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Advanced Electric Traction System Controller Modes

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ABSTRACT: Railways provide the cheapest and most convenient mode of passenger transport both for long distance and suburban traffic. Also, most of the transport in India is being carried out by railway network. Still, accidents are the major concern in terms of railway track crossing and unidentified crack in rail tracks in Indian railway. About 60% accidents are occurring at railway track crossing and due to crack in railway tracks resulting in loss of precious life and loss of economy. Therefore there is need to think about new technology which is robust, efficient and stable for both crack detection in railway track and object detection. This project proposes faulty rail track detection. This project discusses a Railway track crack detection using arduino and is a dynamic approach which combines the use of GPS tracking system and GSM module to send alert messages and the geographical coordinate of location. Arduino Uno is used to control and coordinate the activities of these devices. This project prevents train derailment by detecting a crack in railway tracks.

KEYWORDS: Arduino Uno (At Mega 328), Motor Drive L289N, GPS, GSM SIM 800I, LCD 16*2 Display, IR Sensor, Ultrasonic Sensor, DC Gear Motors, Buzzer.

I. INTRODUCTION

Depending on the fast developments in railway systems, high speed trains are used and rail transportation is increased day by day. The most of the people uses railway for transportation, to transfers the goods and passengers from one place to another place. The railway system is providing facility such as high speed, low cost, environment friendly. These characteristics can be performed by time to time maintenance and control measurements. But depending on different factors, deformations and derailment may occur on the superstructure of railways. These derailments and other problems of railway system like improper maintenance, the currently irregular and manual track line monitoring mistakes from workers. Such deformation and derailment are determining on time and taking precautions is very important for the safety of railway systems. Therefore, solution for this problem is introducing in this project. For providing protection to the railway accident because of cracks occurs on the track. This system is used in between two stations which will detect the cracks present on the track using IR sensors. Which transmit sine waves for an ideal track. If a crack is detected, then this sensor will send a signal to the Adriano Uno board which will activate the GPS receiver. The GPS receiver will pin point the exact location which will then be messaged to the authorities. Once the sensor sends a signal to the controller, the controller will initiate the webcam. The webcam will provide the live feed of the track. The live feed and the data from the GPS will be updated in the designed application of the wireless camera. By using this technology, we will be able to prevent the loss of precious life or property.

II. PROPOSED RESEARCH WORK

A. BLOCK DIAGRAM

The below block diagram is Advanced electric traction system controller. When the supply is given Arudino board the components will get energized except buzzer. the all components are get works when the obstacle is in front of the Ultrasonic sensor will detects and Arudino will give the supply the buzzer will on. when the track is broken the IR sensor will detects the track and the information and location will sends to near station. By using GSM/GPS

components. While the working of those components the l298N motor drive will off the supply. The operation will maintain safe operation.

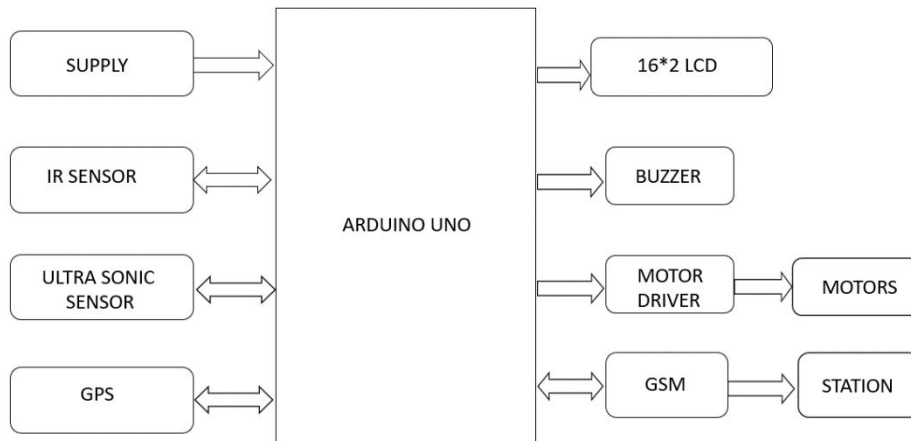


Figure 1: Block Diagram of Advanced Electric Traction System Controller

B. COMPONENTS

(i) IR SENSOR

The IR sensor or infrared sensor detects infrared radiation to measure distance and motion. It is commonly used in devices like motion.

(ii) ULTRASONIC SENSOR

An ultrasonic sensor emits high frequency sound waves and then listens for their echo to determine the distance to object. It's often used for proximity sensing, Object detection and distance measurements in various application like robotics.

(iii) ARDUINO UNO

Arduino is an open-source hardware and software platform that simplifies the process of creating interactive electronic projects. It provides a range of microcontroller boards and a development environment for writing, compiling, and uploading code to these boards. Its simple programming language, extensive community support, and vast ecosystem of add-on modules (shields) make it accessible for beginners while also offering enough flexibility for advanced projects.

(iv) MOTOR DRIVE

A motor drive is a device or circuitry that controls the speed, direction, and torque of an electric motor. The controller interprets signals from a microcontroller, sensors, or other inputs, and adjusts the power stage to regulate the motor's operation.

(v) GSM/GPS

GSM incorporates various security features to protect user communications. These include encryption algorithms to secure voice calls and data transmissions, as well as authentication mechanisms to verify the identity of subscribers connecting to the network. GPS is a satellite-based navigation system that provides location and time information anywhere on or near the Earth's surface.

(vi) 16*2 LCD DISPLAY

A 16x2 LCD display is a liquid crystal display with a grid of 16 columns and 2 rows of characters. Each character slot can display alphanumeric characters, symbols, or custom characters. It's commonly used to output text-based information in electronic devices such as microcontroller-based projects.

(vii) GEAR MOTORS

Gear motor is a type of electric motor that incorporates a gear train to provide mechanical advantage. It actually combines an electric motor with a gearbox to produce high torque or low speed, making it suitable for various applications where high torque and low speeds are required.

(viii) BUZZER

Buzzer is electronic device which produces the sound when an electric signal passed through it. It is typically a transducer that converts electrical signals to mechanical vibrations, which in turn produces sound waves.

III. PROJECT MODEL

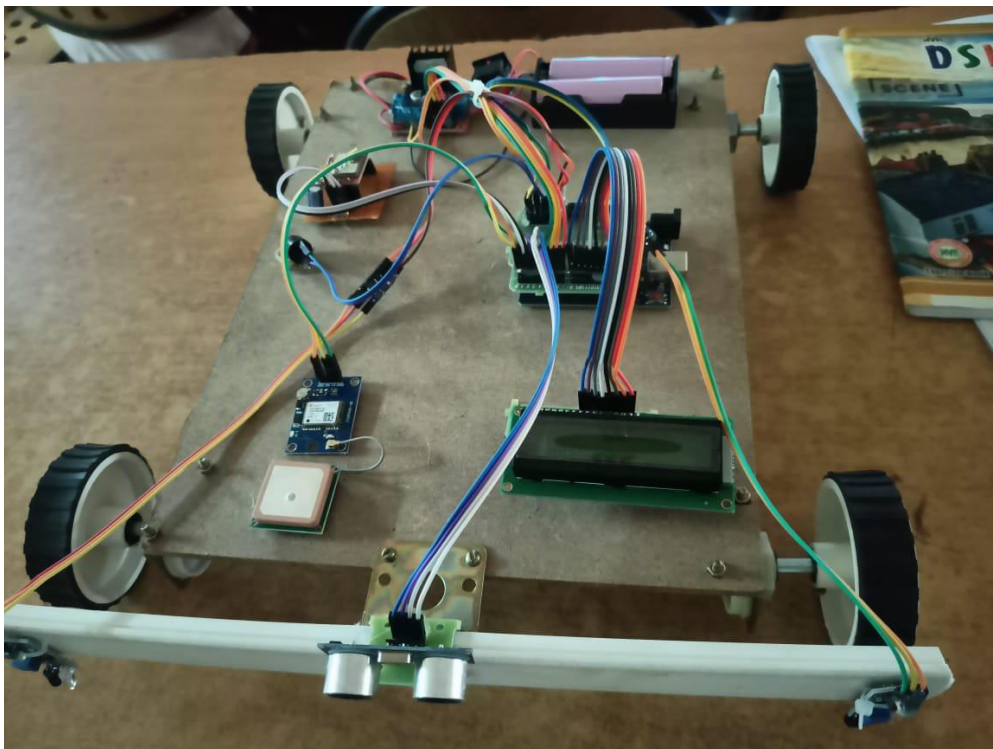


Figure 2: Hardware Kit of Advanced Electric Traction System Controller

This is the advanced electric system controller by using this we can reduce the major train accidents. By using of ultrasonic and IR sensors. Those both sensors will play key role in this project. When this works the information will send to the near by station.

IV. CODE

```
#include <LiquidCrystal.h>
const int rs =8, en =9, d4 =10, d5 =11, d6 =12, d7 =13;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
#include <TinyGPS.h>
TinyGPS gps;
float flat=0,flon=0;
const int pingPin =2;
const int echoPin =3;
long duration;
int distance;
```



```
int buz=A4;
int lm1=4;
int lm2=5;
int rm1=6;
int rm2=7;
int ls=A0;
int Rs=A1;
void read_gps()
{
    bool newData = false;
    unsigned long chars;
    unsigned short sentences, failed;
    for (unsigned long start = millis(); millis() - start < 1000;)
    {
        while (Serial.available())
        {
            char c = Serial.read();
            if (gps.encode(c))
                newData = true;
        }
    }

    if (newData)
    {
        unsigned long age;
        gps.f_get_position(&flat, &flon, &age);
    }
}

void setup() {
    lcd.begin(16,2);
    lcd.setCursor(4,0);
    lcd.print("WELCOME");
    delay(1500);
    lcd.setCursor(0,0);
    lcd.print("RAILWAY TRACK");
    lcd.setCursor(0,1);
    lcd.print("CRACK DETECTION");
    delay(2000);
    Serial.println("AT");
    delay(1500);
    Serial.println("AT+CMGF=1");
    delay(500);
    lcd.clear();
    Serial.begin(9600);
    pinMode(pingPin,OUTPUT);
    pinMode(echoPin,INPUT);
    pinMode(ls,INPUT);
    pinMode(Rs,INPUT);
    pinMode(lm1,OUTPUT);
    pinMode(lm2,OUTPUT);
    pinMode(rm1,OUTPUT);
    pinMode(rm2,OUTPUT);
    pinMode(buz,OUTPUT);
    digitalWrite(buz,0);// Starting Serial Terminal
    pinMode(buz,OUTPUT);
    digitalWrite(lm1,0);
```



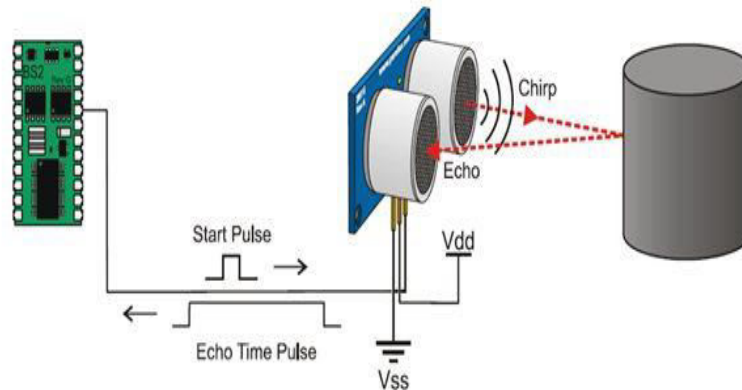
```
digitalWrite(lm2,0);
digitalWrite(rm1,0);
digitalWrite(rm2,0);
}
void loop() {
  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance= (duration/2)/29.1;
  if((digitalRead(ls)==0) && (digitalRead(Rs)==0))
  {
    digitalWrite(lm1,0);
    digitalWrite(lm2,1);
    digitalWrite(rm1,0);
    digitalWrite(rm2,1);
    digitalWrite(buz,0);
  }
  if((digitalRead(ls)==1) && (digitalRead(Rs)==0))
  {
    digitalWrite(lm1,0);
    digitalWrite(lm2,0);
    digitalWrite(rm1,0);
    digitalWrite(rm2,0);
    digitalWrite(buz,1);
    //lcd.clear();
    read_gps();
    send_sms(1);
    digitalWrite(buz,0);
    digitalWrite(lm1,1);
    digitalWrite(lm2,0);
    digitalWrite(rm1,1);
    digitalWrite(rm2,0);
  }
  if((digitalRead(ls)==0) && (digitalRead(Rs)==1))
  {
    digitalWrite(lm1,0);
    digitalWrite(lm2,0);
    digitalWrite(rm1,0);
    digitalWrite(rm2,0);
    digitalWrite(buz,1);
    lcd.clear();
    lcd.setCursor(2,0);
    lcd.print("CRACK DETECTED");
    read_gps();
    send_sms(1);
    digitalWrite(buz,0);
    delay(2000);
    lcd.clear();
    digitalWrite(lm1,1);
    digitalWrite(lm2,0);
    digitalWrite(rm1,1);
    digitalWrite(rm2,0);
  }
}
```



```
}
if((digitalRead(l1)==1) && (digitalRead(Rs)==1))
{
  digitalWrite(lm1,0);
  digitalWrite(lm2,0);
  digitalWrite(rm1,0);
  digitalWrite(rm2,0);
  digitalWrite(buz,1);
  lcd.clear();
  lcd.setCursor(2,0);
  lcd.print("CRACK DETECTED");
  read_gps();
  send_sms(1);
  digitalWrite(buz,0);
  lcd.clear();
  digitalWrite(lm1,1);
  digitalWrite(lm2,0);
  digitalWrite(rm1,1);
  digitalWrite(rm2,0);
}
if (distance <20)
{
  digitalWrite(lm1,0);
  digitalWrite(lm2,0);
  digitalWrite(rm1,0);
  digitalWrite(rm2,0);
  digitalWrite(buz,1);
}
}
void send_sms(int k)
{
  read_gps();
  Serial.println("Sending SMS...");
  Serial.println("AT");
  delay(1000);
  Serial.println("ATE0");
  delay(1000);
  Serial.println("AT+CMGF=1");
  delay(1000);
}
```

V. RESULTS

MODULE-1: OBJECT DETECTION USING ULTRASONIC SENSOR



3:Ultrasonic Sensor

- When the object is in front of the ultrasonic sensor the sensor will detect the object and Blow the horn.
- It measure the distance& also using obstacle detection and avoidance the ultrasonic sensor continuously emits the frequency signals are reflected back which then considered as input to the sensor.

MODULE-2: TRACK DETECTION USING IR SENSOR

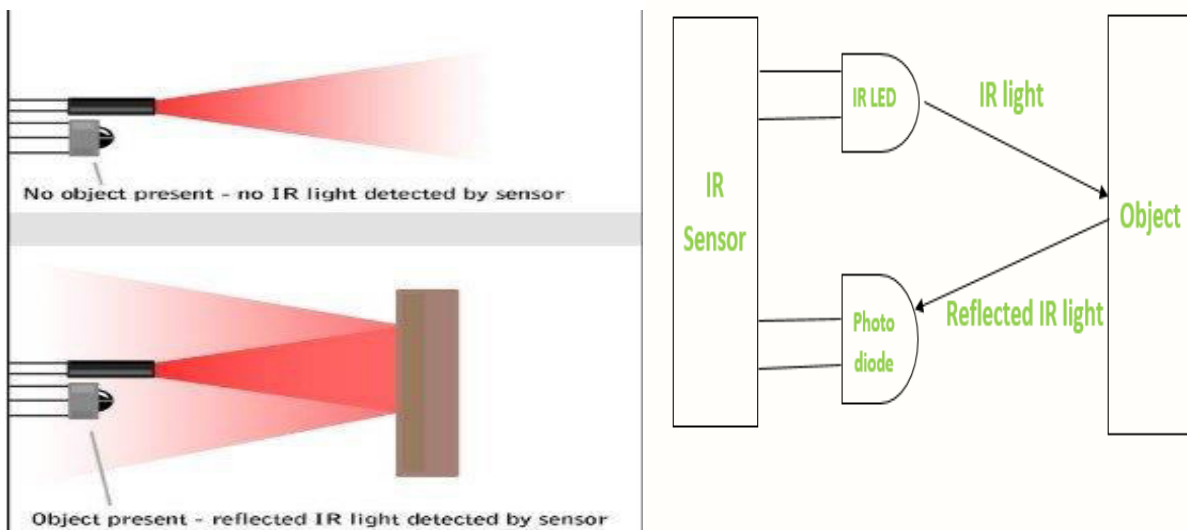


Figure 4: IR Sensor

- The IR sensor detects infrared radiation to measure distance and motion. It is commonly used in devices like motion. When track is broken it will detects.
- While doing the information will go near by station by using of GSM/GPS system.

MODULE:-3 GSM/GPS

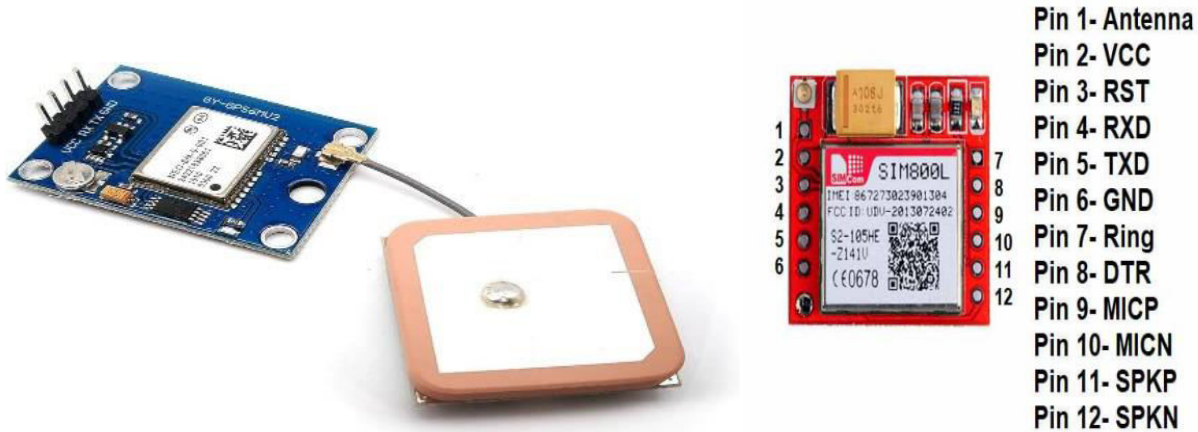


Figure 5: GSM/GPS

- When IR sensor detects the track broken the information will send to arduino board the arduino board will give instruction the GSM will send the information the GPS will send the location near to station by using of GSM.

VI. CONCLUSIONS

By using of advanced electric traction system control to avoid the accidents in railway system. preventing the humans & animals. We think this system will avoid the 60% of train accidents in railway system. The railway track detection using GPS /GSM modules are the information when the track will broken and object detection.

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