560 by pressing the reset button. Use this when you want to restart the program from the beginning or when the Arduino Mega 2560 behaves strangely.

2.5 ICSP

Arduino Mega 2560 has two ICSP terminals, for “ATmega2560-15” and “ATmega16U2”.

2.5.1 Vin: This is the input voltage pin of the Arduino board used to provide input supply from an external power source.

2.5.2 5V: This components pin of the Arduino board is used as a regulated power supply voltage and it is used to give supply to the board as well as onboard.

2.5.3 3.3V: This pin of the board is used to provide a supply of 3.3V which is generated from a voltage regulator on the board.

2.5.4 GND: This pin of the board GND is used to ground the Arduino board.

Power

Power	Explanation
Vin	The voltage of "③Power jack" is output, Power can be supplied from "Vin" without using the power jack.
GND	Ground/Reference point
+5V	+5V voltage output
+3.3V	+3.3V voltage output

Fig 2.4 Pins Specifications

2.5.5 Reset: This pin of the board is used to reset the microcontroller It is used to Resets the microcontroller.

2.5.6 Analog Pins: The pins A0 to A15 are used as an analog input and it is in the range of 0-5V. The analog pins on this board can be used as a digital Input or Output pins.

Analog Input

Analog Input	Explanation
A0-A15	Analog input(0-15) 10-bit A/D converter(1step change every 4.8mV)

Fig. 2.5 Analog Input

Serial pins: It is used for communication between the Arduino board and a computer or other devices.

The TXD and RXD are used to transmit & receive the serial data resp. It includes serial 0, Serial 1, serial 2, Serial 3 as follows:

Serial 0: It consists of Transmitter pin number 1 and receiver pin number 0

Serial 1: It consists of Transmitter pin number 18 and receiver pin number 19

serial 2: It consists of Transmitter pin number 16 and receiver pin number 17

Serial 3: It consists of Transmitter pin number 14 and receiver pin number 15

External Interrupts pins: This pin of the Arduino board is used to produce the External interrupt and it is done by the pin numbers 0,3,21,20,19,18.

I2C: This pin of the board is used for I2C communication.

1. Pin number 20 signifies Serial Data Line (SDA)and it is used for holding the data.

2. Pin number 21 signifies Serial Clock Line (SCL) and it is used for offering data synchronization among the devices.

SPI Pins: This is the Serial Peripheral Interface pin, it is used to maintainSPI communication with the help of the SPI library. SPI pins include:

1.MISO: Pin number 50 is used as a Master In Slave Out.

2.MOSI: Pin number 51 is used as a Master Out Slave In.

3.SCK: Pin number 52 is used as a Serial Clock.

4.SS: Pin number 53 is used as a Slave Select.

LED PIN: The board has an inbuilt LED using digital pin-13. The LED glows only when the digital pin becomes high.

AREF PIN: This is an analog reference pin of the Arduino board. It is used to provide a reference voltage from an external power supply.

Communication

Communication		Explanation
UART (Serial communication)	TX	Serial data transmission
〃	RX	Serial data reception
I2C	SCL	Serial clock
〃	SDA	Serial data transmission/reception
SPI	SS	Select device to control
〃	SCK	Serial clock
〃	MOSI	Master ⇒ Slave data transfer
〃	MISO	Slave ⇒ Master data transfer

Fig. 2.6. Communication Pins

APPLICATION OF AURDINO MEGA:

- 8 bit computer.
- 3D printer.
- To control and handle more than one motor.
- Robot with many sensors.
- CNC router.
- Automation and security projects.
- Internet of things applications.
- Multitasking or parallel programming.

LED TRAFFIC LIGHTS-

Traffic Lights are used to control vehicular traffic on the road and publics streets. In the modern era, where everyone owns different types of vehicles resulting in a rise in the numbers of vehicles which leads to traffic jams and rush on the busy routes. That's why traffic lights are mandatory for smooth traffic to avoid the traffic jams and accidents. It would have been hard to manage the traffic without traffic lights, and the risk of accidents would also increase.The traffic lights are easy to understand as they follow a universal colour code. There are three colours displayed at a traffic signal: red, yellow and green. Below are the basic traffic light rules.

The red colour indicates the motorists to stop.The yellow colour indicates the vehicles to slow down or transition before the red/green light. Lastly, the green light indicates the motorists to move ahead.

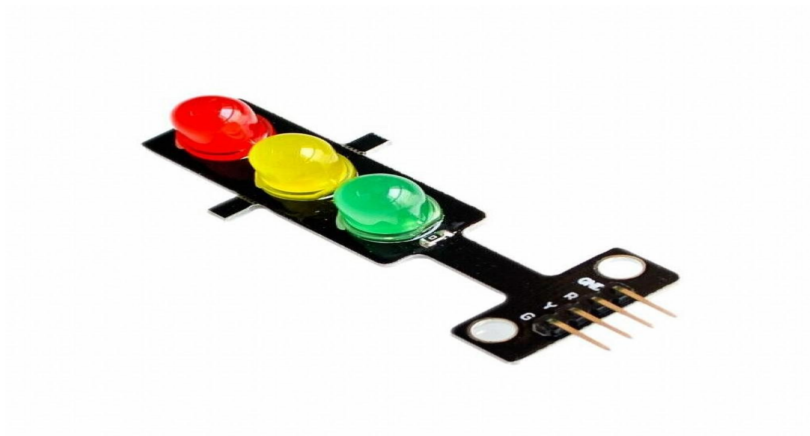


Fig. 2.7 Traffic Light

BREADBOARD

An electronics breadboard (as opposed to the type on which sandwiches are made) is actually referring to a solderless breadboard. These are great units for making temporary circuits and prototyping, and they require absolutely no soldering.

Prototyping is the process of testing out an idea by creating a preliminary model from which other forms are developed or copied, and it is one of the most common uses for breadboards. If you aren't sure how a circuit will react under a given set of parameters, it's best to build a prototype and test it out.

For those new to electronics and circuits, breadboards are often the best place to start. That is the real beauty of breadboards--they can house both the simplest circuit as well as very complex circuits. As you'll see later in this tutorial, if your circuit outgrows its current breadboard, others can be be attached to accommodate circuits of all sizes and complexities.

Another common use of breadboards is testing out new parts, such as Integrated circuits (ICs). When you are trying to figure out how a part works and constantly rewiring things, you don't want to have to solder your connections each time.

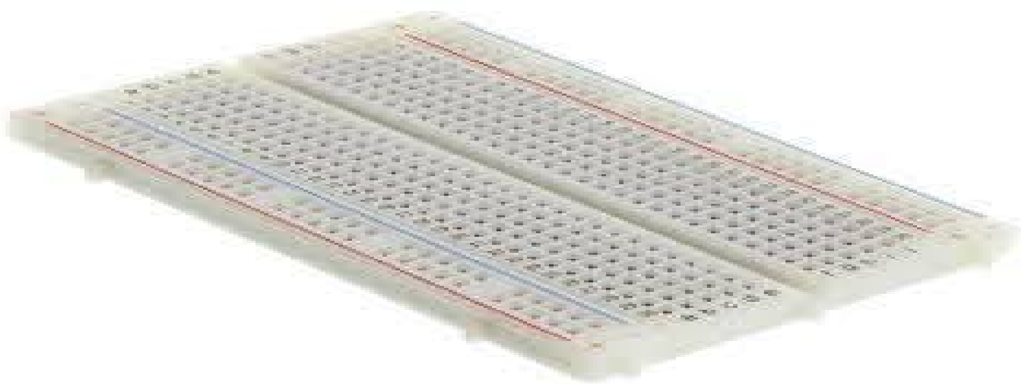


Fig. 2. 8. Breadboard

ULTRASONIC SENSORS:

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver.

Fig.2.9 Ultrasonic Sensor

WORKING PRINCIPLE OF ULTRASONIC SENSORS

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

While some sensors use a separate sound emitter and receiver, it's also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals. This type of sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium. While radar and ultrasonic sensors can be used for some of the same purposes, sound-based sensors are readily available—they can be had for just a couple dollars in some cases—and in certain situations, they may detect objects more effectively than radar.

For instance, while radar, or even light-based sensors, have a difficult time correctly processing clear plastic, ultrasonic sensors have no problem with this. In fact, they're unaffected by the color of the material they are sensing. On the other hand, if an object is made out of a material that absorbs sound or is shaped in such a way that it reflects the sound waves away from the receiver, readings will be unreliable.

The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be.

$$D=0.5*0.025*343$$

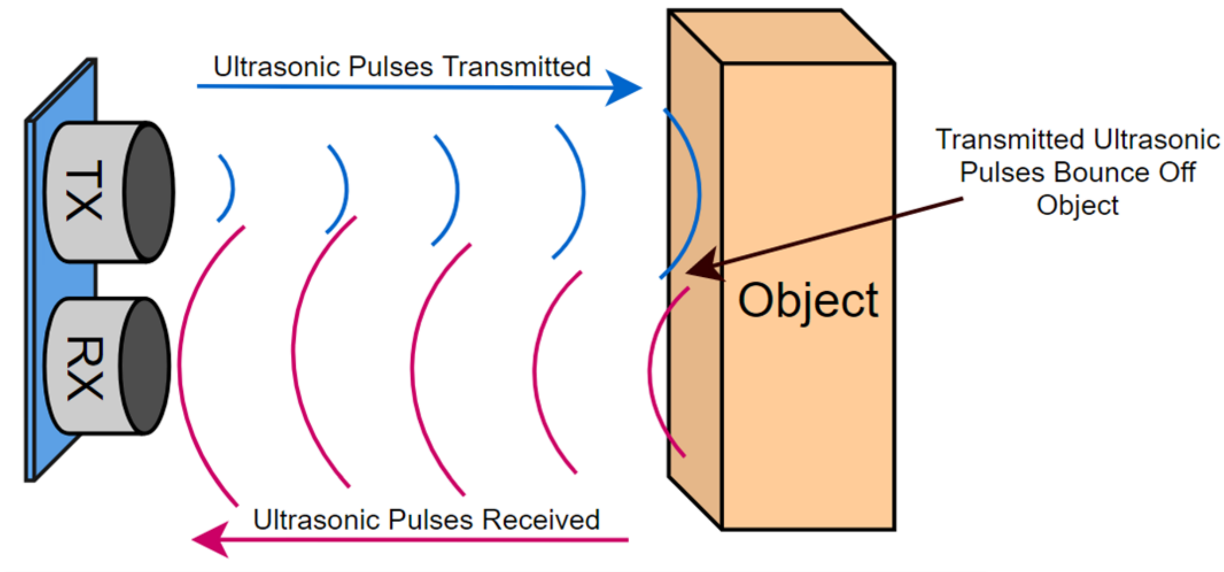


Fig. 2.10 Ultrasonic Sensor Working

FEATURES OF ULTRASONIC

- Power consumption of 20mA
- Pulse in/out communication
- Narrow acceptance angle
- Provides exact, non-contact separation estimations within 2cm to 3m
- The explosion point LED shows estimations in the advancement
- 3-pin header makes it simple to connect utilizing a servo development link

SPECIFICATIONS:

- Power supply: 5V DC
- Quiescent current: <15mA
- Effectual angle: <15°
- Ranging distance: 2cm – 350 cm
- Resolution: 0.3 cm
- Output cycle: 50ms

APPLICATIONS

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology.

JUMPERS WIRES

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

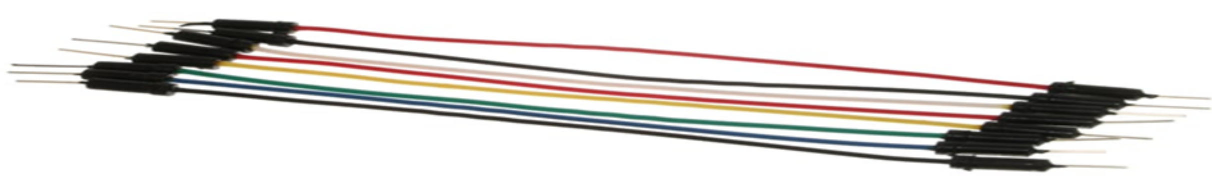


Fig.2.11 Jumper Wires

RESISTORS:

The term "resistor" refers to a device that acts as a two-terminal passive electrical component that is used to limit or regulate the flow of electric current in electrical circuits. And it also allows us to introduce a controlled amount of resistance into an electrical circuit. The most important and commonly used components in an electronic circuit are resistors.

Fig.2.12 Resistor

A resistor's main job is to reduce current flow and lower voltage in a specific section of the circuit. It's made up of copper wires that are wrapped around a ceramic rod and coated with insulating paint.

The basic idea is known to all about how electricity flows through an electronic circuit. Here, two categories can be identified which are conductors and insulators. Insulators do not allow the flow of electrons, but the conductor does. However, the resistor determines the amount of electricity that is allowed to pass through them. The total voltage passes through when it is passed through a conductor like the metal; by introducing the resistors, the amount of voltage and current can be controlled. The ease at which the electrons will allow the electricity to flow through it is known as resistance.

COMPONENTS

Hardware:

1 Arduino Mega 2560

2 HC SR04 Ultrasonic Sensor

3. Solderless Breadboard

4. Signal Light Module PCB

5. Resistors

6. Jumper Wires

SOFTWARE:

Arduino IDE

Proteus

ORGANISATION OF REPORT:

The following report on the topic "Density Baes Traffic Control System" is organised as follows:-

Chapter 1- Describes the introduction which includes background, motivation and working of the project in current scenario.

Chapter 2- Discuss the problem formulation that is working principle methodology and the model of the project along with the coding and circuit diagram.

Chapter 3- Elaborates the results and applications of the proposed project.

Chapter 4- Gives the conclusion and future scope of the project.

CHAPTER-03

PROBLEM FORMULATION

PURPOSE

Traffic congestion is a severe problem in most of the cities across the world and it has become a nightmare for the citizens. It is caused by delay in signal, inappropriate timing of traffic signaling etc. The delay of traffic light is hard coded and it does not depend on traffic. Therefore, for optimizing traffic control, there is an increasing demand in systematic quick automatic system which is a Density based traffic controller system using ARDUINO. The signal timing changes automatically on sensing the traffic density at the junction. The microcontroller used in this project is ARDUINO MEGA. The system contains ultrasonic sensors which will be mounted on the either side of the road on poles. It gets activated and receives the signal as the vehicles passes close by it. In this system, we will use ultrasonic sensors to measure the traffic density. We have to arrange one ultrasonic sensor for each road; these sensors always sense the traffic on that particular road. All these sensors are interfaced to the microcontroller. Based on these sensors, controller detects the traffic and controls the traffic system.

INTRODUCTION

Traffic administration has the goal to constantly improve traffic system and regulation. As the number of vehicle users constantly increases and resources provided by current infrastructures are limited, intelligent control of traffic will become a point of focus in the future.

Avoiding traffic jams is beneficial to both environment and economy. In our research we focus and optimization of traffic light controller in a city using ULTRASONIC sensor and developed using Arduino Mega.

Density based traffic signal to reduce vehicle delays and stop. Fixed control on traffic is basically not control according to the density, but in a manner of programming which is already fixed in the system. This project proposes an intelligent system using Arduino for implementing it in the city .

FLOW CHART

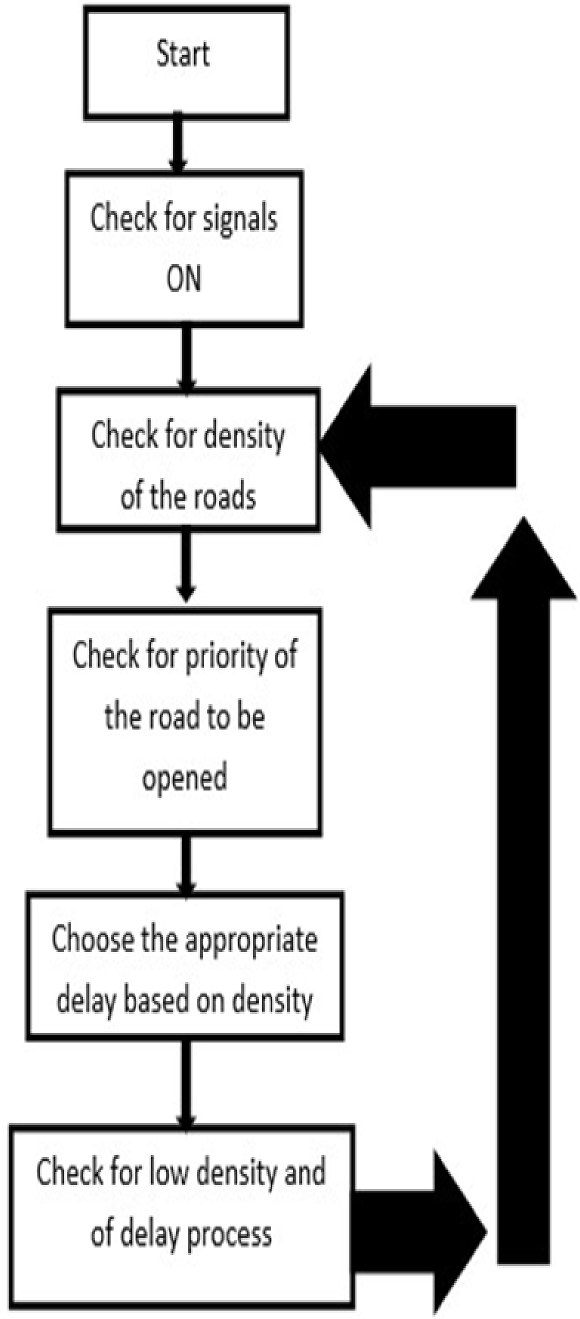

Start
Check for signals ON
Check for density of the roads
Check for priority of the road to be opened
Choose the appropriate delay based on density
Check for low density and of delay process

Fig.3.1 Flowchart

BLOCK DIAGRAM

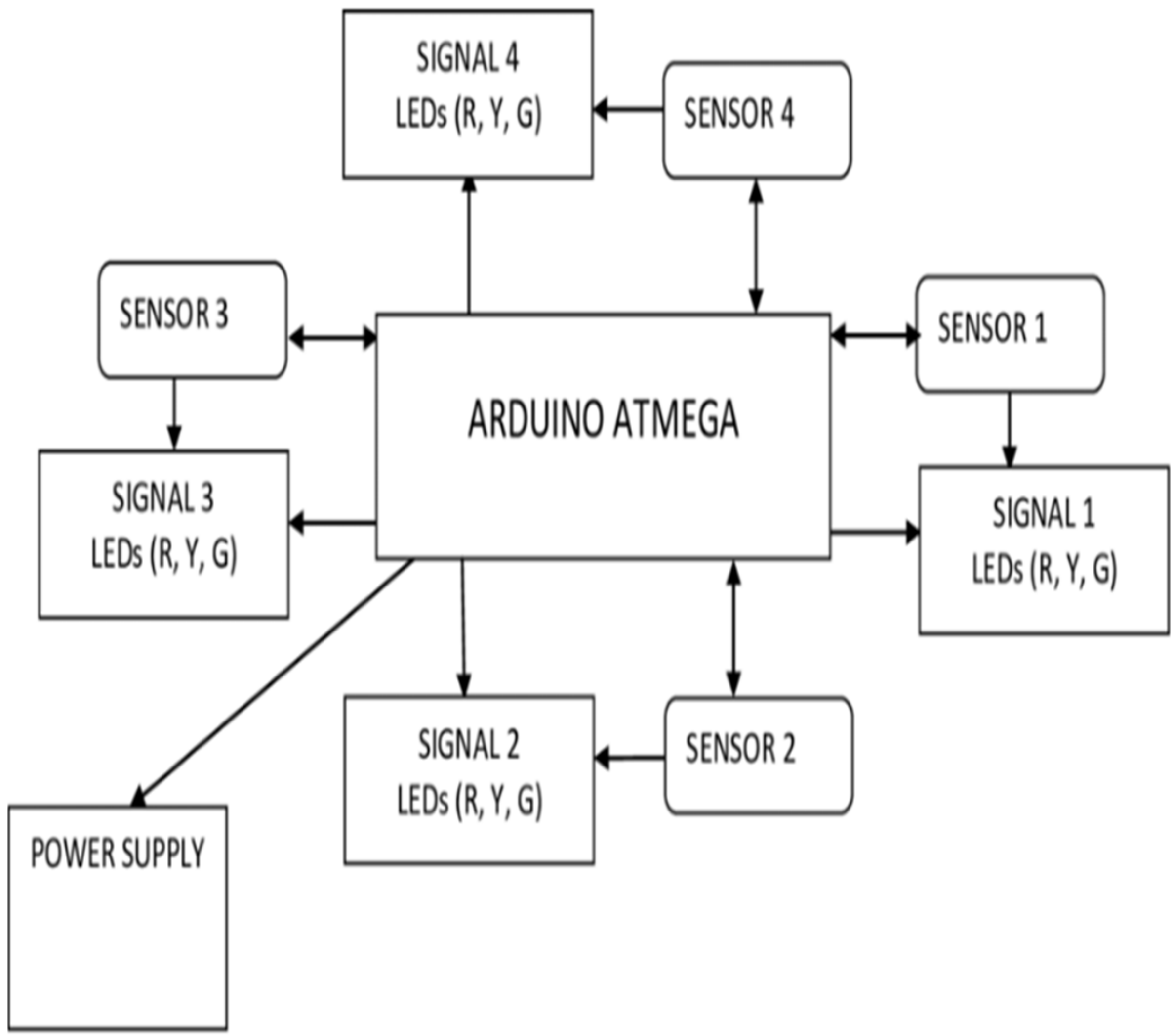


Fig.3.2 Block Diagram

CIRCUIT DIAGRAM :

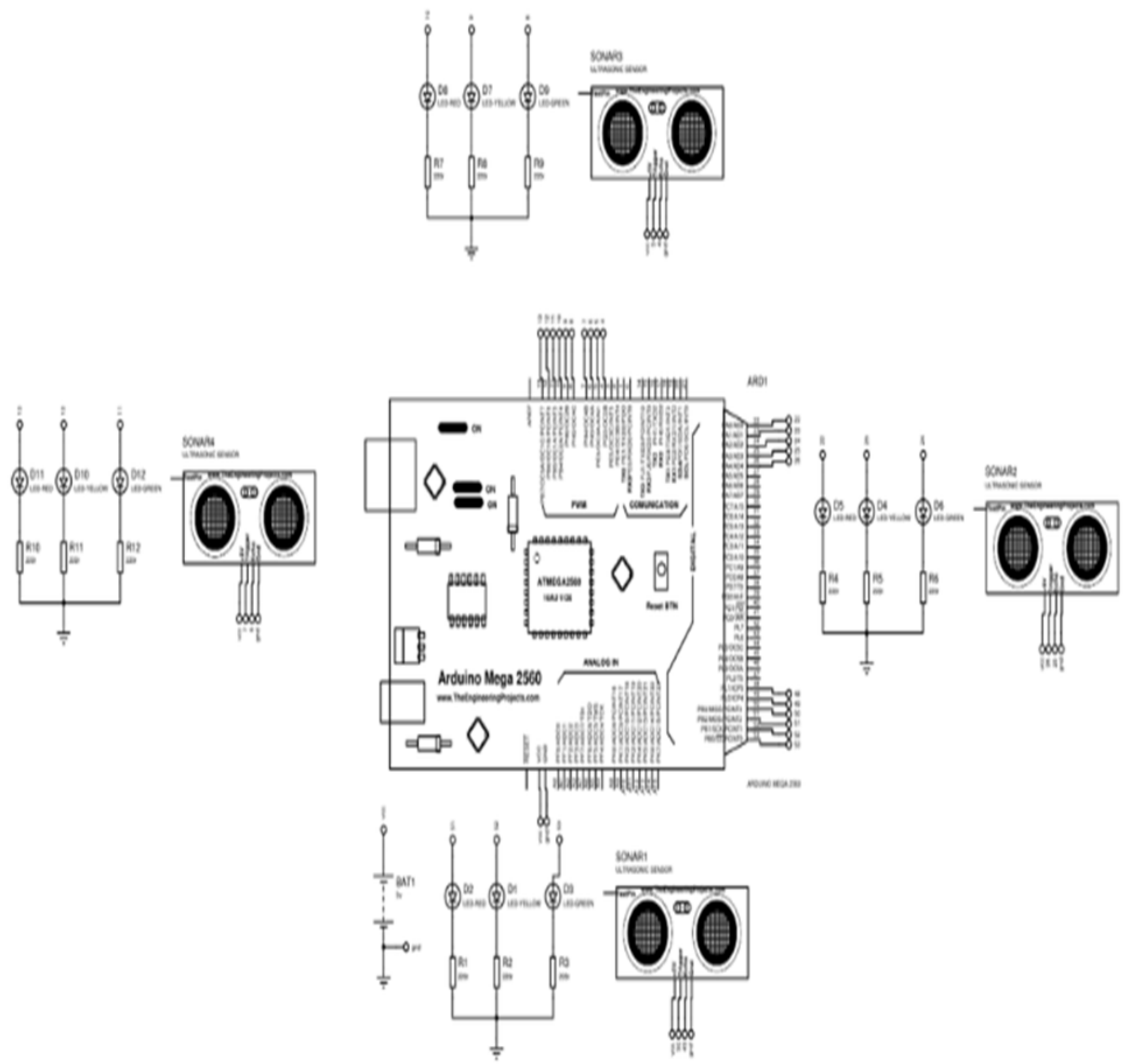


Fig. 3.3 Circuit Diagram

CODE

```
#include<TimerOne.h>

 int signal1[] = {23, 25, 27};
 int signal2[] = {29, 31, 33};
 int signal3[] = {35, 37, 39};
 int signal4[] = {41, 43, 45};

 int redDelay = 5000;
 int yellowDelay = 2000;

 volatile int triggerpin1 = 11;
 volatile int echopin1 = 10;
 volatile int triggerpin2 = 7;
 volatile int echopin2 = 6;
 volatile int triggerpin3 = 5;
 volatile int echopin3 = 4;
 volatile int triggerpin4 = 2;
 volatile int echopin4 = 3;

 volatile long time;                    // Variable for storing the time traveled
 volatile int S1, S2, S3, S4;           // Variables for storing the distance covered

 int t = 10;  // distance under which it will look for vehicles.
```

```
 void setup(){
 Serial.begin(115200);
   Timer1.initialize(100000);   //Begin using the timer. This function must be called first. "microseconds" is the period of time the timer takes.
    Timer1.attachInterrupt(softInterr); //Run a function each time the timer period finishes.

 // Declaring LED pins as output
 for(int i=0; i<3; i++){
   pinMode(signal1[i], OUTPUT);
   pinMode(signal2[i], OUTPUT);
   pinMode(signal3[i], OUTPUT);
   pinMode(signal4[i], OUTPUT);
 }

 // Declaring ultrasonic sensor pins as output
 pinMode(triggerpin1, OUTPUT);
 pinMode(echopin1, INPUT);
 pinMode(triggerpin2, OUTPUT);
 pinMode(echopin2, INPUT);
 pinMode(triggerpin3, OUTPUT);
 pinMode(echopin3, INPUT);
 pinMode(triggerpin4, OUTPUT);
 pinMode(echopin4, INPUT);
}

void loop()
{
 // If there are vehicles at signal 1
 while (S1<t)
 {


   signal1Function();
 }
 if  (S1>t)
 {
   signal01Function();
 }
```

```
  // If there are vehicles at signal 2
  while (S2<t)
  {
   signal2Function();
  }
  if  (S2>t)
  {
   signal02Function();
  }
  // If there are vehicles at signal 3
  while (S3<t)
  {
   signal3Function();
  }
   if  (S3>t)
  {
   signal03Function();
  }
  // If there are vehicles at signal 4
  while (S4<t)
  {
   signal4Function();
  }
  // If there are NO BUSY vehicles at signalS
 if  (S4>t)
  {
   signal04Function();
  }
}

 // This is interrupt function and it will run each time the timer period finishes. The
timer period is set at 100 milli seconds.
 void softInterr()
 {
  // Reading from first ultrasonic sensor
  digitalWrite(triggerpin1, LOW);
  delayMicroseconds(2);
  digitalWrite(triggerpin1, HIGH);
  delayMicroseconds(10);
```

```
digitalWrite(triggerpin1, LOW);
time = pulseIn(echopin1, HIGH);
S1= time*0.034/2;

// Reading from second ultrasonic sensor
digitalWrite(triggerpin2, LOW);
delayMicroseconds(2);
digitalWrite(triggerpin2, HIGH);
delayMicroseconds(10);
digitalWrite(triggerpin2, LOW);
time = pulseIn(echopin2, HIGH);
S2= time*0.034/2;

// Reading from third ultrasonic sensor
digitalWrite(triggerpin3, LOW);
delayMicroseconds(2);
digitalWrite(triggerpin3, HIGH);
delayMicroseconds(10);
digitalWrite(triggerpin3, LOW);
time = pulseIn(echopin3, HIGH);
S3= time*0.034/2;

// Reading from fourth ultrasonic sensor
digitalWrite(triggerpin4, LOW);
delayMicroseconds(2);
digitalWrite(triggerpin4, HIGH);
delayMicroseconds(10);
digitalWrite(triggerpin4, LOW);
time = pulseIn(echopin4, HIGH);
S4= time*0.034/2;

// Print distance values on serial monitor for debugging
Serial.print("S1: ");
Serial.print(S1);
Serial.print("  S2: ");
Serial.print(S2);
Serial.print("  S3: ");
Serial.print(S3);
Serial.print("  S4: ");
```

```
  Serial.println(S4);
}

void signal1Function()
{
  Serial.println("1");
  low();
  // Make RED LED LOW and make Green HIGH for 5 seconds
  digitalWrite(signal1[0], LOW);
  digitalWrite(signal1[2], HIGH);
  delay(redDelay);

  // if there are vehicels at other signals
  if(S2<t || S3<t || S4<t)
  {
    // Make Green LED LOW and make yellow LED HIGH for 2 seconds
    digitalWrite(signal1[2], LOW);
    digitalWrite(signal1[1], HIGH);
    delay(yellowDelay);
  }
}

void signal2Function()
{
  Serial.println("2");
  low();
  digitalWrite(signal2[0], LOW);
  digitalWrite(signal2[2], HIGH);
  delay(redDelay);

  if(S1<t || S3<t || S4<t)
  {
    digitalWrite(signal2[2], LOW);
    digitalWrite(signal2[1], HIGH);
    delay(yellowDelay);
  }
}

void signal3Function()
```

```
{
 Serial.println("3");
 low();
 digitalWrite(signal3[0], LOW);
 digitalWrite(signal3[2], HIGH);
 delay(redDelay);

 if(S1<t || S2<t || S4<t)
 {
  digitalWrite(signal3[2], LOW);
  digitalWrite(signal3[1], HIGH);
  delay(yellowDelay);
 }
}

void signal4Function()
{
 Serial.println("4");
 low();
 digitalWrite(signal4[0], LOW);
 digitalWrite(signal4[2], HIGH);
 delay(redDelay);

 if(S1<t || S2<t || S3<t)
 {
  digitalWrite(signal4[2], LOW);
  digitalWrite(signal4[1], HIGH);
  delay(yellowDelay);
 }

}

void signal01Function()
{
 Serial.println("01");
 low();
 digitalWrite(signal1[0], LOW);
 digitalWrite(signal1[2], HIGH);
 delay(3000);
```

```
  digitalWrite(signal1[2], LOW);
  digitalWrite(signal1[1], HIGH);
  delay(1000);
  digitalWrite(signal1[1], LOW);
  digitalWrite(signal1[0], HIGH);
 }

void signal02Function()
{
  Serial.println("02");
  low();
  digitalWrite(signal2[0], LOW);
  digitalWrite(signal2[2], HIGH);
  delay(3000);
  digitalWrite(signal2[2], LOW);
  digitalWrite(signal2[1], HIGH);
  delay(1000);
  digitalWrite(signal2[1], LOW);
  digitalWrite(signal2[0], HIGH);
}

void signal03Function()
{
  Serial.println("03");
  low();
  digitalWrite(signal3[0], LOW);
  digitalWrite(signal3[2], HIGH);
  delay(3000);
  digitalWrite(signal3[2], LOW);
  digitalWrite(signal3[1], HIGH);
  delay(1000);
  digitalWrite(signal3[1], LOW);
  digitalWrite(signal3[0], HIGH);
}

void signal04Function()
{
  Serial.println("04");
  low();
```

```
  digitalWrite(signal4[0], LOW);
  digitalWrite(signal4[2], HIGH);
  delay(3000);
  digitalWrite(signal4[2], LOW);
  digitalWrite(signal4[1], HIGH);
  delay(1000);
  digitalWrite(signal4[1], LOW);
  digitalWrite(signal4[0], HIGH);

 }

// Function to make all LED's LOW except RED one's.
void low()
{
  for(int i=1; i<3; i++)
  {
    digitalWrite(signal1[i], LOW);
    digitalWrite(signal2[i], LOW);
    digitalWrite(signal3[i], LOW);
    digitalWrite(signal4[i], LOW);
  }
  for(int i=0; i<1; i++)
  {
    digitalWrite(signal1[i], HIGH);
    digitalWrite(signal2[i], HIGH);
    digitalWrite(signal3[i], HIGH);
    digitalWrite(signal4[i], HIGH);
  }
}
```

CHAPTER 4

RESULT AND DISCUSSION

The construction of the project was done firstly on the breadboard before being transferred to the Veroboard. The LEDs which are red (5 mm), yellow (5 mm) and green (5 mm) are connected in series with resistors of 220 Ω each connected to the negative legs of the LEDs The connections of the LEDs and the resistors are created to represent traffic lights for each lane i.e. there will be four of these for each of the lanes. The Arduino is placed at the middle as the controlling system that will send the information for this operation to be effective. The legs of each of the components are then wired to the digital input and output pins of the Arduino board. The LEDs at the lanes will be connected to the pins on the board between pins 3 and 53. The legs of the IR sensors are 3 in number. The VCC leg is connected to the 5 V pin on the arduino board, the GND leg is connected to the GND pin on the board and the legs of the resistors simultaneously. The OUT leg is connected to one of the digital input and output pins corresponding to the traffic light it is to control. The power is connected using an Arduino power cord and a 9 V battery. Although the alternative power supply used is the USB cable to be able to send the codes and power to the board simultaneously. The Arduino is then programmed to enable the traffic flow on a timely basis. Also, when the sensor at lane 2 is being signalled, this will turn the traffic lights to green i.e. a GO on that lane and making the other lanes to stop for lane 2 to have the right of way. The sensor at lane 3 also detecting obstacle turns the traffic light on that lane to obstacle turns the traffic light on that lane to green for go and stops all other lanes. When two sensors are detected at the same time as shown in Figure 9 the sensor that detected the signal first will be given the right of way and it will switch to the next sensor once the first one stops detecting the signal.

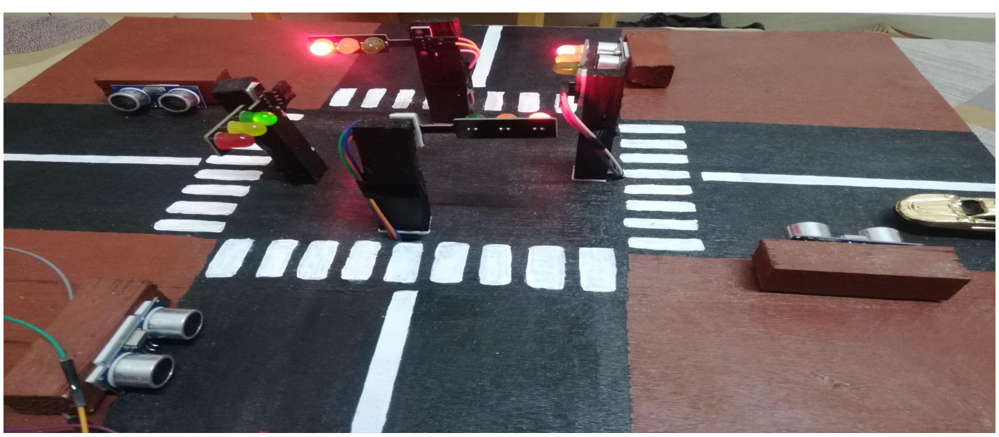


fig 4.1 Project Setup

CHAPTER 4

CONCLUSION AND FUTURE SCOPE

CONCLUSION

The density-based traffic control system has been designed, constructed and tested to ensure validation of its function and operations. In this research, we have succeeded in minimizing the traffic congestions created by the fixed time-based traffic light system. The system is effective and the cost of production is very low. Future work is recommended in order to produce the device on a large scale and deploy to all roads in order to reduce traffic congestion in places like Lagos where traffic congestion has become a big issue.

FUTURE SCOPE

Though the prototype model worked very efficiently with remarkable outputs, the real life situation is going to be way more challenging and demanding. Few of the challenges that should be taken into account are listed as follows

• Low range Ultrasonic sensors may not be an answer for long range signaling systems. We may resort to ultrasound or radar techniques for big scale set-ups.

• Next is the influence of stray signals that may alter the reading of sensory receptors and lead to conveying false information to the microcontroller.

• Periodic checking of the accuracy and precision is a must for efficacious operation of this model prototype.

Safety first: it has to be absolutely made sure that no compromise is being made on safety issues, i.e. a secondary stand-by set-up that can switch over from automated to manual mode, should be provided in case of sensor or circuit malfunctions so that vehicular crowd does not go beyond control. As part of future advancements, the traffic check post may be connected by wireless transmitters by which the crossings ahead may be an anticipation of the traffic that is approaching. This may be achieved the connecting the sensor network with GPS connectivity and short wave radio transmission signals. This will act as a feed forward system making the signalling system even more smooth and congestion free.

We will also update this system with modern technology so that when a vehicle try to move even during red signal it will turn on an alarm to warn the driver of the vehicle and will send the alert to the traffic warden with the picture.

REFERENCE

[1]Mr.Sujoy Mondal ,7 years as an Assistant Professor in RCCIIT.

[2] Intelligent Traffic Signal Control System Using Embedded System by Dinesh Rotake and Prof.SwapniliKarmore, Innovative Systems Design And Engineering, ISSN 2222-1727 (paper) ISSN 2222-2871 (online), Vol. 3, No. 5, 2012.

[3] Priority Based Traffic Lights Controller Using Wireless Sensor Networks by Shruthi K R andVinodha K, International Journal Of Electronics Signals And Systems (IJESS) ISSN: 2231-5969, Vol-1 Iss-4, 2012

[4] Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology by Koushik Mandal, Arindam Sen, Abhijnan Chakraborty and Siuli Roy, IEEE | Annual Conference on Intelligent Transportation Systems, 2011.

[5] Image Processing Based Intelligent Traffic Controller by VikramadityaDangi, AmolParab, KshitijPawar and S.S Rathod. Undergraduate Academic Research Journal (UARJ), ISSN: 2278 – 1129, Vol-1, Iss-1, 2012.

[6] B. Prashanth Kumar, B. Karthik ― Micro controller based traffic light controller, Department of Electrical Engg.

[7] International Journal of Innovative Research in Science, Engineering and Technology Volume 3, Issue 3, March 2014 Density Based Traffic Signal System by K.Vidhya, A.BazilaBanu.

[8] Shilpa S. Chavan, Dr. R. S. Deshpande & J. G. Rana (2009) "Design of Intelligent Traffic Light Controller Using Embedded System" Second International Conference on Emerging Trends in Engineering and Technology.

[9] Intelligent Cross Road Traffic Mangaement System(ICRTMS) by Ahmed S Salama, Bahaa K Saleh and Mohamad M Eassa submitted at the 2nd International Conference on Computer Technology and Development(ICCTD 2010) in the year 2010.

[10] Intelligent Traffic Light and Density Control using IR Sensors and Microcontroller by First A MsPromilaSinhmar published in the International Journal of Advanced Technology and Engineering Research (IJATER).