Traffic Control by Using Arduino UNO

Project Tasks

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Traffic Control by Using Arduino UNO

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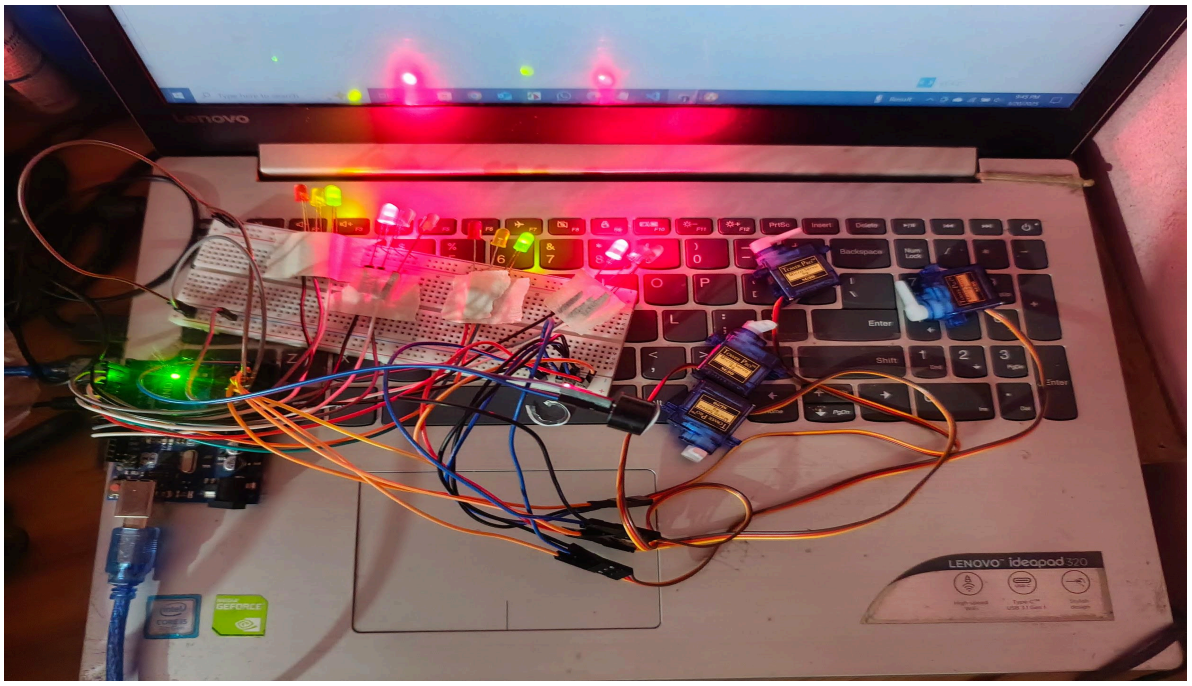
***A**bstract*— Our main goal is to develop an ultramodern and reliable traffic control by using arduino uno. Which is faced in almost every field in our daily life. For example road crossing, human, car, bus, motor-cycle, three-wheelers, etc. To develop this system, we used an Arduino UNO as the main processor, LEDs, servo motors, buzzers, resistors, jumper wires, a 9V battery, and other components.

Methodology

<u>Equipments</u>:

- Arduino UNO
- BreadBoard
- Buzzer
- Servo Motor
- LEDs (Red, Yellow, Green)
- Resistors
- Jumper Wires
- 9V Battery

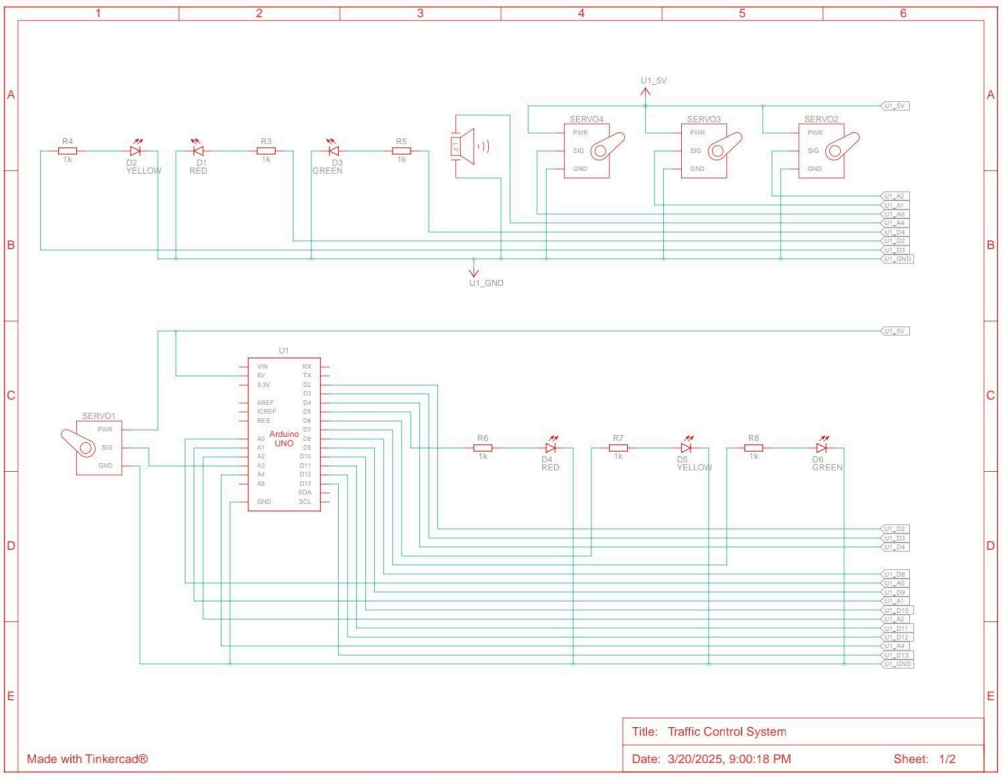
*To enhance the project's quality, we can modify the materials as needed. The selection of materials will depend on the tasks that can be completed within the project's limited timeframe.



Use Case Diagram: A use case diagram, a type of Unified Modeling Language (UML) diagram, visually represents the interactions between users (actors) and a system, outlining the different ways a user can interact with and achieve goals within the system.

Fig. Traffic Control System

<u>Circuit Diagram</u>: To develop this system, we used an Arduino UNO as the main processor, LEDs, servo motors, buzzers, resistors, jumper wires, a 9V battery, and other components.



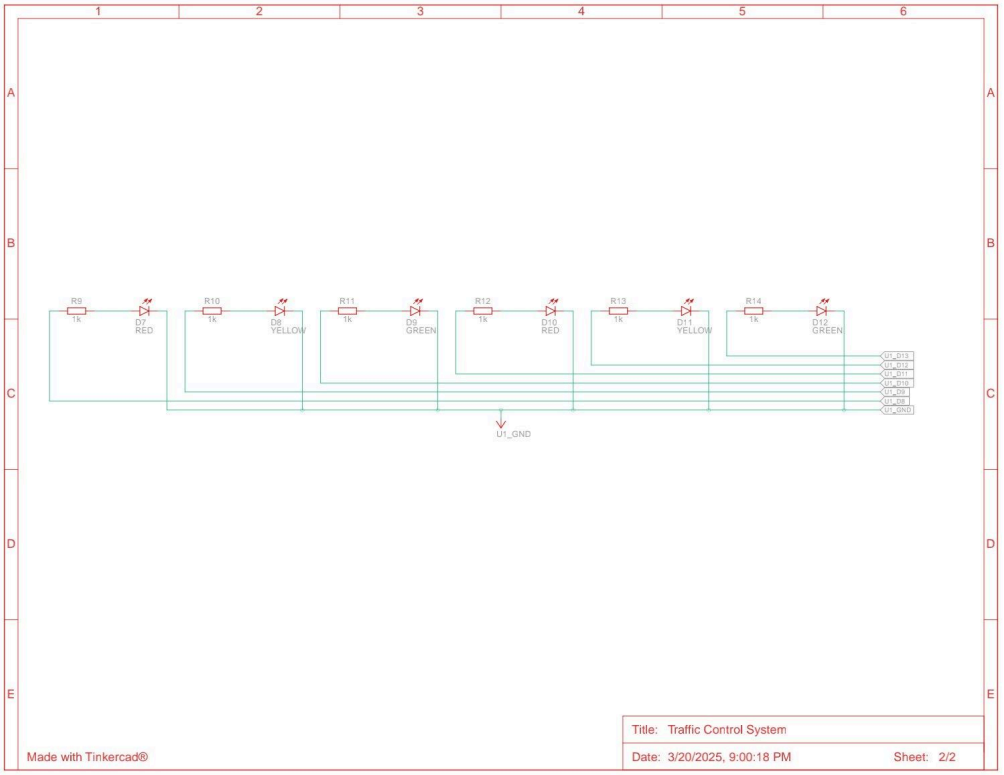


Fig. Circuit Diagram

Connection Diagram: A connection diagram, also known as a wiring diagram, is a visual representation that shows how electrical components are connected, including their relative positions and the connections between them, often using standardized symbols and lines.

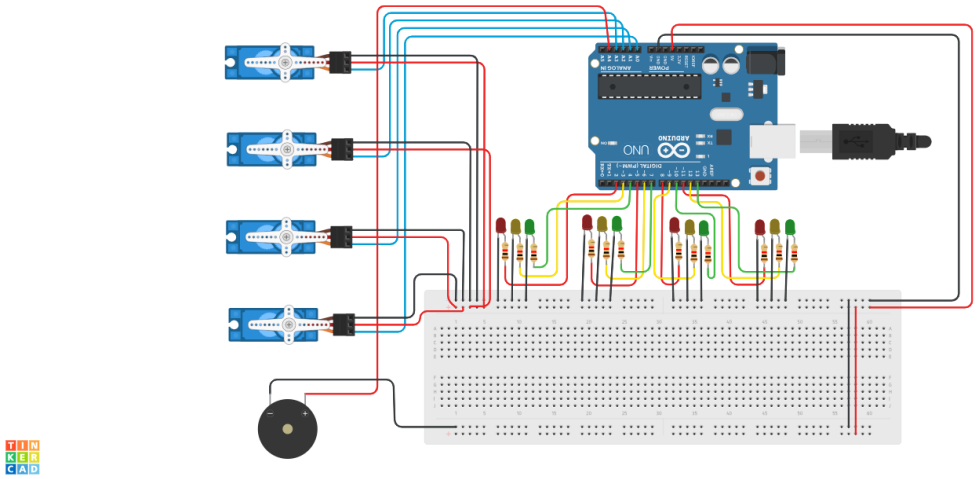


Fig. Connection Diagram

Arduino UNO Code:

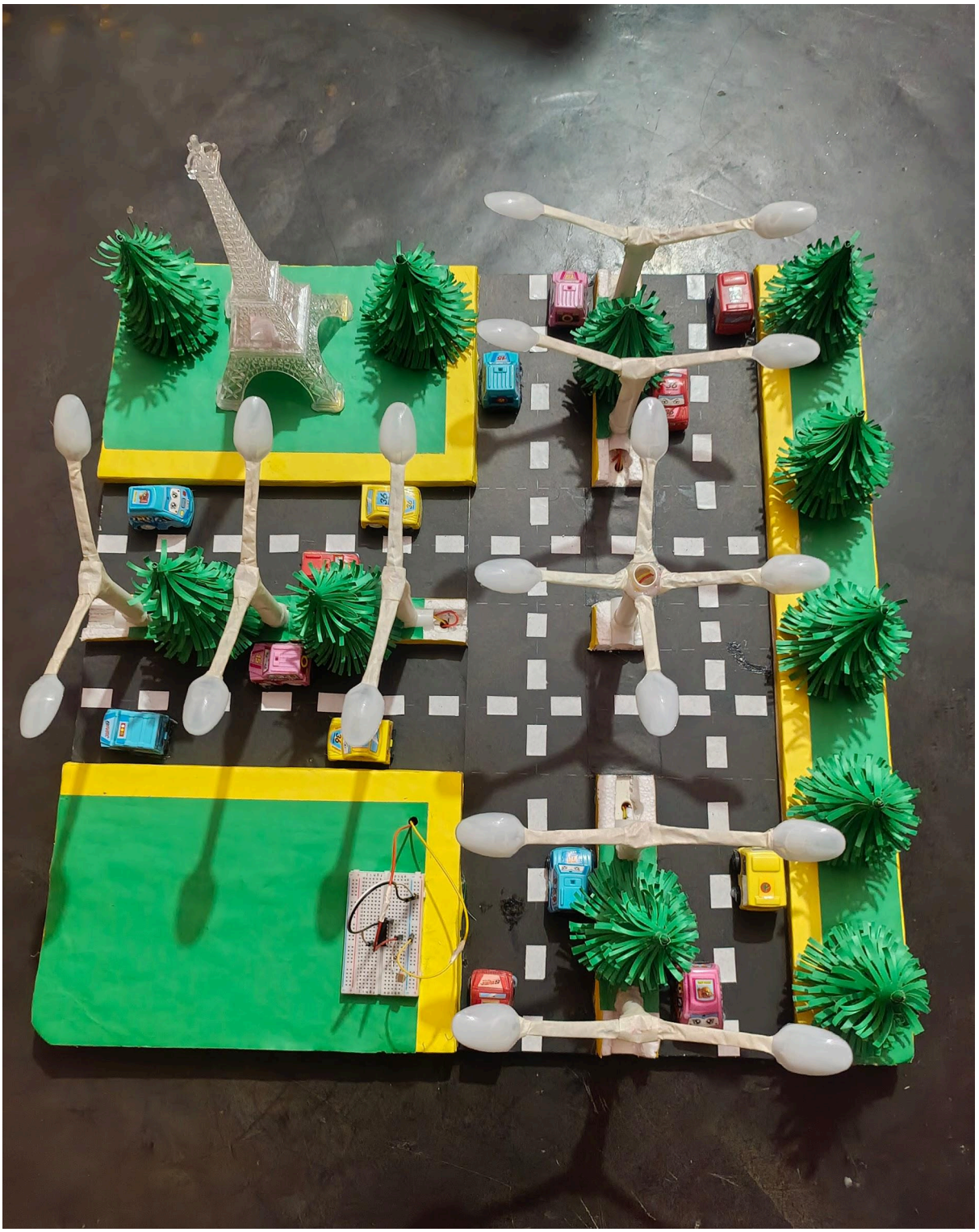
```
#include <Servo.h>

// Create servo objects for 4 lanes
Servo servo1, servo2, servo3, servo4;

// Define servo motor pins (separate from LED pins)
int servoPins[4] = {A0, A1, A2, A3}; // Using Analog pins for servos (A0-A3)

// Define LED pins (4 lanes × 3 LEDs each)
int ledPins[4][3] = {
  {2, 3, 4},   // Lane 1: Red, Yellow, Green
  {5, 6, 7},   // Lane 2: Red, Yellow, Green
  {8, 9, 10},  // Lane 3: Red, Yellow, Green
  {11, 12, 13} // Lane 4: Red, Yellow, Green
};

// Define Buzzer pin
const int buzzer = A4;

void setup() {
  // Set LED pins as outputs
```

```
  for (int i = 0; i < 4; i++) {
    for (int j = 0; j < 3; j++) {
      pinMode(ledPins[i][j], OUTPUT);
    }
  }

  // Attach servos
  servo1.attach(servoPins[0]);
  servo2.attach(servoPins[1]);
  servo3.attach(servoPins[2]);
  servo4.attach(servoPins[3]);

  // Set all servos to initial closed position
  servo1.write(0);
  servo2.write(0);
  servo3.write(0);
  servo4.write(0);

  // Set Buzzer as output
  pinMode(buzzer, OUTPUT);
}

void loop() {
  // **Step 1 & 3: Lane 1 & Lane 3 Green (Lane 2 & Lane 4 Red)**
  controlTraffic(0, 2, 90); // Lane 1: Green, Servo Open
  controlTraffic(2, 2, 90); // Lane 3: Green, Servo Open
  controlTraffic(1, 0, 0);  // Lane 2: Red, Servo Closed
  controlTraffic(3, 0, 0);  // Lane 4: Red, Servo Closed
  buzzerSignal(2000, 3);    // Short "Go" beeps for Green
  delay(5000);              // Green light duration

  // **Step 2 & 4: Lane 1 & 3 Yellow -> Red, Lane 2 & 4 Green**
  controlTraffic(0, 1, 0);  // Lane 1: Yellow
  controlTraffic(2, 1, 0);  // Lane 3: Yellow
  buzzerSignal(1500, 1);    // Short warning beep for Yellow
  delay(2000);              // Yellow delay

  controlTraffic(0, 0, 0);  // Lane 1: Red
  controlTraffic(2, 0, 0);  // Lane 3: Red
  controlTraffic(1, 2, 90); // Lane 2: Green, Servo Open
  controlTraffic(3, 2, 90); // Lane 4: Green, Servo Open
  buzzerSignal(2000, 3);    // Short "Go" beeps for Green
  delay(5000);              // Green light duration
```

```
  // **Repeat the cycle**
  controlTraffic(1, 1, 0);  // Lane 2: Yellow
  controlTraffic(3, 1, 0);  // Lane 4: Yellow
  buzzerSignal(1500, 1);    // Short warning beep for Yellow
  delay(2000);

  controlTraffic(1, 0, 0);  // Lane 2: Red
  controlTraffic(3, 0, 0);  // Lane 4: Red
  buzzerSignal(1000, 1);    // Long beep for Red
}

// Function to control traffic lights and servos
void controlTraffic(int lane, int signal, int servoAngle) {
  // Turn OFF all LEDs for the lane
  for (int i = 0; i < 3; i++) {
    digitalWrite(ledPins[lane][i], LOW);
  }
  // Turn ON selected LED
  digitalWrite(ledPins[lane][signal], HIGH);

  // Move servo to correct position
  switch (lane) {
    case 0: servo1.write(servoAngle); break;
    case 1: servo2.write(servoAngle); break;
    case 2: servo3.write(servoAngle); break;
    case 3: servo4.write(servoAngle); break;
  }
}

// Function to signal using the buzzer
void buzzerSignal(int frequency, int count) {
  for (int i = 0; i < count; i++) {
    tone(buzzer, frequency);
    delay(300);
    noTone(buzzer);
    delay(300);
  }
}
```

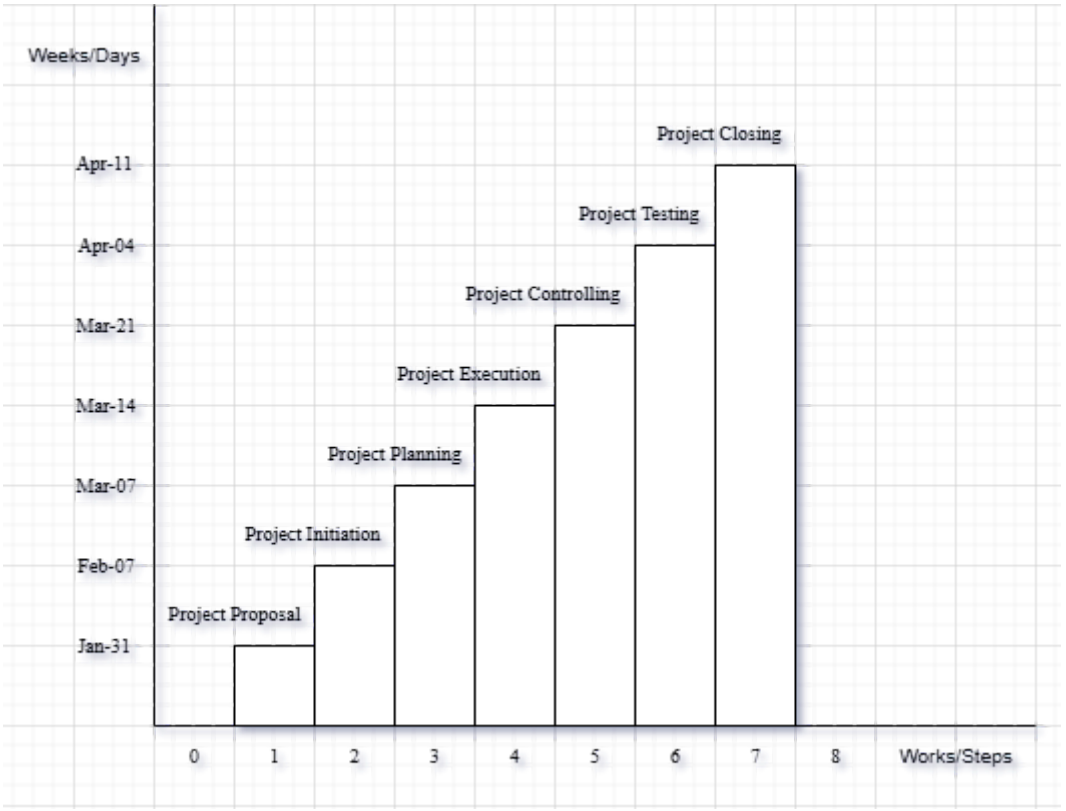
Project Controlling: Project controlling, a crucial element of project management, involves monitoring and managing a project's progress to ensure it stays on track, achieves goals, and stays within budget and timeline, by comparing actual performance against planned objectives and taking corrective actions when necessary.

*When light mode,



*When night mode,

Milestones



References

We mentioned all the literature or web references, etc here-

- Internet web page & resources: ResearchGate, Gemini, etc.
- TinkerCad circuit simulation software:

https://www.tinkercad.com/things/a0ubEAdp67Q-traffic-control-system?sharecode=xx0k-L8L7O1WeQGpxyaN1SCgtBETq1BPRXW4US2GfGc

End!