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Smart Railway Management System

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Abstract - The project aims at improving the railway management system which will be useful for authorities as well as to passengers. It includes different functions like controlling the speed of train based signals, it notifies about the problem in railway tracks and inform to the railway authorities via GSM and it can avoid derailment of train which causes the accident. Station alert SMS function is used in the project for the beneficial of passengers. The PIC Microcontroller is the heart of the project. The IR sensor is used for detecting the crack in the railway tracks. Once the crack has been detected, railway authorities will be notified via SMS and also the loco pilot of train within the coverage area which will further used to avoid accidents. The GPS is used to trace the location of the failure of railway track. The Fire Sensor is used to detect the fire in the train, once the fire is detected it will inform to the railway authorities and fire bridge for an emergency.

Key Words: GSM, GPS, MICROCONTROLLER, IR SENSOR, FIRE SENSOR, SMS, SIGNALS

1. INTRODUCTION:

In India most of the commercial transport is being carried out by the railway network and therefore if any problem occurred during transportation the major damage is getting occurred to the economy. The Indian railway network today has a track length of 113,617 kilometers (70,598mi). over a route of 63,974 kilometers (39,752 mi) and7, 083 stations It is the fourth largest railway network. Indian railway network is still on the growth trajectory trying to fuel the economic needs of our nation. Though railway transport in India is growing in a rapid speed, but our facilities are inadequate compared to the international standards and as a result, there have been frequent derailments that have resulted in severe loss of valuable human lives and property as well. On further analysis of the factors that cause these rail accidents, recent statistics reveal that approximately 60% of all the rail accidents have derailments as their cause, of which about 90% are due to cracks on the rails either due to natural causes (like excessive expansion due to heat) or due to antisocial elements. Hence these cracks in railway lines have been a serious problem which has to be solved as early as possible. These railway lines cracks problems are generally not noticed due to improper maintenance and lack of alertness in manual checking work. The high frequency of trains and the unreliability of manual labor have put forth a need for an automated system to monitor the presence of crack on the railway lines. Owing to this problem, this paper presents an implementation of an efficient and cost effective solution suitable for large scale application. In this paper we are going to use IR sensor to detect crack in rail tracks and RF transmitter and receiver to receive the corresponding red, green and yellow signal to automatically control the speed of the train. GPS service to trace the position of the train and GSM service to send the alert message to the passenger.

2.OBJECTIVE:

In this project we are focusing on three important features of train which will be helpful further and overcome the existing system used for it. The proposed system for the features focused in this paper is given below.

2.1 Automatic signal control: Whenever a particular signal is observed on signal pole, the RF transmitter fitted on the pole will send the corresponding signal which will be received by the RF receiver which is fitted on the train and will reduce or increase or stop depending on the signal

2.2 Message alert system: For message alert System instead of using timer system we are making use of GPS system to locate the position of the train which will trace the location of the upcoming station and send an alert message to the passengers who will be shortly reaching their destination by using GSM service.

2.3 Crack detection: In railway track one of the most important reasons for rail accidents is crack in railway track due to climatic changes. Existing technique used to monitor the rail track is manual checking done individual person which leads more man power and also is less efficient. To make it more efficient we are going to use IR sensor to detect the crack in rail track which will give an alert and suitable action will be taken.

2.4 Fire sensor: It is implemented to detect the fire in the train, which will be specified with a particular range, if the threshold range goes above then the fire sensor will detect the problem. Once the fire is detected it will inform to the microcontroller and via microcontroller it will inform to GSM and GPS module which will inform the authorities about the problem.

3. SYSTEM OVERVIEW:

3.1. Block Diagram-

Transmitter block diagram of our model is shown below

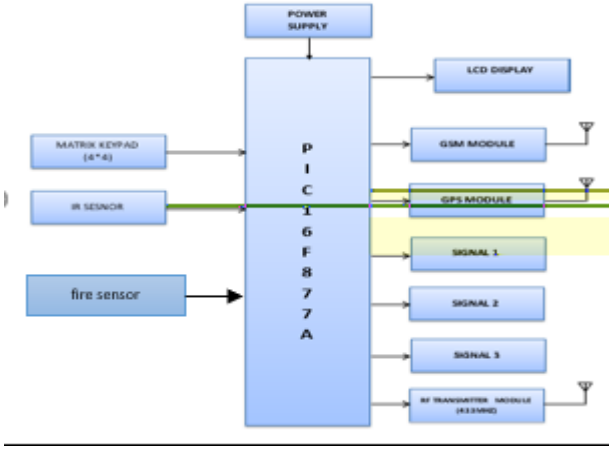

Figure -1 : TRANSMITTER BLOCK DIAGRAM

The whole system is implemented in the following manner:

MICRONTROLLER:

The PIC 16F877A Microcontroller is the heart of the circuit and it is very easier one of the main advantage is that it can be write and erase as many time as possible because it use flash memory technology. It has a total number of 40 pin and there are 33 pins for input and output. It consists of two 8-bit and one 16-bit timer, Capture and compare modules, serial port, parallel port and five input and output port are also present in it. Here we are using pic for interfacing various blocks such as power supply, signals (g, y, r), crack detection, LCD display, decoder, level convertor, driver circuit, etc.

IR SENSOR:

The IR sensor is used for detecting the crack in the railway track. IR sensor is used as a wireless communicator between GSM module and cracks detected. Once the problem is detected in the railway track the IR sensor will detect and give the information to the Microcontroller, LCD, GSM for further notification.

GSM MODULE:

GSM module stands for global system for mobile communication. Its operates at 850Mhz,900Mhz, 1800Mhz frequency band. GSM is connected with Microcontroller for its operation, once the GSM receives the signal from microcontroller after detecting the crack, the GSM will send the SMS to the railway authorities.

GPS MODULE

GPS module stands for global positioning system. It is connected with microcontroller, it gives the location of the place where the problem has been detected. When the signal is received from microcontroller, the GPS will give the longitude and latitude value. This values are converted and send to the authorities with the help of GSM module.

LCD DISPLAY:

Liquid crystal oscillator display is used in project to get the message displayed as it can controlled on pixel level by doing the specific programming which should be displayed. We have used this, as it is most commonly used type of display and easily available.

FIRE SENSOR:

The fire sensor is connected in the transmitter section, it is used to detect the fire in the train, once it is detected it will inform to the GSM and GPS via microcontroller. The GSM module will send SMS to the railway authorities and fire authorities about the problem.

MATRIX KEYPAD:

Keypad is used to change the signal indication on signal poles. The keys 1,2,3 are programmed for indication of Red, Yellow and Green for signal 1 and accordingly keys 4,5,6 for signal 2 and keys 7,8,9 for signal 3.

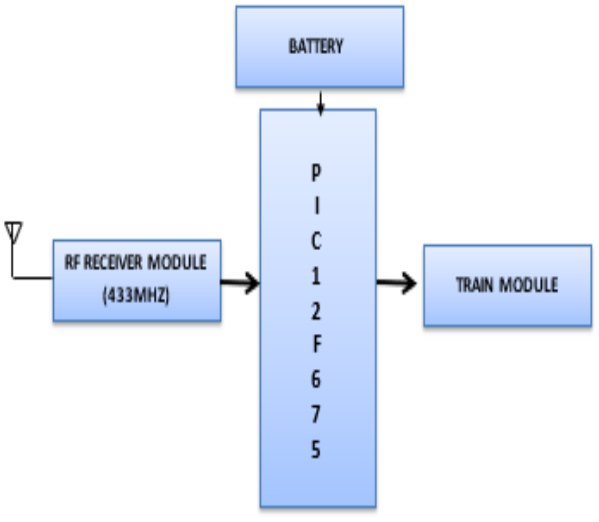

Figure -2: RECEIVER BLOCK DIAGRAM

RF TRANSMITTER AND RECEIVER:

In our project we are making use of HT12E-D which is used for decoder and encoder part respectively. The RF module has a four encoder/decoder ICs. The RF transmission is employed using Amplitude Shift Keying (ASK) at transmitter/receiver operating at 434MHz.

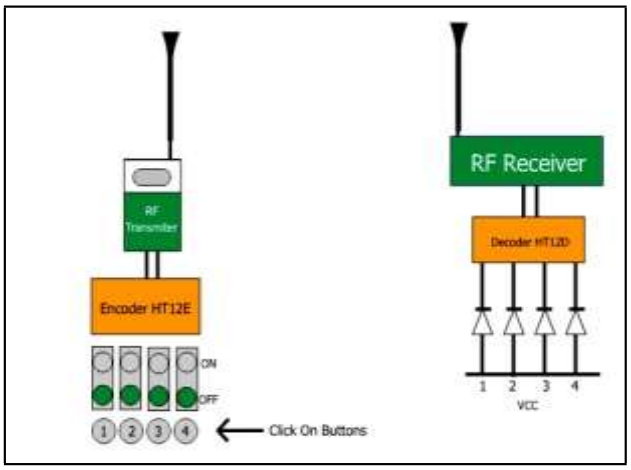

Figure 3: RF TRANSMITTER AND RECEIVER

4. PROPOSED SYSTEM:

When there is some obstacle is present in front of the track or there is a presence of gap between two joining tracks, the IR sensor will detect the gap between the two tracks and indicate on LCD display and with the help of GSM and GPS system the authorized person of railway will be informed via SMS function. The GPS module will give the exact location of latitude and longitude which can be converted into value which will show the place on google maps. When the LDR and LED pairs are cut in the sequence, the alert message is sent via GSM about the NEXT STATION and it is displayed on LCD display and SMS are also send to the registered mobile numbers of passengers. When there is RED light on signal pole, the RF transmitter will send the notification to the loco pilot to stop the train which is in the particular range or else the train will be stopped automatically, the train will start only once the signal is Green on signal indication pole. Similarly, for the yellow indication on the signal pole the train speed will get automatically slow. The ire sensor is implemented in the transmitter section of the circuit which will detect the fire in the train and notify to the required authorities via GSM and GPS module.

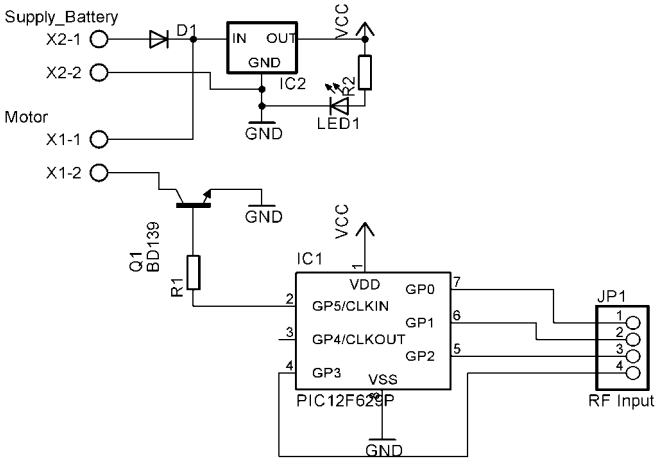

FIGURE 4 : RECEIVER CIRCUIT DIAGRAM

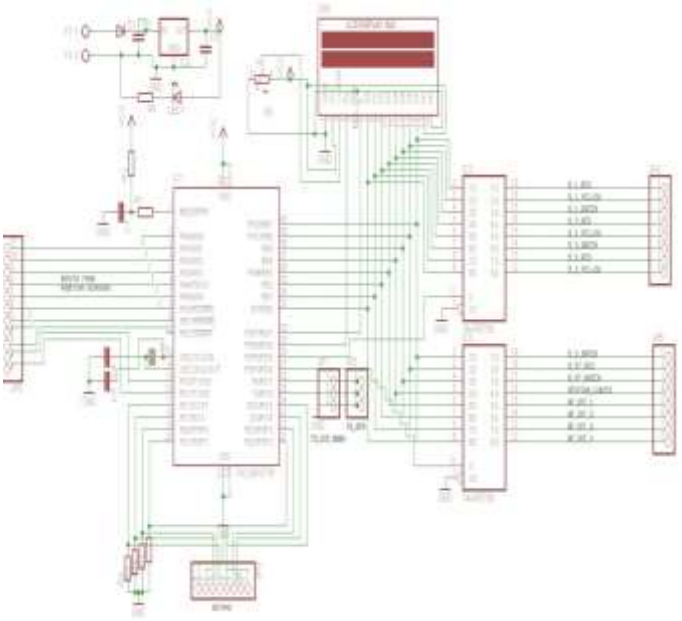

Figure 5: TRANSMITTER CIRCUIT DIAGRAM

All the signals poles will have LDR and LED detectors to locate the train's current position. Let S_ST may be the signal on Station. This signal will have only red and green signals. Let S1, S2, S3 be the three signals on tracks. These signals have Red, Yellow and Green signals.

5. RESULT:

The fig.6 shows the output of crack detected on railway track. When the crack is detected by the IR sensor, it will displayed on the LCD display and stop the train automatically and the SMS will send to the registered numbers and railway authorities.

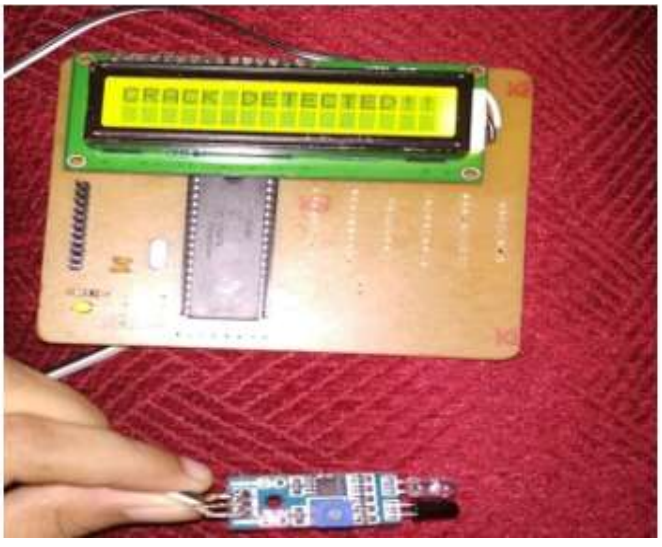

FIGURE 6: WHEN CRACK IS DETECTED ON THE TRACK.

The fig.7 shows the received SMS from GSM on mobile number as well as it includes the latitude and longitude value of the area where the failure of track has taken place.

FIGURE 7: WHEN SMS IS RECEIVED

The below figure shows the overview and full implantation of the system.

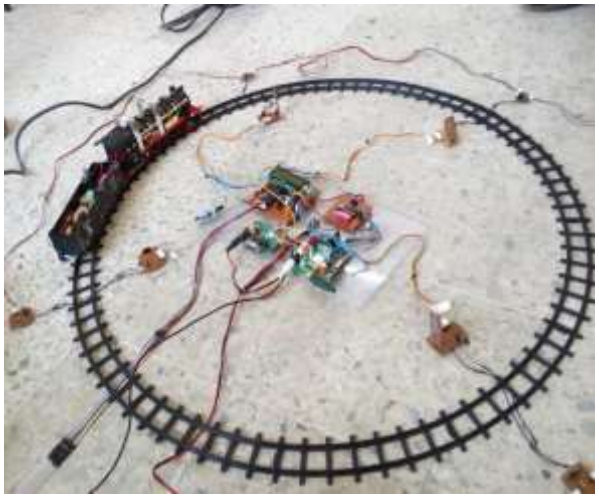

FIGURE 8: IMPLEMENTED CIRCUIT

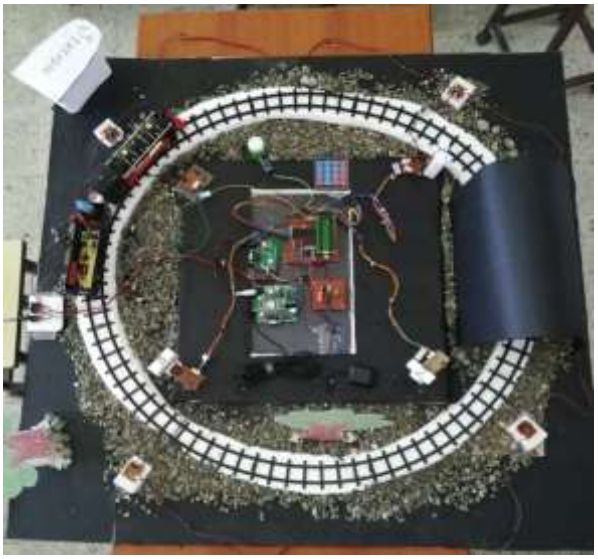

FIGURE 9: FINAL CIRCUIT IMPLEMENTATION

6. CONCLUSION:

As the railway accidents are the major problem in todays world this system helps to avoid the accidents as well the derailments which occurred due to the failure of tracks, the system also includes other facilities to the passengers as well as to the authorities like SMS alert function of next station and emergency exist. It also includes fire sensor which detects the fire and informs to the authorities. Therefore, this system overcome the traditional method problems in low cost.

7. ACKNOWLEDGE:

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8. REFERENCES:

[1] Ganeshan P, Purushottam Shekhar,Ravi Shankar Shekhar "AUTOMATIC DETECTION OF SQUATS IN RAILWAY TRACK ", IEEE sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIIECS'15.

[2] Anil Kumar Verma, Dharmendra Kumar, Gopal Krishna Gole, Jitendra Kumar, "INTELLIGENT TRAIN ENGINE FOR FASTEST NEW TECHNOLOGY", International Journal of Innovative Research in Computer and Communication Engineering Vol.1, Issue 1,March2013 ISSN(print): 2320-9798 ISSN(online):2320-9801

[3] Kawshik Shikder, "INTELLIGENT SYSTEM FOR TRAIN ENGINE WITH AUTOMATIC CONTROLLING USING WIRELESS TECHNOLOGY", International Journal of science and research(IJSR) ISSN (online):2319-7064 volume

[4] Archana A. Raut, Nisha S.Punekar "Improving Railway Safety with Obstacle Detection and Tracking System using GPS-GSM Model", International Journal of Science & Engineering Research, Vol. 4, Issue 8, Aug 2013.

[5] Dibyayan Das Sharma,Sanjeev Kumar, Shweta Gupta "An Intelligent Train Engine Based on Auto-Signal Following

Scheme Using IR Technology", The IUP Journal of Electrical and Electronics Engineering, Vol. IV, No. 4, pp. 36-47, October 2011.

[6] "ATC – Automatic Train Control". Siemens.dk. Siemens. Archived from the original on 3 March 2016. Retrieved 15 January 2015

[7] history of signalling:

https://en.wikipedia.org/wiki/Railway_signalling#History_of_block_signalling

[8] Cannon, D. F., Edel, K.-O., Grassie, S. L. & Sawley, K. "Rail defects: an overview." Fracture & Fatigue of Engineering Material & Structures. vol. 26. no.10. pp. 865–886. Oct. 2003