# Development of automatic "Crack Detecting Device" for train line by using GSM module

Hemlata Nasare[1], Yogesh G. Joshi[2], Manoj R. Matale[3], Nilam Wankhade[4]

[1] *Assistant professor, Dept. of Mechanical Engg., DMIETR, Maharashtra, India*
[2] *Assistant professor, Dept. of Mechanical Engg., DMIETR, Maharashtra, India*
[3] *Assistant professor, Dept. of Mechanical Engg., DMIETR, Maharashtra, India*
[4] *Assistant professor, Dept. of Mechanical Engg., DMIETR, Maharashtra, India*

## ABSTRACT

*Most of the commercial transport in India is being carried out by the railway network and therefore, any problems in the same have the capacity to induce major damage to the economy. In terms of the reliability and safety parameters, Indian railway has not yet reached the international standards. The main problem about railway analysis is detection of cracks in the structure. If these deficiencies are not controlled at early stages they might lead to a number of derailments resulting in a heavy loss of life and property. This work proposes a cost effective solution to the problem of railway track crack detection utilizing IR transmitter and receiver which tracks the location of faulty track which then mended immediately so that many lives will be saved.*
*There are many advantages with this system when compared with the traditional detection techniques. It includes less cost, low power consumption and less analyze is time.*

**Keyword :** - *IR transmitter, IR receiver ,crack detection, railway track etc.*

## 1. INTRODUCTION

### 1.1 Overview

Transport is a key necessity for specialization that allows production and consumption of products to occur at different locations. Transport has throughout history been a spur to expansion as better transport leads to more trade. Economic prosperity has always been dependent on increasing the capacity and rationality of transport. But the infrastructure and operation of transport has a great impact on the land and is the largest drainer of energy, making transport sustainability and safety a major issue. In India, we find that rail transport occupies a prominent position in providing the necessary transport infrastructure to sustain and quench the ever-burgeoning needs of a rapidly growing economy. Today, India possesses the fourth largest railway network in the world. However, in terms of the reliability and safety parameters, we have not yet reached truly global standards. The principal problem has been the lack of cheap and efficient technology to detect problems in the rail tracks and of course, the lack of proper maintenance of rails which have resulted in the formation of cracks in the rails and other similar problems caused by anti-social elements which jeopardize the security of operation of rail transport. In the past, this problem has lead to a number of derailments resulting in a heavy loss of life and property. Cracks in rails have been identified to be the main cause of derailments in the past, yet there have been no cheap automated solutions available for testing purposes. Hence, owing to the crucial repercussions of this problem, an efficient and cost effective solution suitable for large scale application is required. The new method which utilizes simple components inclusive of GSM Modem, IR Transmitter and Receiver based crack detector assembly is very useful in railway crack detection. This idea can be implemented in the long run to facilitate better safety standards and provide effective testing infrastructure for achieving better results in the future.

**1.2 Problem Statement**

- Inspections on railway track are done by conventional method or manual detection.
- The exact location of the crack cannot be found by using the conventional method of crack detection.
- This method consumes more time to detect the crack on railway track.

**1.2 Components:**

- **IR sensor**
- **FM transmitter**
- **IR receiver**
- **GSM Module**
- **DC Motor**
- **Transformer**

**1.3 Construction Details:**

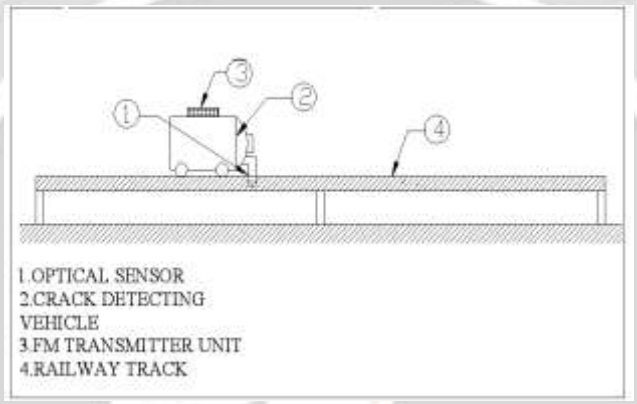


Fig 1 :- Automatic crack detecting vehicle for railway track**.**

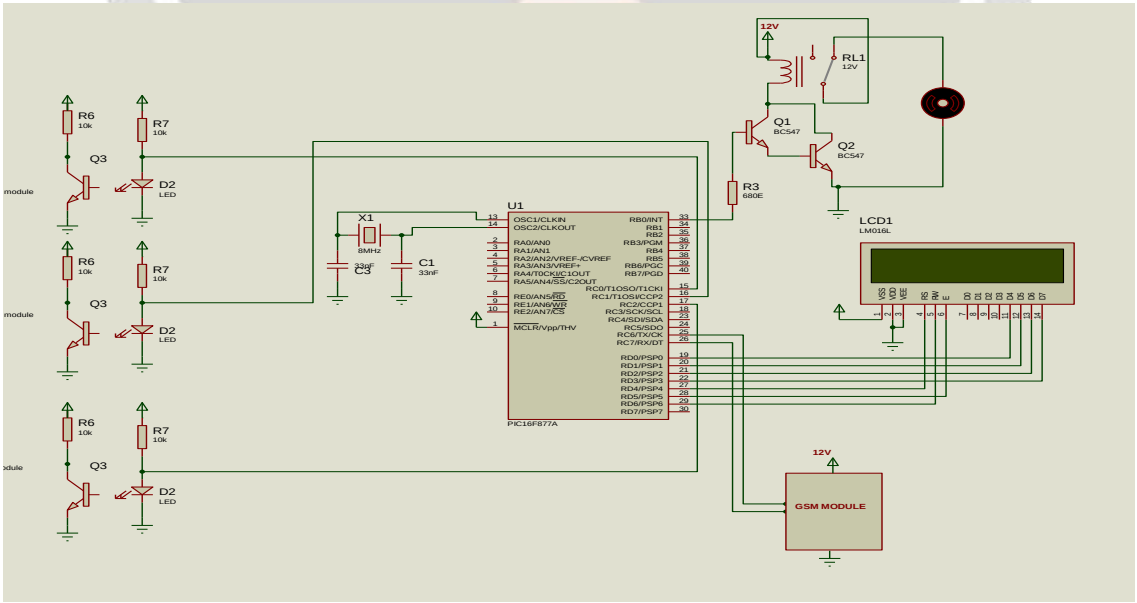


Fig 2 :- Circuit diagram for GSM module

1.4 Program Coding :

```
// LCD module connections
sbit LCD_RS at RD5_bit;
sbit LCD_EN at RD4_bit;
sbit LCD_D4 at RD0_bit;
sbit LCD_D5 at RD1_bit;
sbit LCD_D6 at RD2_bit;
sbit LCD_D7 at RD3_bit;
sbit LCD_RS_Direction at TRISD5_bit;
sbit LCD_EN_Direction at TRISD4_bit;
sbit LCD_D4_Direction at TRISD0_bit;
sbit LCD_D5_Direction at TRISD1_bit;
sbit LCD_D6_Direction at TRISD2_bit;
sbit LCD_D7_Direction at TRISD3_bit;
// End LCD module connections
char txt1[] = "Km=";
char txt2[] = "Crk=";
unsigned cnt;
unsigned tms;
unsigned rrr;
void send_sms();
void main() {
 TRISB=0x00;
 TRISD=0x00;
 TRISC=0xFF;
 PORTB =0;
 Delay_ms(100);
 Delay_ms(50);
 UART1_Init(9600);
  Lcd_Cmd(_LCD_CLEAR);              // Clear display
 Lcd_Cmd(_LCD_CURSOR_OFF);         // Cursor off
 Lcd_Out(1,1,txt1);                // Write text in first row
 Lcd_Out(1,9,txt2);                // Write text in second row
 counter=0;
 aa=0;
 ss=0;
 ff=0;
 b=0   ;
 PORTB .b0=1;
 Delay_ms(100);
 InitTimer1();
 Delay_ms(100);
 uu=1;
 adcreadflag = 0;
 cntadc = 0;
 do{
   if(PORTC.B1==1 || PORTC.B2==1 )     // counter pulse pin no.15
      {
       PORTB.b0=0;
       send_sms();
      }
      else
       b=0;
   if(PORTC.B0==1)     // counter pulse pin no.15
      {
```

```
          tty=1 ;
        }
        else
        {
          if(tty==1)
          {
            tty=0;
            rrr++;
          }
        }
        if(PORTC.B1==0 )   // counter pulse pin no.17
        {
         PORTB .b0=0;
         send_sms();
         ff=1 ;
        }
        else
        {
          if(ff==1)
          {
            ff=0;
            ss++;
            cntadc = 0;
             b=0;
          }
        }
         bytetostr(rrr,txt);
         Lcd_Out(1,5,txt);
         bytetostr(ss,tmt);
         Lcd_Out(1,13,tmt);
          if (ss==60)
          {
          if(aa==0)
          {
           bytetostr(rrr,txt);
           Lcd_Out(2,9,txt);
           rrr=0;
           }
           if(aa==1)
          {
           bytetostr(rrr,txt);
           Lcd_Out(2,12,txt);
           aa=0;
           rrr=0;
           b=0;
           }
           aa++;
          ss=0;
    }  //---------------------------------------------------------------------------

  } while(1);
}

void send_sms(void)
 {
 if(b==0)
```

```
 {
UART1_Write_Text("AT+CMGF=1");
UART1_Write(13);       // for enter button pressed
      Delay_ms(100);
 Delay_ms(1000);
      UART1_Write_Text("AT+CMGS=")  ;
      UART1_Write('"');
      UART1_Write_Text("8055221996");
      UART1_Write('"');
      UART1_Write(13);
      Delay_ms(1000);
      UART1_Write_Text("ALERT ");
       UART1_Write_Text("ALERT ON Km=");
       UART1_Write_Text(txt);
      b=b+1;
  }
```

## 2. WORKING:

1) When the vehicle is Powered On, it moves along the model track. The IR Obstacle sensors monitors the condition of the tracks.
2) When a crack is detected by the IR sensor the vehicle stops at once, and the GSM receiver triangulates the position of the vehicle to receive the Latitude and Longitude coordinates of the vehicle position, from satellites.
3) The Latitude and Longitude coordinates received by GSM are converted into a text message which is done by PIC microcontroller.
4) The GSM module sends the text message to the predefined number with the help of SIM card that is inserted into the module.
5) Once the message has been successfully sent to the number, the vehicle resumes its movement forward depending on the type of crack.

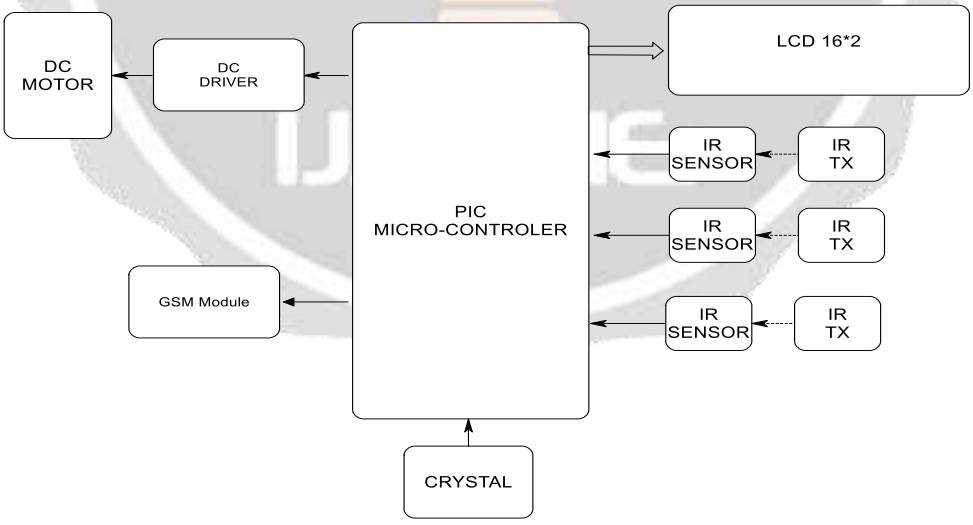


Fig 3:- Block diagram for the working project

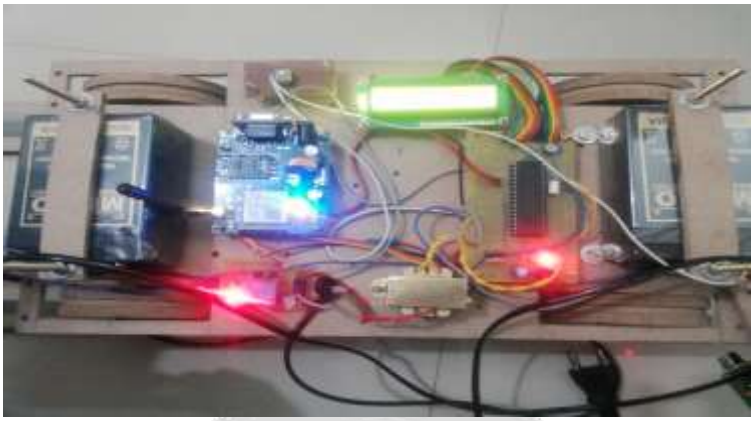

Fig 4:- Working model of project

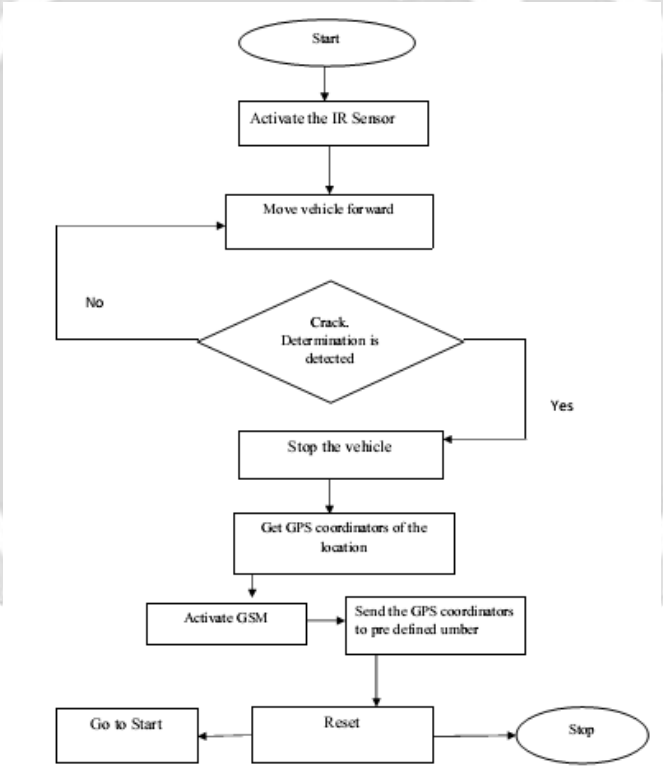


Fig 5:- Flow chart of working model of project

**3. Result & Discussion:**

By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle

By using this vehicle for the purpose of Railway track inspection and crack detection and automated SMS will be sent to pre-defined phone number whenever the vehicle sensors detect any crack or deformation This will help in maintenance and monitoring the condition of railway tracks without any errors and thereby maintaining the tracks in good condition, preventing train accidents to very large extent Railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents. The addition of solar panel is an added advantage, which also helps conserving the power resource.

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