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Design and Prototype of Efficient Railway Track Management

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Abstract - *In the current railway systems, it is becoming even more necessary to have safety elements in order to avoid accidents. One of the important causes that can provoke serious accidents is the existence of obstacles on the tracks, either fixed or mobile. This project deals about one of the efficient methods to avoid train derailment and obstacle detection and provides automated railway crossing management. A GPS system is being used to provide the location of faults on tracks and obstacle. The project presents a solution, to provide an intelligent train tracking and management system to improve the existing railway transport service. The solution is based on powerful combination of mobile computing, Global System for Mobile Communication (GSM), Global Positioning System (GPS) technologies and software. The inbuilt GPS module identifies the train location with a highest accuracy and transfer the information to the central system. The availability of the information allows the robot Controller to take accurate decisions as for the train location.*
If any crack or obstacle detected the robot sends the information to control station via zigbee to take decision over the railway crossing management system.

Keywords: **Ultrasonic Sensor, MINI ARM 7 Kit, GPS & GSM Module, L293D, IR Sensor, Zigbee Module.**

1.INTRODUCTION

On recent developments in railway systems, high-speed trains are being extensively used, and rail transportation is being increased. Reasons for this increase are high speed, cost effectiveness, environment friendly, safety, and modern characteristics of railway systems. In railway tracks, anytime the track is damaged due to weather conditions, floods, earthquakes, cyclones etc. The existing track surveying systems have some limitations. It takes more time and it is less accurate. In this paper, the proposed system immediately notices the cracks in the track and informs the railway authority and hence can reduce the train accidents. Thus by placing the robot in each station and checking at even intervals will help to reduce train accidents. The robotic section in the proposed system consists of ultrasonic sensor which finds the obstacle on the track and IR sensor to detect the track This section mainly consist of GPS module which is used to find the exact position of the crack and GSM modules for transmitting the information to railway authority. It also consist of two motors which is controlled by the motor driver L293D.Control system consist of an LPC2148 microcontroller which is based on ARM7 architecture. When crack or obstacle detected by robo section its send information to control section so it controls the railway cross management.

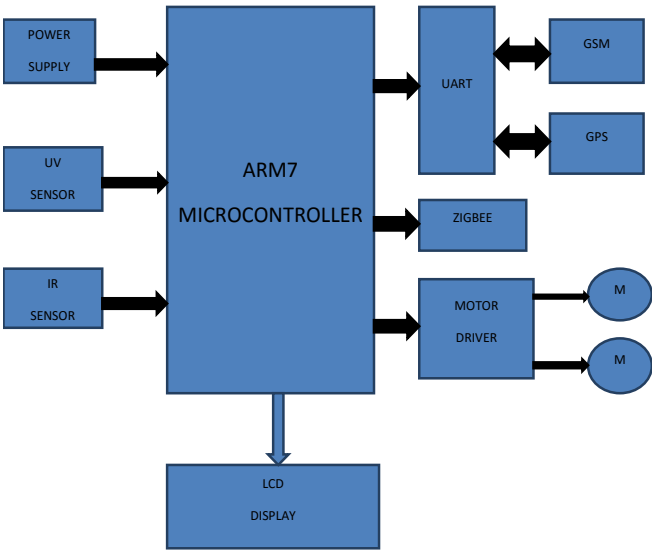
2. LITERATURE SURVEY

For development of railway track management system , The current status of the railway track and controlling of the barricade at railway crossing more important parameter as compared to others as it has crucial role in avoiding a accident caused by derailment of train which saves millions of lives every year .the automatic barricade opening and closing at the railway crossing help to avoid collision of vehicle at the crossing by train.
Study of crack and the obstacle detection are calculated based on the information available from the UV sensor and IR sensors respectively. Based on the information provided by robot section to control station via zigbee module, the control section control the signal light and the barricade at the railway crossing.
The implementation results of the RRCDS utilizing simple components inclusive of a GPS module, GSM Modem and LED-LDR[1] based crack detector assembly. The proposed scheme has been modeled for robust implementation in the Indian scenario.
The system comprises of GPS module, GSM modem, IR sensor, PIR sensor[2] to bring into operation the crack detection, communication purpose and identification of any living being crossing the railway track.
The localization system is constructed with GPS and GSM device. Currently, three tasks, including collision detection and following, object detection, and obstacle avoidance, has been implemented on this platform. Developing on-board automotive driver assistance systems[3] aiming to alert drivers about driving environments, and possible collision with other trains has attracted a lot of attention lately.
In three systems, robust and reliable train detection is a critical step. Methods aiming to quickly hypothesize the location of trains as well as to verify the hypothesized locations are reviewed next. Integrating detection with tracking is also reviewed to illustrate the benefits of exploiting temporal continuity for train detection. Finally, we present a critical overview of the methods discussed, we assess their potential for future deployment, and we present directions for future researches. The use of GSM and GPS technologies allows the system to track train and

provides the most up-to-date information about ongoing trips. In this paper, we have established into use and operation of the integration of ultrasonic crack detection[4] method and complete station for eternal railway track geometry surveying system. This system comprises of GPS module, GSM modem, IR sensor, PIR sensor to bring into operation the crack detection, communication purpose and identification of any living being crossing the railway track.

3. METHODS

Proposed approach is useful for railway department to reduce the effort for taking care of track and also the railway crossing management. Basically it consists of modules which are respect to the crack detection, obstacle detection, and railway crossing management. Lpc2148 micro-controller is the heart of the system which is based on the arm7 microcontroller architecture.It will interface with all other modules. Microcontroller receives the information from all the modules and processes the data for further uses. Whenever any problem occurs it will give the alerts to the railway department control station using zigbee module regarding respective issues. LCD use to display the robot status. Details of all modules used in the model are:



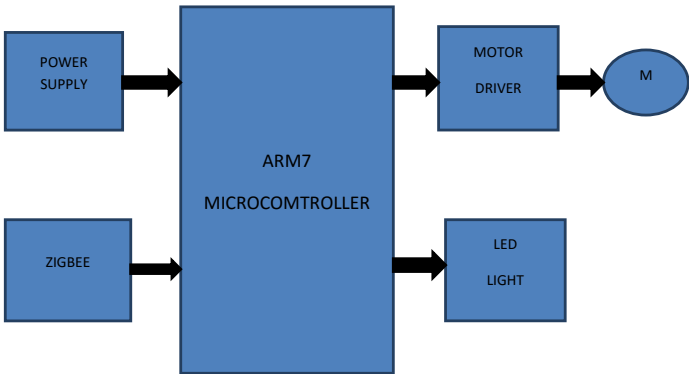


Fig -3.1: Proposed Block Diagram.

A. Crack Detection

IR sensor is used to detect the crack and sends the information to the microcontroller. It analyzes the input , makes robot to stop automatically my providing 0 volts to DC motor. The “crack detected” displayed on LCD display of robot section.The position of robot is detected by GPS and information of latitude and longitude is sent to subscribed mobile station through GSM module. And status of robot is sent to control station through zigbee module.

B. Obstacle detection

UV sensor is used to detect the obstacle and sends the information to the microcontroller. It analyzes the input, makes robot to stop automatically by providing 0 volt to DC motor. The “obstacle detected” displayed on LCD display of robot section. The position of robot is detected by GPS and information of latitude and longitude is sent to subscribe mobile station through GSM module. And status of robot is sent to control station through zigbee module.

C. Railway Crossing management

Whenever the robot section detects the crack or obstacle it will send the information to control system through the zigbee module. If robo is near the railway crossing if crack or obstacle detected then it will turn the railway signal to into red and also close the barricade of railway crossing if not it is kept open.

D. MICRO-CONTROLLER

LPC2148 micro-controller has been used in this project. It is based on arm microcontroller architecture. This microcontroller is being manufactured by Phillips .Its having 8-40Kb of static RAM and 32-512Kb of flash memory.LPC2148 operates at frequency of 60MHz

4. FLOW DIAGRAM

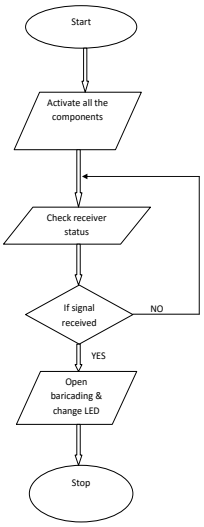


Fig 4.1: Proposed Flow Chart for Robot Section

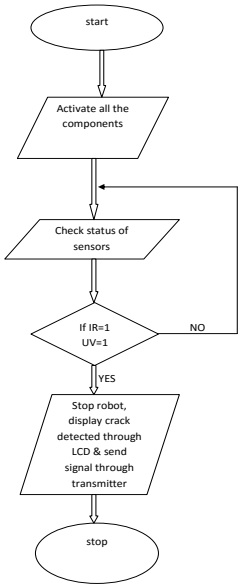


Fig 4.2: control section

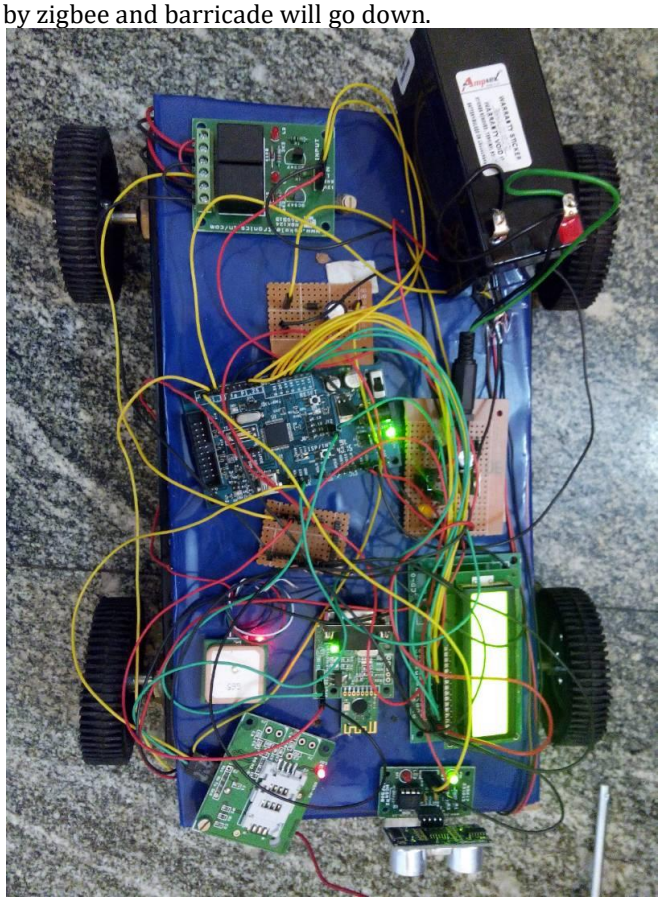
The flow describes the procedural execution of the system. The same has been implemented as code using Embedded C language, complied using IDE (Integrated Development Environment). All conditions are implemented as cases for which there is corresponding operations which have been hardcoded into the code and can be maintained to add further developmental features.

5. PROPOSED SYSTEM

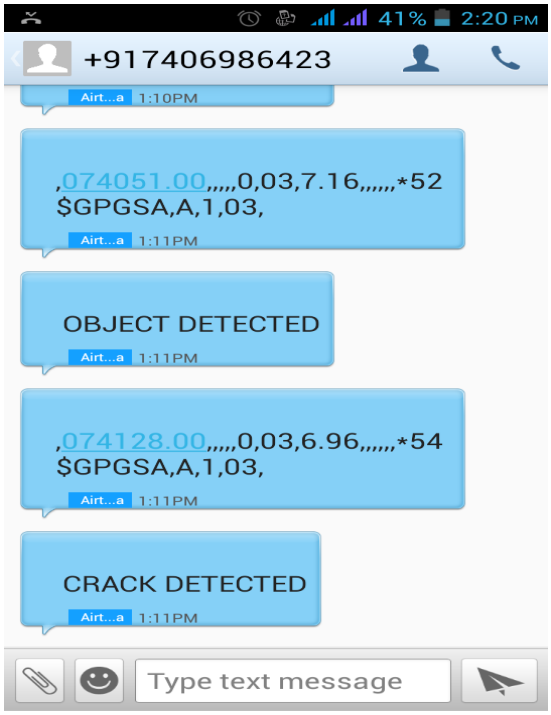
The purpose of this project is to reduce the physical interface of the working railway department with greater reliability, efficiency, better adaptability, security and cost effectiveness. The entire system works with the sole purpose of providing convenience by continuously monitoring every activity on the track and thereby providing real time details and updates to the control station. The project has been successfully monitoring the activities which include conditions likes crack detection ,obstacle detection and railway crossing management..However this project has been in the initial stages but can be optimized in near future with enhanced features and better quality communications between the robot and the control station. which reduces their intimidation and responsibilities to the major extent.

6. EXPERIMENTAL SETUP

It contains ARM7, IR sensor, UV sensor, GSM-GPS Module ,Zigbee module. When crack or obstacle is detected by IR sensor and UV sensor respectively, location of crack is allocated by gps and it is sent to control unit by gsm.when crack or obstacle is detected signal will be sent by zigbee and barricade will go down.



7. RESULT



When crack or obstacle is detected on track, GPS allocates the crack and authority is informed by GSM. Crossing will be closed after crack or obstacle detection.

8. CONCLUSION

The project is developed and designed to improve rail management .the aim of project is to reduce man power.
By using this project we can detect crack in railway track and obstacle on the track. In the proposed method IR sensor is used to detect the crack and UV sensor is used to detect object on the track. The robotic section continuously checks the crack and obstacle. Location of crack and obstacle is detected by GPS and then send to authority by GSM. The system can be operated in tunnel without any interruptions. After the crack or obstacle detection control section controls the barricade.

9. FUTURE SCOPE

Now this project is mainly for demo purpose ,we have developed a prototype of the module. In future this prototype can be taken into production level. To going further, most of the modules can be embedded along with the microcontroller in a single board and ther by reduce the size of system. For feature we can use camera on board of the robot section to detect specifically whats on the track, so by this the railway department can know status of the track.

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