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Traffic Light Monitoring System using IOT

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***Abstract* – To improve the traffic light configuration, this paper proposed monitoring system to be as an additional component to the intelligent traffic light system. This will be able to determine the location of the emergency vehicle and provide the smooth way at the crossroad where the traffic light is placed. On the wide roads a reserve path will be provide for the emergency vehicle so that they can reach their destination as soon as possible. If there is no emergency vehicle on the road that path can be used by normal vehicles. On the traffic light an emergency light added which will indicates the traffic whether there is an ambulance or any rescue wagon is on the road or not. If there is an emergency vehicle on road, the traffic will not use that reserve path. Where roads are narrow there the traffic will be controlled through the traffic light by the controller.**

***Keywords* – ultrasonic sensor, Arduino, Webapplication, Mobile application.**

I. INTRODUCTION

Traffic crowding on urban road networks has become increasingly problematic. As We know that the number of road user continuously increases while resources provided by current infrastructures are confined, control of traffic will become a very important issue. In urban areas, the roads are of two lanes and the traffic is mainly regulated by traffic light. In traffic, there may be an emergency vehicles which may have to wait for turning the red into green signal this may contribute to the unnecessary long waiting times.

For example an ambulance is in traffic they have to reach the hospital sooner as the patient condition is critical. They reached the cross road, vehicles have to wait till traffic light turns green which may contribute the long waiting time. In emergency condition, each and every seconds are very important to saving a patient's life.

This project will solve the above problem, it will provide the smooth route to the so that emergency vehicle can reach their destination as soon as possible. A reserved path will be made on the wide roads for the ambulance or any other rescue wagon and if there is no emergency then that reserved path can be normally used by other traffic vehicles. Where the roads are narrow and no possibility of reserved route so the traffic will be controlled through the traffic light by the controller.

In this project technology being used is IOT & other components like- Arduino Mega, GSM+GPS Etc. Ardunio will fetch the data and access GSM and GPS. GPS will calculate the geographical position of an emergency vehicle. GSM will send the data to the network with the help of Ardunio.

that accumulate data on traffic, and use that data to sync lights to peak traffic times. This improves cities overall efficiency and saves the money since everything can be remotely managed. Smart homes, thermostats, lighting systems and coffee maker will all collect data on habits and patterns of usage.

1. Technology Used

1.1 Internet of Things (IoT)

Internet of Things is a system of interconnected computing devices, digital and mechanical machines, animals or people.object that are provided with unique identifiers.[12] It has the ability to transfer data over a network without requiring human-to- human or human-to-computer interaction. It enhances the data collection, deeper automation and database operations. IoT devices are becoming a part of mainstream electronics and people are adopting smart devices into their homes. These devices are getting smarter everyday through machine learning and artificial intelligence. The new data that IoT devices collect, the smarter they become. Cities are getting transform into smart cities through the use of IoT devices.Smart traffic lights

Fig .1 IoT.

2. Components Used

2.1 Arduino Mega (2560)- Arduino is an open source electronic platform, it is easy to use as hardware and software. It works on a set of instruction given to the microcontroller on the board. Ardunio programming language is used for the instruction and the Ardunio Software (IDE). Arduino Mega (2560) has a ATmega2560 microcontroller. It has 54 digital input/output pins, 16 analog inputs,16 MHz crystal oscillator,4UARTs, USB connector, a power jack, an ICSP header & reset button.

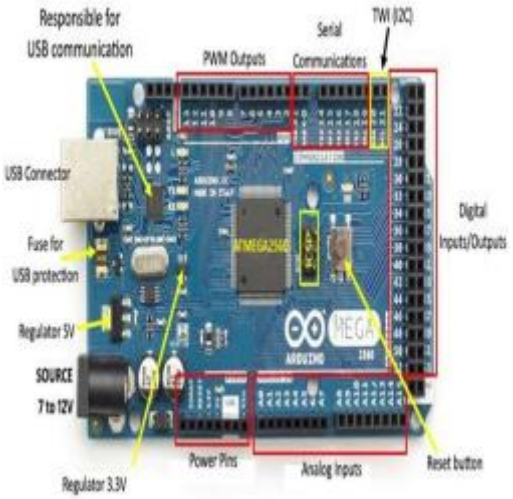

Fig. 2. Arduino Mega (2560).

Power it with an AC to DC adapter or battery to get started. Ardunio mega will fetch the data and access GSM and GPS .GPS will calculate the geographical position of an emergency vehicle. GSM will send the data to the network with the help of Ardunio.

Specification
5V Operating Voltage
5V Input Voltage
6-20V Input Voltage(limit)
54 Digital I/O Pins (of which 15 pins provide PWM output)
16 Analog Input Pins
20mA DC current per Input/Output Pin
50mA DC Current provide for 3.3V Pin
256KB Flash Memory of which 8KB used by boot loader
8KM SRAM
4KB EEPROM
16MHz Clock Speed
At pin 13 LED BUILTIN
101.52 mm Length
53.3mm Width

2.2 GSM (SIM 900A)- GSM (Global System of Mobile communication) is a digital network that is widely used by mobiles phones users. GSM use a transformation of time division multiple access in short it is called as TDMA and is the most widely used of the three digital wireless telephony technologies: TDMA, GSM and code division multiple access in short it is called as CDMA.

Fig . 2.GSM (SIM 900A)

Specification

900/1800 MHz Dual-Band
GPRS multi-slot 10/8 GPRS mobiles station class B
Compliant to GSM phase 2/2+
24*24*3mm Dimesion
3.4g Weight
Operate via AT commands (GSM 07.07,07.5 and SIMCOM enhanced AT Commands)
Supply Voltage range : 5V
1.5mA Low power consumption (sleep mode)
40C to +85C Operation temperature
5V Supply voltage range

2.3 GPS Receiver- A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position Using suitable software, the device may display the position on a map, and it may offer directions. The GPS receiver mode is based on SIMCOM's SIM28ML GPS module. SIM28M is a GPS receiver. With the help of built in LNA,

Fig. 3.GPS Receiver.

SIM28M can relax antenna necessities and don't need any exterior LNA. SIM28M can simply track as low as 165dBm signal even without network assistance. SIM28M has excellent low power consumption characteristics . SIM28M supply various location and navigation application as follows:

Autonomous GPS
QZSS
SBAS ranging (WASS, EGNOS, GAGAN, MSAS)
DGAS
A-GPS

II. WORKING

When an emergency vehicle gets stuck in traffic, the driver of the emergency will activate the emergency device. Due to which Arduino Mega gets activated and fetch the location with the help of GPS oom of traffic light system will identify the location with the help of their system and start working on the clearance of route. If the emergency vehicle will be coming on the wide road the control room will turn ON the emergency light, the traffic will start working on providing a clear reserve path. So that the emergency vehicle not stuck in the traffic. Where the roads are narrow and no possibility of reserved route so the traffic will be controlled through the traffic light by the controller. In this way traffic free route will be provided to an emergency vehicle and help them to reach their destination as quick as possible.

PROGRAMES

Program of GSM

```
#include <TinyGPS.h> #include <SoftwareSerial.h> SoftwareSerial Gsm(7, 8);
char phone_no[] = "+917906629258"; //replace with phone no. to get sms
TinyGPS gps; //Creates a new instance of the TinyGPS object void setup()
{
```

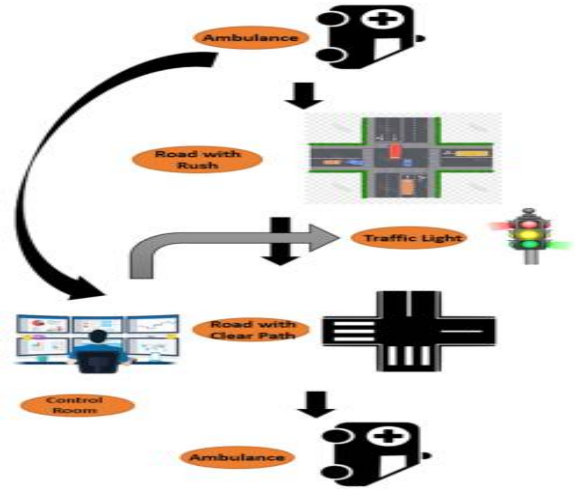

Fig.4. Working Diagram.

receiver. As the data collect form the receiver further Arduino Mega will send it to control room of the traffic light system with the help of GSM. Then the control

```
Serial.begin(9600); Gsm.begin(9600);
}
void loop()
{
bool newData = false;

unsigned long chars;
unsigned short sentences, failed;
// For one second we parse GPS data and report some key values
for (unsigned long start = millis(); millis() - start < 1000;)
{
while (Serial.available())
{
char c = Serial.read(); Serial.print(c);
if (gps.encode(c)) newData = true;
}
Gsm.print(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
//Gsm.print(" Longitude = "); Serial.print(",");
Gsm.print(flon== TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);
delay(200);
Gsm.println((char)26); // End AT command with a ^Z, ASCII code 26
delay(200); Gsm.println(); delay(20000);
}
if (newData) //If newData is true }
{
float flat, flon; unsigned long age;
gps.f_get_position(&flat, &flon, &age);
Gsm.print("AT+CMGF=1\r"); delay(400);
Gsm.print("AT+CMGS=\""); Gsm.print(phone_no);
Gsm.println("\"");
delay(300);
Gsm.print("http://maps.google.com
/maps?q=loc:");
// Gsm.print("Latitude = ");
Serial.println(failed);
// if (chars == 0)
// Serial.println("** No characters received from GPS: check wiring
**");
}
```

Program of Traffic light that controls automatically

```
int Lane1[] = {13,12,11}; // Lane 1 Red, Yellow and Green
int Lane2[] = {10,9,8};// Lane 2 Red, Yellow and Green
int Lane3[] = {7,6,5};// Lane 3 Red, Yellow and Green
int Lane4[] = {4,3,2};// Lane 4 Red, Yellow and Green
void setup()
{
for (int i = 0; i < 3; i++)
{
pinMode(Lane1[i], OUTPUT); pinMode(Lane2[i], OUTPUT);
pinMode(Lane3[i], OUTPUT);
pinMode(Lane4[i], OUTPUT);
}
for (int i = 0; i < 3; i++)
{
digitalWrite(Lane1[i], LOW); digitalWrite(Lane2[i], LOW); digitalWrite(Lane3[i], LOW);
digitalWrite(Lane4[i], LOW);
}
}
```

```
void loop()
{
digitalWrite(Lane1[2], HIGH); digitalWrite(Lane3[0], HIGH); digitalWrite(Lane4[0], HIGH); digitalWrite(Lane2[0], HIGH); delay(7000); digitalWrite(Lane1[2], LOW); digitalWrite(Lane3[0], LOW);
digitalWrite(Lane1[1], HIGH); digitalWrite(Lane3[1], HIGH); delay(3000); digitalWrite(Lane1[1], LOW); digitalWrite(Lane3[1], LOW); digitalWrite(Lane1[0], HIGH); digitalWrite(Lane3[2], HIGH); delay(7000); digitalWrite(Lane3[2], LOW); digitalWrite(Lane4[0], LOW); digitalWrite(Lane3[1], HIGH); digitalWrite(Lane4[1], HIGH); delay(3000); digitalWrite(Lane3[1], LOW); digitalWrite(Lane4[1], LOW); digitalWrite(Lane3[0], HIGH); digitalWrite(Lane4[2], HIGH); delay(7000); digitalWrite(Lane4[2], LOW); digitalWrite(Lane2[0], LOW); digitalWrite(Lane4[1], HIGH); digitalWrite(Lane2[1], HIGH); delay(3000); digitalWrite(Lane4[1], LOW); digitalWrite(Lane2[1], LOW); digitalWrite(Lane4[0], HIGH); digitalWrite(Lane2[2], HIGH); delay(7000); digitalWrite(Lane1[0], LOW); digitalWrite(Lane2[2], LOW); digitalWrite(Lane1[1], HIGH); digitalWrite(Lane2[1], HIGH);
delay(3000); digitalWrite(Lane2[1], LOW); digitalWrite(Lane1[1], LOW);
}
```

Program of Traffic light that control manually

```
int L11 = 13; int L12 = 12; int L13 = 11; int L21 = 10; int L22 = 9; int L23 = 8; int L31 = 7; int L32 = 6; int L33 = 5; int L41 = 4; int L42 = 3; int L43 = 2;
int buttonPin1 = 27; int buttonPin2 = 28; int buttonPin3 = 29; int buttonPin4 = 30;
int buttonState1 = 0; int buttonState2 = 0; int buttonState3 = 0; int buttonState4 = 0; void setup() {
pinMode(L11,OUTPUT);
pinMode(L12,OUTPUT); pinMode(L13,OUTPUT);
pinMode(L21,OUTPUT); pinMode(L22,OUTPUT);
pinMode(L23,OUTPUT); pinMode(L31,OUTPUT);
pinMode(L32,OUTPUT); pinMode(L33,OUTPUT);
pinMode(L41,OUTPUT); pinMode(L42,OUTPUT);
pinMode(L43,OUTPUT);

pinMode(buttonPin1,INPUT);
pinMode(buttonPin2,INPUT);
pinMode(buttonPin3,INPUT);
pinMode(buttonPin4,INPUT);
}
void loop() {
buttonState1 = digitalRead(buttonPin1); buttonState2 = digitalRead(buttonPin2); buttonState3 = digitalRead(buttonPin3); buttonState4 = digitalRead(buttonPin4);
if(buttonState1 == HIGH)
{
digitalWrite(L12,1); digitalWrite(L22,1); digitalWrite(L32,1); digitalWrite(L42,1); delay(3000);

digitalWrite(L12,0); digitalWrite(L22,0);
digitalWrite(L32,0); digitalWrite(L42,0);
digitalWrite(L13,1); digitalWrite(L21,1);
digitalWrite(L31,1); digitalWrite(L41,1); delay(7000);
digitalWrite(L13,0); digitalWrite(L21,0);
digitalWrite(L31,0); digitalWrite(L41,0); return 1;
}

else if(buttonState2 == HIGH)
{
digitalWrite(L12,1); digitalWrite(L22,1);
digitalWrite(L32,1); digitalWrite(L42,1); delay(3000);
digitalWrite(L12,0); digitalWrite(L22,0);
digitalWrite(L32,0); digitalWrite(L42,0);
digitalWrite(L23,1); digitalWrite(L11,1);
digitalWrite(L31,1); digitalWrite(L41,1); delay(7000);
digitalWrite(L23,0); digitalWrite(L11,0);
digitalWrite(L31,0); digitalWrite(L41,0); return 2;
}
else if(buttonState3 == HIGH)
{
digitalWrite(L12,1); digitalWrite(L22,1);
digitalWrite(L32,1); digitalWrite(L42,1); delay(3000);
digitalWrite(L12,0); digitalWrite(L22,0);
digitalWrite(L32,0); digitalWrite(L42,0);
digitalWrite(L33,1); digitalWrite(L11,1);
digitalWrite(L21,1); digitalWrite(L41,1); delay(7000);
digitalWrite(L33,0); digitalWrite(L11,0);
digitalWrite(L21,0); digitalWrite(L41,0); return 3;
}
else if(buttonState4 == HIGH)
{
digitalWrite(L12,1); digitalWrite(L22,1);

digitalWrite(L32,1); digitalWrite(L42,1); delay(3000);
digitalWrite(L12,0); digitalWrite(L22,0);
digitalWrite(L32,0); digitalWrite(L42,0);
digitalWrite(L43,1); digitalWrite(L21,1);
digitalWrite(L11,1); digitalWrite(L31,1); delay(7000);
digitalWrite(L43,0); digitalWrite(L21,0);
digitalWrite(L11,0); digitalWrite(L31,0); return 4;
}
```

III. CONCLUSION

This project represents an example of an intelligence of traffic monitoring system with technology IOT. If it is fixed, the emergency vehicles will not wait till traffic light turns green. And also for ambulance will be provided a way to reach the hospital as quick as possible and save the patient's life. By this project not only the lives will be safe but also help the rescue wagon reach their destination

sooner. In future, this project will be enhanced by using automated approach for fast and accurate performance.

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