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RFID BASED TRAFFIC CONTROL SYSTEM FOR EMERGENCY VEHICLE

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ABSTRACT
In developing nations like India, the development of the population and the number of cars has increased traffic congestion and the number of traffic accidents. However, by identifying crowded locations and enhancing traffic flow, a smart traffic control system that makes use of RFID sensors has the ability to alleviate these problems. By giving emergency vehicles precedence, this approach also makes it possible for them to get to their destination quickly. Drivers can also gain from the real-time data offered by RFID sensors, which can help decrease idling and save time. This data can be used to recommend other routes to drivers so they can avoid crowded regions and cut down on the amount of time they spend stuck in traffic. In addition to enhancing traffic flow, this also aids in lowering fuel consumption and emissions, creating a cleaner and greener environment. To manage the growing traffic flow and lower traffic accidents, emerging nations like India can use a smart traffic control system using RFID sensors. Overall, an RFID-based smart traffic control system has the potential to significantly improve the environment, the economics, and the welfare of road users in emerging countries like India.
Keywords— Traffic congestion, Traffic density estimation, Traffic management, Traffic Control, RFID, Radio Frequency, Emergency.

1. Introduction

Traffic lights have been a ubiquitous sight in cities all around the world since their creation in 1912. But as the number of cars on the road rises, many nations today have serious traffic issues that have a detrimental influence on transportation and produce congestion. Despite the building of new highways, flyovers, and the renovation of existing infrastructure, traffic issues continue to be challenging for a variety of reasons. First of all, there are peaks in traffic flow throughout the morning and afternoon commutes, and weekends are often less congested. Additionally, present traffic signal systems have predetermined transition times that do not adapt to the actual flow of traffic, which results in ineffective traffic management. Thirdly, traffic flow at nearby intersections might be impacted by the condition of a single traffic signal at an intersection. Additionally, the conventional traffic system does not take into consideration breakdowns, road construction, or accidents, all of which can increase traffic bottlenecks. Along with pedestrians crossing roadways, emergency vehicles like ambulances, fire brigades, police, and VIP cars all struggle to manoeuvre through traffic.

A tag and a reader are the two halves of a wireless device called Radio-Frequency Identification (RFID). Depending on the application, RFID system complexity varies. Access control applications, where access control data is kept in a back-end database, are where RFID is most frequently used. Hard-coded (pre-timed) or adaptive traffic signals are used. While adaptive signals can react to the presence of cars or pedestrians at a crossing, hard-coded control has intervals that are fixed and repeat for a predetermined cycle time. Detectors inside the intersection provide information on current operations and demands to change one or more aspects of the signal timing cycle by cycle. Vehicle-

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actuated signals require detection by a vehicle on one or more approaches to change the signal timing for traffic movements. In the end, the use of RFID systems and vehicle-actuated signals may enhance traffic flow, ease congestion, and facilitate the more effective navigation of emergency vehicles

An RFID reader and tag are required for the technology to work. A reader gathers a tag's data when it reaches its read range and transfers it to a host computer or programmable logic controller for storage. To activate the tag and read and write data to it, the reader sends radio frequency signals. Depending on its power output and the radio frequency employed, the reader can generate radio waves that can travel from 1 inch to 100 feet. The activation signal from the reader is recognized by an RFID tag when it enters the electromagnetic field. The information is sent to the host computer for processing once the reader decodes the data held in the integrated circuit of the tag. Radio Frequency Identification tags were initially created as a potential barcode replacement in supply chains. Microchip, Antenna, Case, and Battery (for active tags only) are all parts of RFID transponders (tags). In terms of power or energy, we distinguish between three categories of RFID tags: passive, semi-passive, and active.

2. Objective

The major goal is to create an RFID-based traffic controller that can recognize emergency vehicles like ambulances and alter traffic signals accordingly, allowing them to pass through crossings without being hindered. RFID tags, readers, a central control system, and connection with current traffic management and emergency response procedures are all necessary for this system.

3. Components

- Arduino UNO
- RFID reader
- Antenna
- Transponders (RFID Tags)
- Resistors
- Cables and connectors
- LED

3.1.Arduino UNO

A popular microcontroller board for electronics projects, especially among beginners, is the Arduino UNO, which features an ATmega328P CPU. It contains USB ports for programming and power as well as digital and analogue pins for connecting with different components. The board is adaptable, with applications ranging from straightforward LED programs to sophisticated robotics, and a sizable community and resources are accessible.

3.2.RFID reader

RFID readers transmit radio waves and receive signals from RFID tags using one or more antennas. These tags convey their identification and other details to nearby readers using radio waves. RFID tags come in passive and active varieties. RFID passive tags are powered by the reader rather than a battery.

3.3.Tansponders

Active and passive RFID tags are available. Active tags are perfect for asset tracking and logistics because they have their own power source and can read data at distances of over 100 metres. The maximum range of passive tags, which rely solely on the electromagnetic radiation of readers and have no power supply, is 25 metres.

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3.4.Antannas

By transmitting and receiving radio frequency signals that allow communication with RFID tags, RFID antennas are essential to the operation of RFID readers. The RFID antenna(s) are built into the same construction as the device in handheld RFID devices and some all-in-one devices

4..LED Driver circuit

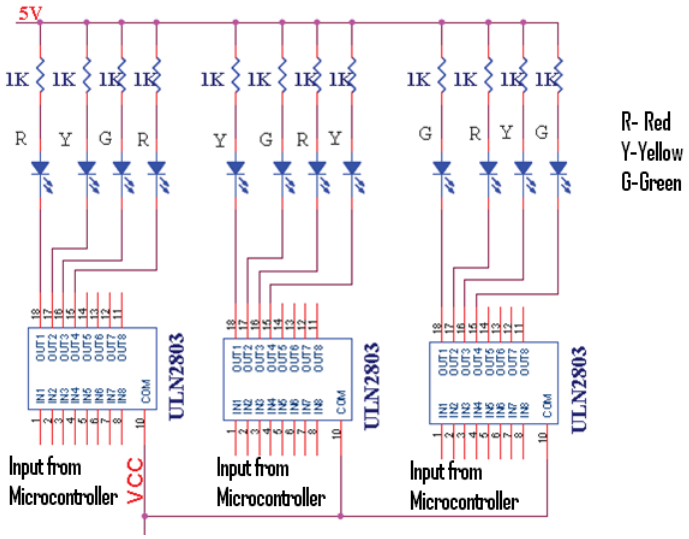

Fig 1.LED Driver circuit

4.1 LCD Driver

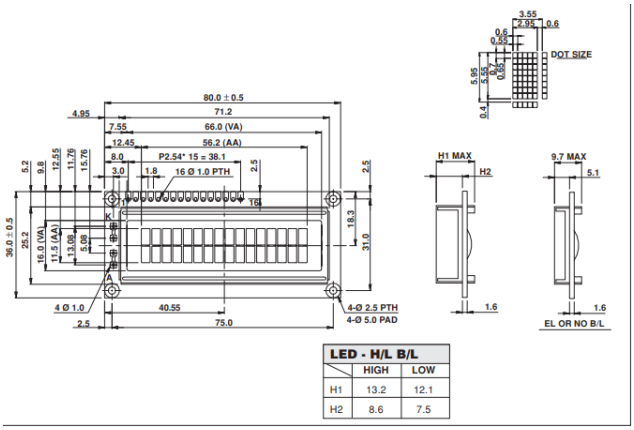

Fig 2.LCD Driver

5.Coding

```
#include <Wire.h>
#include <LCD_I2C.h>
LCD_I2C lcd(0x27);
#include <EveryTimer.h>
#define PERIOD_MS 1000
```

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```
EveryTimer timer;

//signal 1
const int s1g=A2;
const int s1y=A1;
const int s1r=A0;

//signal 2
const int s2g=3;
const int s2y=2;
const int s2r=A3;

//signal 3
const int s3g=6;
const int s3y=5;
const int s3r=4;

//signal 4
const int s4g=9;
const int s4y=8;
const int s4r=7;
int sec;
int count = 0 ;
char input[12];

char readert[]= "4D008B4FA029";
void setup() {
  // put your setup code here, to run once:
timer.Every(PERIOD_MS, action);
 Serial.begin(9600);
 Serial.println("hi");

   //signal 1
   pinMode(s1r,OUTPUT);
   pinMode(s1y,OUTPUT);
   pinMode(s1g,OUTPUT);

   //signal 2
   pinMode(s2r,OUTPUT);
   pinMode(s2y,OUTPUT);
   pinMode(s2g,OUTPUT);

   //signal 3
   pinMode(s3r,OUTPUT);
   pinMode(s3y,OUTPUT);
   pinMode(s3g,OUTPUT);

   //signal 4
   pinMode(s4r,OUTPUT);
   pinMode(s4y,OUTPUT);
   pinMode(s4g,OUTPUT);
```

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```
   digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
    digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
    digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
    digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);
  Wire.begin(); // gpio 2 and gpio 0 which are D4, and D3
  lcd.begin();               //Init the LCD
 lcd.backlight();           //Activate backlight
 lcd.home();

 lcd.setCursor(0,0);

 lcd.print("SMART TRAFFIC");

 lcd.setCursor(0,1);

 lcd.print("   SIGNAL    ");

 delay(2000);
 lcd.clear();
}

void loop() {
 // put your main code here, to run repeatedly:
  reader();
  timer.Update();
  if(strncmp(input,readert,12) == 0)
  {

    digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
    digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
    digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
    digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);

digitalWrite(s1g,HIGH);digitalWrite(s2y,HIGH);digitalWrite(s3r,HIGH);digitalWrite(s4r,HIGH);
      lcd.setCursor(0,0);
    lcd.print("   SIGNAL 1   ");
    lcd.setCursor(0,1);
    lcd.print("    OPENED     ");
    delay(3000);
    input[1]='a';
  }

 else if((sec >=0 && sec <=4))
  {
    digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
    digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
    digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
    digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);
```

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```
digitalWrite(s1g,HIGH);digitalWrite(s2y,HIGH);digitalWrite(s3r,HIGH);digitalWrite(s4r,HIGH);
        lcd.setCursor(0,0);
     lcd.print("   SIGNAL 1   ");
     lcd.setCursor(0,1);
     lcd.print("    OPENED     ");
     }
    else if((sec >=5 && sec <=10))
    {
    digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
     digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
     digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
     digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);

digitalWrite(s2g,HIGH);digitalWrite(s3y,HIGH);digitalWrite(s4r,HIGH);digitalWrite(s1r,HIGH);
            lcd.setCursor(0,0);
     lcd.print("   SIGNAL 2   ");
     lcd.setCursor(0,1);
     lcd.print("    OPENED     ");
    }
     else if((sec >=11 && sec <=15))
    {

    digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
     digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
     digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
     digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);
  digitalWrite(s3g,HIGH);digitalWrite(s4y,HIGH);digitalWrite(s2r,HIGH);digitalWrite(s1r,HIGH);
         lcd.setCursor(0,0);
     lcd.print("   SIGNAL 3   ");
     lcd.setCursor(0,1);
     lcd.print("    OPENED     ");
  }
     else if((sec >=16 && sec <=20))
    {
   digitalWrite(s1r,LOW);digitalWrite(s1y,LOW);digitalWrite(s1g,LOW);
     digitalWrite(s2r,LOW);digitalWrite(s2y,LOW);digitalWrite(s2g,LOW);
     digitalWrite(s3r,LOW);digitalWrite(s3y,LOW);digitalWrite(s3g,LOW);
     digitalWrite(s4r,LOW);digitalWrite(s4y,LOW);digitalWrite(s4g,LOW);


digitalWrite(s4g,HIGH);digitalWrite(s3r,HIGH);digitalWrite(s2r,HIGH);digitalWrite(s1y,HIGH);
            lcd.setCursor(0,0);
     lcd.print("   SIGNAL 4   ");
     lcd.setCursor(0,1);
     lcd.print("    OPENED     ");
    }
    else
    {
      sec=0;
    }
```

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```
    delay(1000);
}
void action()
{
  sec++;
}
//RFId READer.....................................
 void reader()
  {

    if(Serial.available())
   {
      count = 0;
      while(Serial.available() && count < 12)          // Read 12 characters and store them in input array
      {
        input[count] = Serial.read();
        count++;
        delay(5);
      }
      Serial.print(input);                        // Print RFID tag number

   }
  }
```

6.Result and discussion

According to the prototype's results, when a tag is shown underneath an RFID reader, the reader interprets this as a high density and extends the period that a particular lane has a green signal. When a tag is read by a different reader while the signal is red, it is considered a rule violation and turns the specific lane green.

7.Conclusion

Ambulances and other emergency vehicles can greatly benefit from an RFID-based traffic control system. The system may prioritize the ambulance's movement and give it a direct route to its destination using RFID technology, which shortens response times and enhances patient outcomes. The device can also warn other cars to move over and aid in reducing traffic congestion, allowing the ambulance to get at its destination promptly and safely. For regulating urban traffic and transit, particularly in emergency scenarios requiring ambulances, an RFID-based traffic management system provides an efficient and effective option

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