TEAM-F

Members

Akshat Soni: 20CH10005
Arnepalli Jahnavi: 20EC10013
Mudita Srivatsa: 20CE30018
Vasav: 20NA10043

ARDUINO TRAFFIC LIGHT CONTROLLER

MOTIVATION AND BACKGROUND

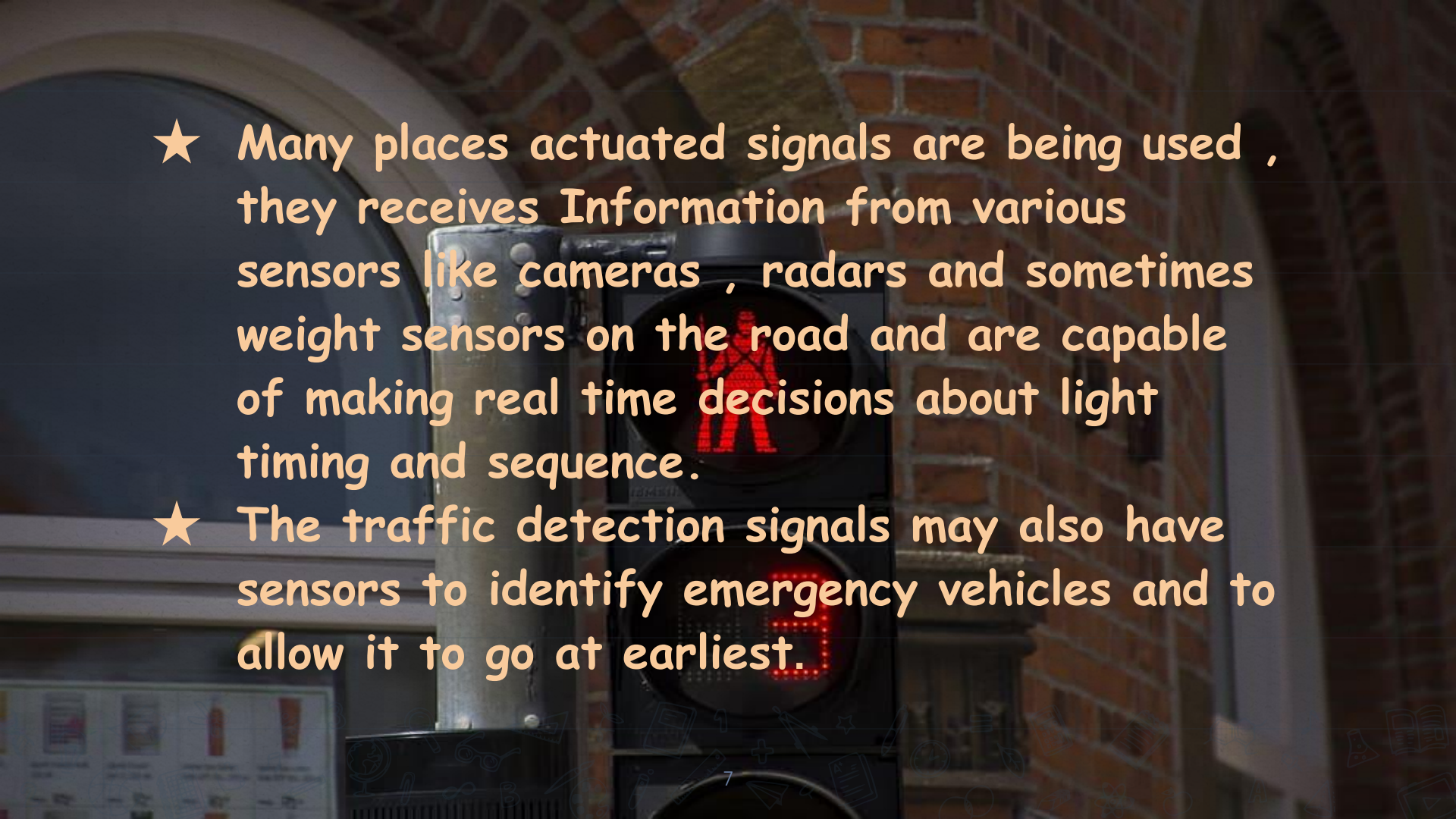
The use of personal vehicles is very common now a days and a result, the number of vehicles on the roads are exponentially increasing. Roads without any supervision or guidance can lead in to traffic congestions and accidents.Traffic Lights or Traffic Signals are signalling devices that are used to control the flow of traffic. Generally, they are positioned at junctions, intersections, 'X' roads, pedestrian crossings etc. and alternate the priority of who has to wait and who has to go.The traffic lights will provide instructions to the users (drivers and pedestrians) by displaying lights of standard color. The three colors used in traffic lights are Red, Yellow and Green.

The system must be used to control the traffic lights for smooth and safe movement of traffic. These control systems consists of electro mechanical controllers with clockwork mechanisms or modern solid state computerised systems with easy setup and maintenance.In this project, an Arduino based Traffic Light Controller system is designed. It is a simple implementation of traffic lights system but can be extended to a real time system with programmable timings, pedestrian lighting etc.

Traffic congestion continues to grow significantly throughout the world. Agencies tasked with managing traffic control systems are frequently challenged with moving traffic in congested conditions and situations where the traffic demand exceeds the capacity of the system.The majority of agencies involved in the operation maintenance of traffic signal systems are stretched thin and challenged to provide adequate service to drivers in their jurisdictions. So we have tried to design a four way traffic light small scale module using Arduino to overcome the excess traffics on cross-roads.

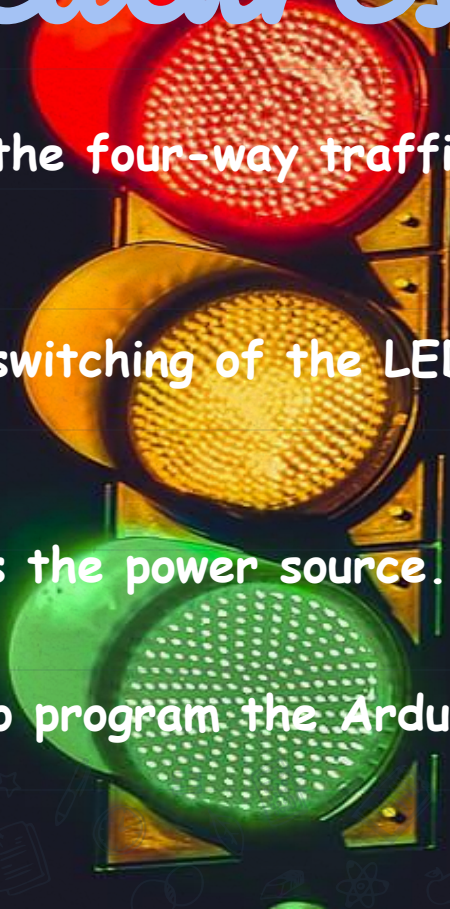
Currently Available Technology In Traffic Light System

- ★ Traditionally, incandescent and halogen bulbs were used but they were replaced by LEDs which served as advantage due to Power efficiency but now for safety concerns heating device on lens has to be developed.
- ★ Many remote traffic lights operates on timer.



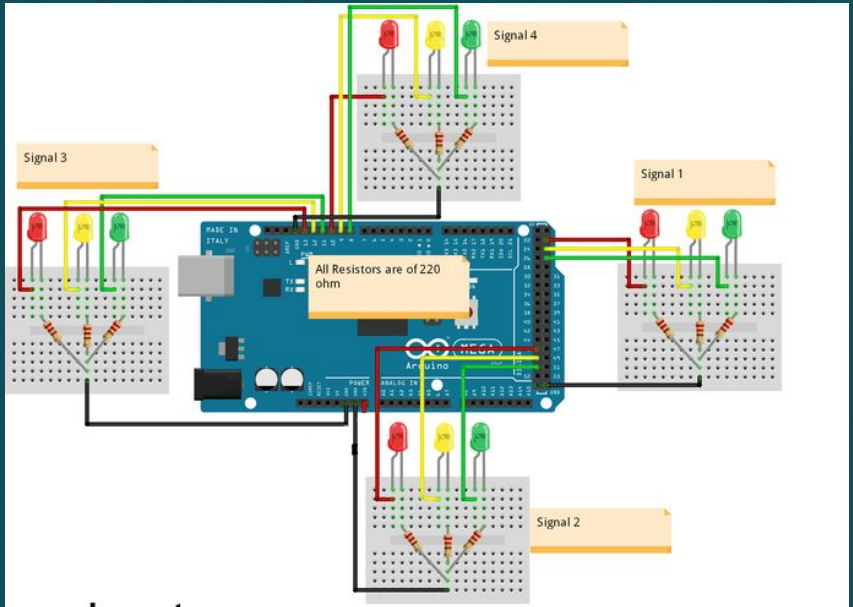
- ★ Many places actuated signals are being used , they receives Information from various sensors like cameras , radars and sometimes weight sensors on the road and are capable of making real time decisions about light timing and sequence.
- ★ The traffic detection signals may also have sensors to identify emergency vehicles and to allow it to go at earliest.

Salient Features



- It is a simple implementation of the four-way traffic light system.
- Arduino board will handle all the switching of the LEDs and control their timings.
- It uses energy from the laptop as the power source.
- Arduino IDE software was used to program the Arduino board.

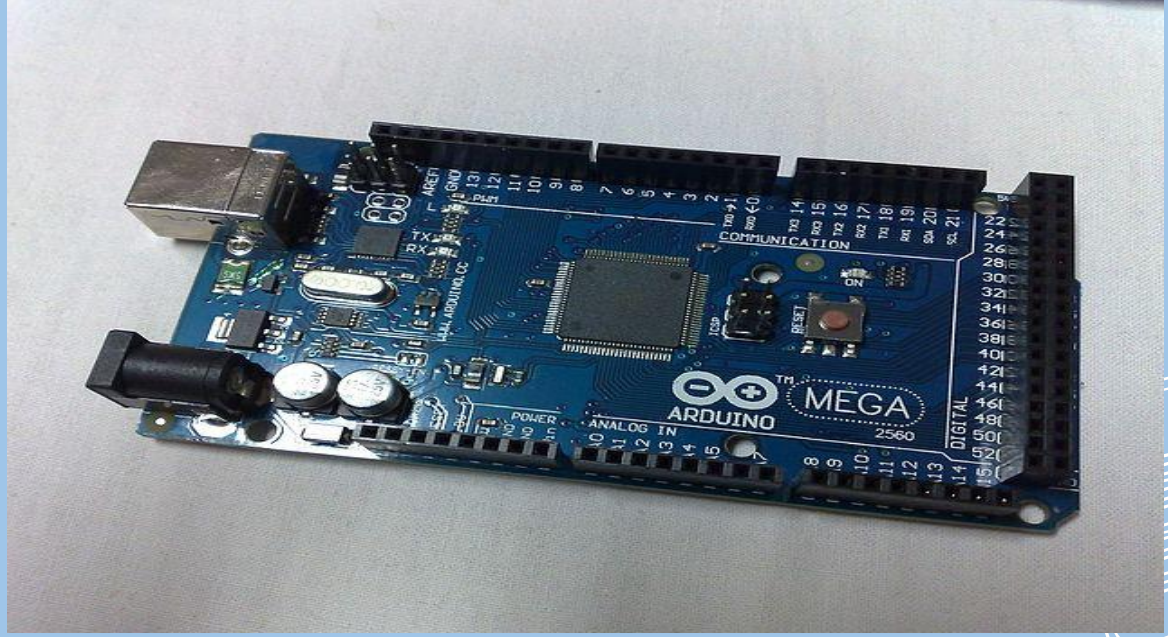
CIRCUIT DIAGRAM



Component	Price	Quantity	Total Price
Arduino Mega 2560	793.00/-	*1	793.00/-
Red LED(5mA,1.9V)	2.00/-	*4	8.00/-
Yellow LED(5mA,1.9V)	2.00/-	*4	8.00/-
Green LED(5mA,1.9V)	2.00/-	*4	8.00/-
220 ohm Resistors	0.45/-	*12	5.40/-
Jumper Cables(20cm)	2.00/-	*20	40.00/-
BreadBoard(17cm*6cm)	90.00/-	*4	360.00/-
			1222.40/-

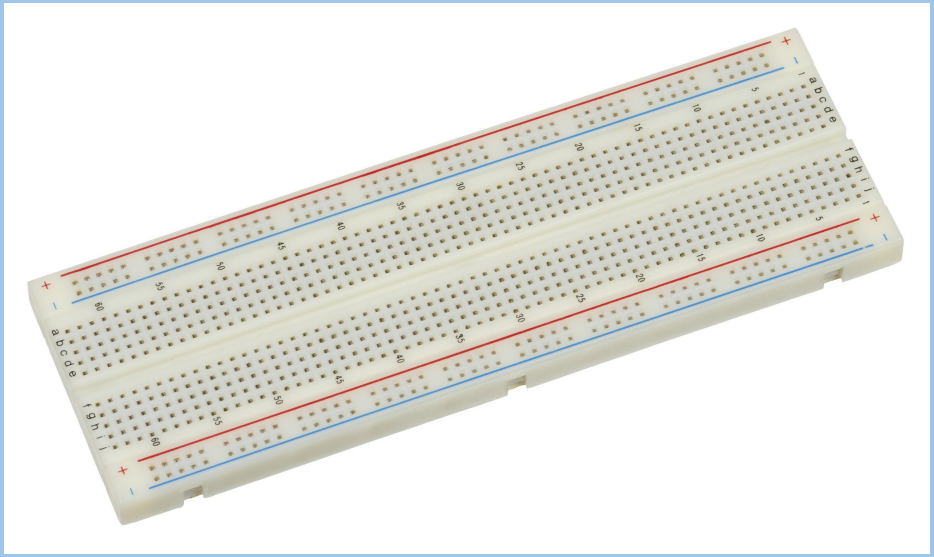
Components:-

Arduino Mega 2560



The **Arduino Mega 2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Breadboard



Breadboard is solderless device on which we make a temporary prototype device with electronic and test circuit design. Since the it is solderless device i.e., it does not require any soldering to connect the components, and this is one of the main reasons to use breadboard to make a prototype.

Jumper Cables

Jumper wire are the group of wire which are join in a form of a cable and each wire contain pin or connector at both the end. This type of wire is used to create prototype of any device because this wire does not require any type of soldering

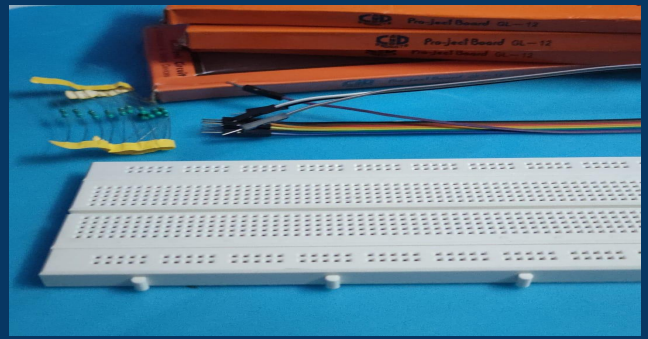
LEDs

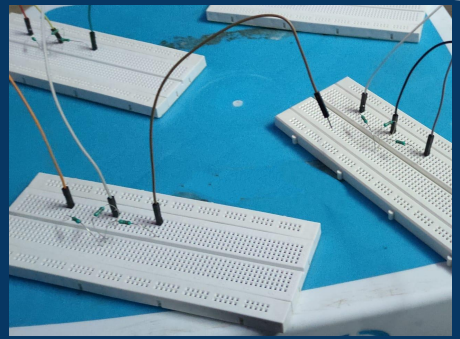
A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor.

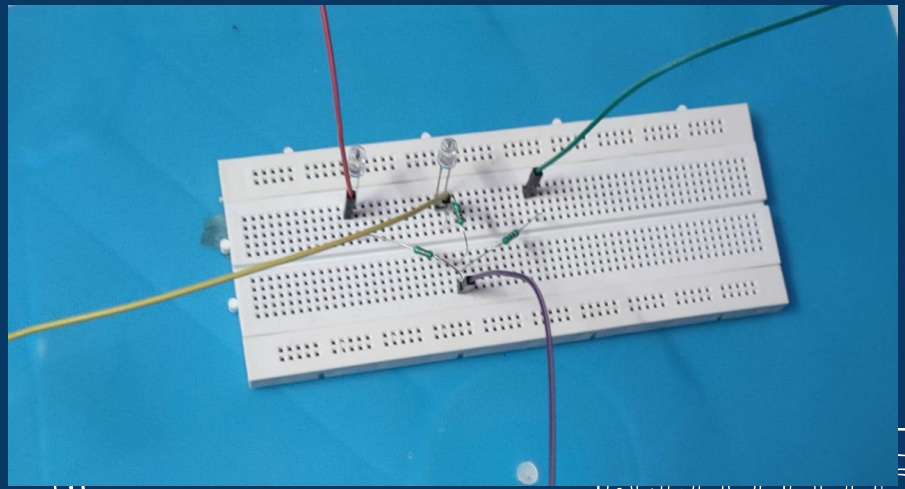
Resistor

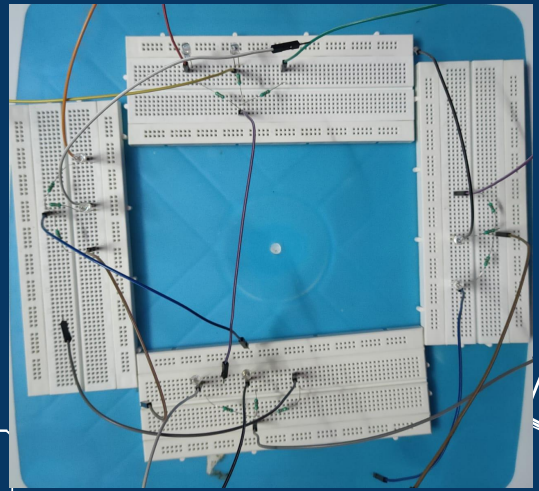
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

PROCESS OF ASSEMBLING







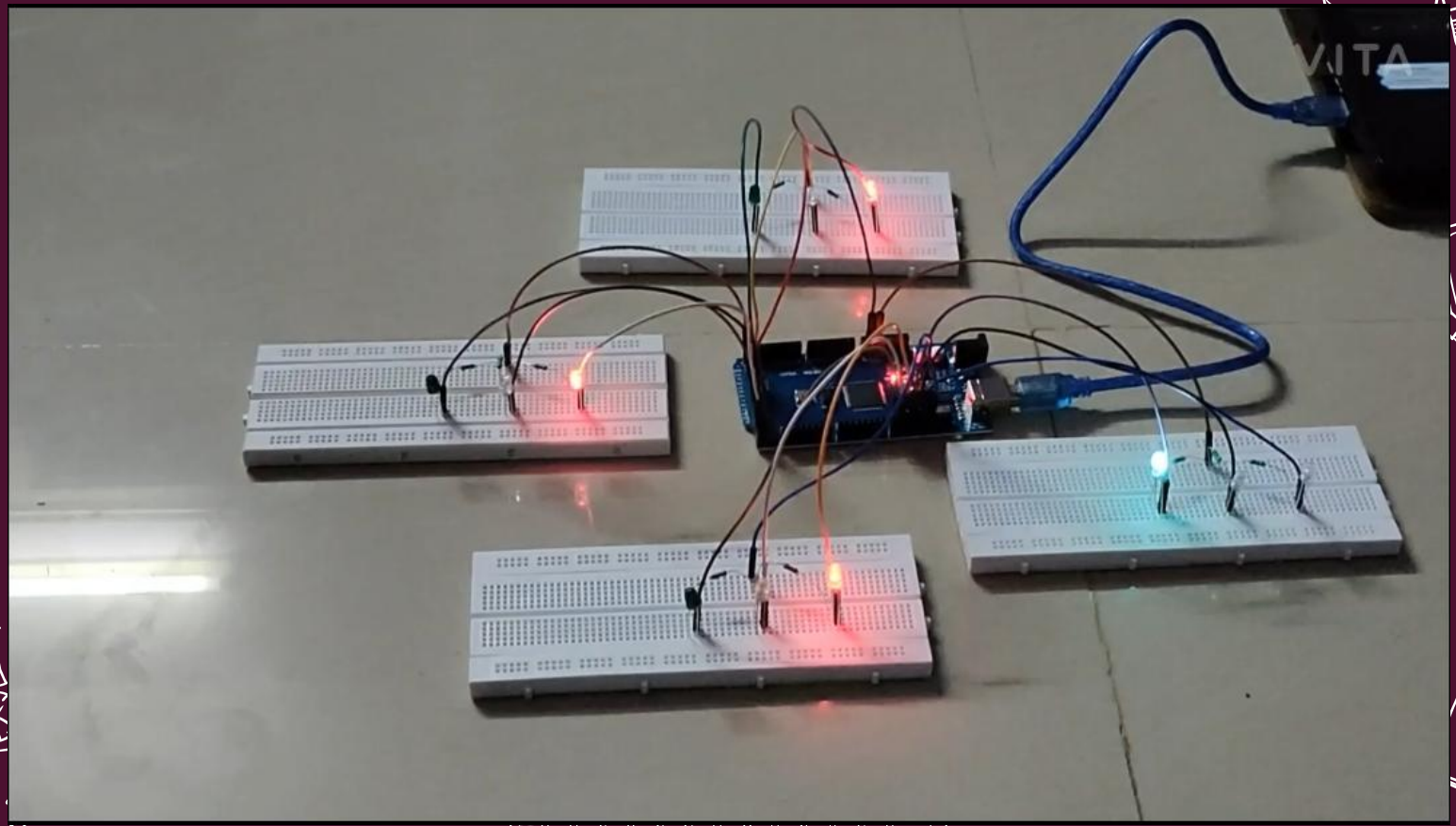


Process which we followed to complete our project

After having received all the components

1) Connection of LEDs to the breadboard were made
2) Connection of Jumper Cables with breadboard were made
3) Resistors were connected to the breadboard to limit the current passing through LEDs
4) Code was uploaded to the Arduino Mega 2560 board using the software Arduino IDE
5) Connected jumper cables to different pins of Arduino board as shown in the circuit diagram
6) Ran some sample experiments
7) Ran the final experiments and made the video explaining our project

FINAL CIRCUIT



WORKING

So at start, green light of signal 1 and red lights at other signals will light up to give time to the vehicles at signal 1 to pass.

After 5 seconds, the yellow light at signal 1 will light up to give an indication that the red light at signal 1 is about to come up and also to give an indication to the vehicles at signal 2 that the green light is about to light up.

So after 2 seconds, red light at signal 1 will come up and green light at signal 2 will come up meaning vehicles at signal 1 must stop and vehicles at signal 2 can move.
Similarly the traffic light controller will work for the signal 3, signal 4 and the system will keep looping.

There are total of 12 LEDs used in this project. Each signal has 3 LEDs (Red, Yellow and Green) connected to it through the 220 ohm resistors.

The resistors are used to limit the current that is going to pass through the LEDs. If we won't use the resistors then the LEDs may burn due to excessive current.

Software Used

Arduino IDE

It was used to upload the code to the Arduino Mega 2560 board

Code of Arduino

```
int signal1[] = {23, 25, 27};
int signal2[] = {46, 48, 50};
int signal3[] = {13, 12, 11};
int signal4[] = {10, 9, 8};

int redDelay = 5000;
int yellowDelay = 2000;

void setup() {
  // Declaring all the LED's 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);
  }
}
```

```
void loop() {
  // Making Green  LED at signal 1 and red LED's at other signal HIGH
  digitalWrite(signal1[2], HIGH);
  digitalWrite(signal1[0], LOW);
  digitalWrite(signal2[0], HIGH);
  digitalWrite(signal3[0], HIGH);
  digitalWrite(signal4[0], HIGH);
  delay(redDelay);

// Making Green LED at signal 1 LOW and making yellow LED at signal 1 HIGH for 2 seconds
  digitalWrite(signal1[1], HIGH);
  digitalWrite(signal1[2], LOW);
  delay(yellowDelay);
  digitalWrite(signal1[1], LOW);

  // Making Green  LED at signal 2 and red LED's at other signal HIGH
  digitalWrite(signal1[0], HIGH);
  digitalWrite(signal2[2], HIGH);
  digitalWrite(signal2[0], LOW);
  digitalWrite(signal3[0], HIGH);
  digitalWrite(signal4[0], HIGH);
  delay(redDelay);
```

```
// Making Green LED at signal 2 LOW and making yellow LED at signal 2 HIGH for 2 seconds
 digitalWrite(signal2[1], HIGH);
 digitalWrite(signal2[2], LOW);
 delay(yellowDelay);
 digitalWrite(signal2[1], LOW);


 // Making Green  LED at signal 3 and red LED's at other signal HIGH
 digitalWrite(signal1[0], HIGH);
 digitalWrite(signal2[0], HIGH);
 digitalWrite(signal3[2], HIGH);
 digitalWrite(signal3[0], LOW);
 digitalWrite(signal4[0], HIGH);
 delay(redDelay);

 // Making Green LED at signal 3 LOW and making yellow LED at signal 3 HIGH for 2 seconds
 digitalWrite(signal3[1], HIGH);
 digitalWrite(signal3[2], LOW);
 delay(yellowDelay);
 digitalWrite(signal3[1], LOW);
```

```
// Making Green  LED at signal 4 and red LED's at other signal HIGH
 digitalWrite(signal1[0], HIGH);
 digitalWrite(signal2[0], HIGH);
 digitalWrite(signal3[0], HIGH);
 digitalWrite(signal4[2], HIGH);
 digitalWrite(signal4[0], LOW);
 delay(redDelay);

 // Making Green LED at signal 4 LOW and making yellow LED at signal 4 HIGH for 2 seconds
 digitalWrite(signal4[1], HIGH);
 digitalWrite(signal4[2], LOW);
 delay(yellowDelay);
 digitalWrite(signal4[1], LOW);
}
```

What we learned while Doing the project

- Coding of an Arduino Board.
- Using Arduino IDE Interface.
- Using of Bread Board and how to make connections on it.
- Variations of output voltage from the Arduino board.

WORK DISTRIBUTION

Jahnavii Arnepalli

Ordering of components
Assembling of components
Implementing the Code on Arduino IDE
Video preparation

Akshat Soni

Modification of Code according to project specifications
Making PPT and Presentation
Research work (Finding relevant information regarding the project)

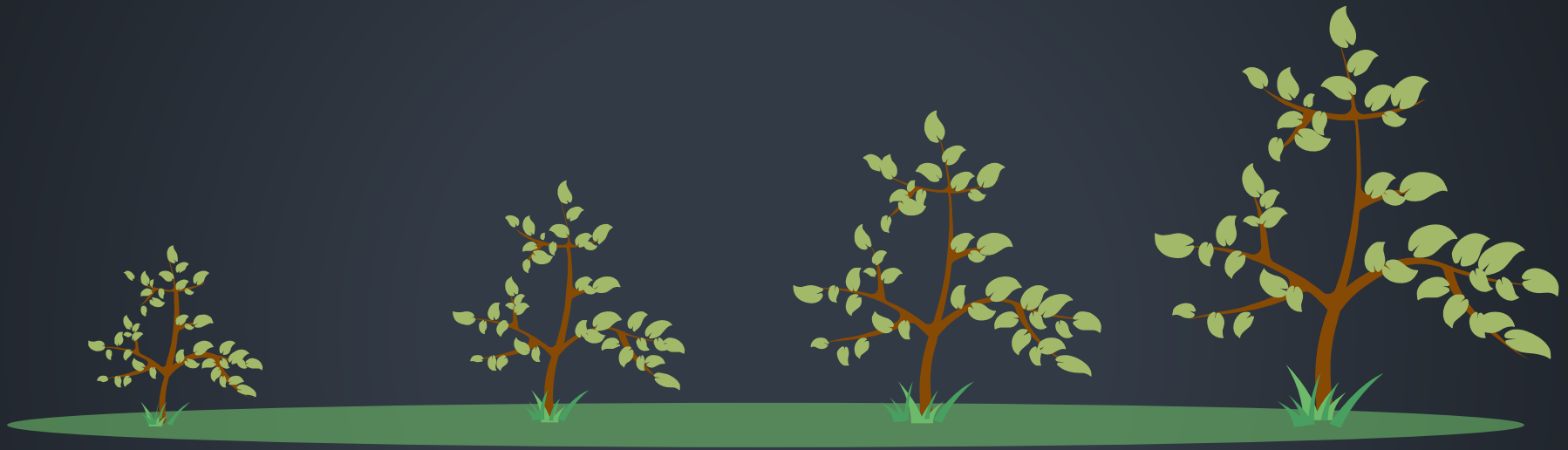
Mudita Srivatsa

Debugging of code
Making of PPT and Presentation
Research work (Finding relevant information regarding the project)

Vasav

Modification of Code according to project specifications
Making PPT and Report
Understanding the Arduino Library

WEEKLY PROGRESS REPORT



WEEK 1

Gathering information regarding the project.

WEEK 2

Searching information regarding project including components required and code for the project.

WEEK 3

Buying of components.

WEEK 4

Assembling of components.
Implementing of the code in UNO IDE interface.
Modifying and Debugging of code.
Preparation of report and video presentation.

Video Demonstration

The whole project has been explained in a video and link to that video is :
https://youtu.be/IAGHTHw9WTo

References

- https://www.electronicshub.org/arduino-traffic-light-controller/
- https://create.arduino.cc/projecthub/muhammad-aqib/how-to-build-an-arduino-traffic-light-controller-4-way-184aa1
- https://www.instructables.com/Arduino-Street-Traffic-Light/