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IOT BASED CRACK DETECTING, OBSTACLE DETECTING AND ENERGY MINIMIZING ROBOT IN RAILWAY TRACK

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ABSTRACT
Now a days lot of advanced medium of transports have been developed. One of the major transport medium is train. In India majority of the railway tracks have been improved with the latest technology. Accidents may occur due to some mechanical error, but often due to human error. Even then lot of train accidents are occurring due to crack in the railway track due to which many people are losing their lives. Also sometimes due to problem in the signaling train collision have also been occurring. Because of the fast development in advanced technology, many devices have been developed to detect and avoid the accident due to crack railway track and train collision. In this paper, one mini robot has been developed to identify the crack in the robot and also to avoid the collision of the train. The device also has energy minimizing technique in the railway compartment. The proposed mini robot has multiple sensors for crack detection, obstacle avoidance and energy consumption. It uses IR sensor, ultrasonic sensor and touch sensor. All the status from the sensors will be updated to the specific IOT website. Keywords: IR Sensor; IoT; Touch Sensor.
KEYWORDS: IR Sensor; IoT; Touch Sensor

I. INTRODUCTION

In India and lot of people prefer railway as their medium of transport. Because of this many technological advancements have been carried out to improve the railway transportation. Since railway is the major transportation medium and spread over in all over the India, it needs proper maintenance. Without proper maintenance it is difficult to avoid accidents in railway. Now-a-days lot of technological development have been done to improve the railway department. Many microcontroller based devices have been developed to identify the problem in the railway track. Those devices use simple sensors to detect the error in the railway system [8].

II. LITERATURE SURVEY

César Briso-Rodríguez, Ke Guan, Yin Xuefeng proposed a system that includes communication for controlling and supervision of the wireless sensors in the high speed trains. [1]. Ishan Jain, Shubham Malik, Soumya Agrawal proposed a system to detect track, and to find the train collision. Also the system warns the train driver through SMS if the collision is about to occur [2]. Fraga-Lamas, Tiago M. Fernández-Caramés and Luis reviewed GSM technology used for railway[3]. George Lederman, James Garrett explored a mechanism for proper monitoring of the railway infrastructure [4]. Anbazhagan P and Dixit, Naresh PS and Bharatha, TP used GPR antenna for the identification of type and degree of railway system fouling in [5]. Borja Martinez, Marius Mont, Ignasi Vilajosana and Joan Daniel Prades presented complete model for wireless sensors. Using this model approaches the minimum power with maximum efficiency[9]. In [6], the model proposes a system for energy minimization in railway communication network. It gives the basic concept of using cloud server based smart vehicular tactical manoeuvre systems in smart cities an mandatory usage of the Internet of Things.[7].

III. PROPOSED SYSTEM

The proposed system uses multiple sensors for railway application. It consists of IR sensor, ultrasonic sensor and touch sensor. The IR sensor will sense the crack in the railway track. If it detects, then this system updates the crack detected information to the IoT website and stops the train slowly. The ultrasonic sensor will notice the obstacle in front of the train. If it detects, then the information will be updated to the IoT

website and it slows down the train. All the status from the sensors will be updated to the specific IoT website. The train can also be stopped through the IoT. To stop the train manually we can use IoT. The light and fan will be controlled with the help of touch sensor. If the touch sensor doesn't detect the user, it will turn off the light and fan. By this process more energy can be saved.

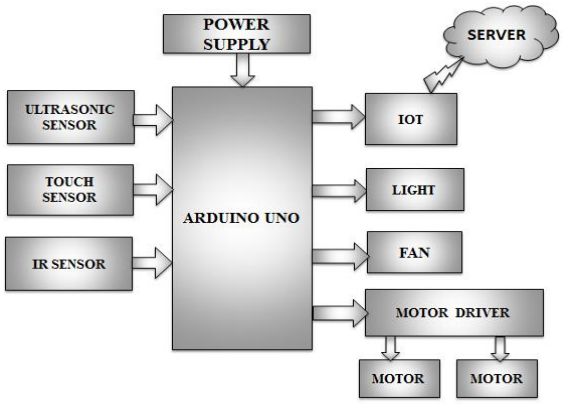

Fig.1-Block diagram of IOT based Crack detecting, obstacle avoiding and energy minimizing robot in Railway

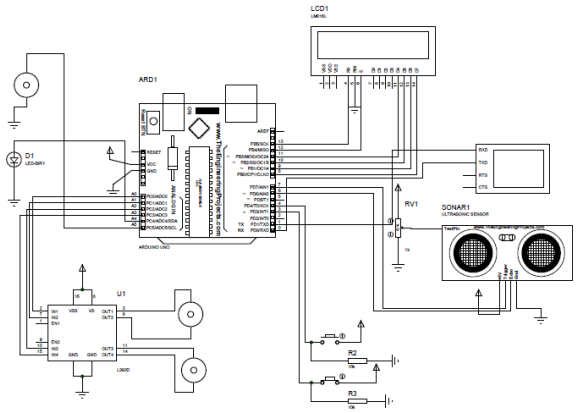

Fig.2-Circuit diagram of IOT based Crack detecting, obstacle avoiding and energy minimizing robot in Railway

IV. COMPONENTS AND ITS DESCRIPTION

The main components of the IoT based crack detecting, obstacle avoiding and energy consuming robot for Railway track includes,

- IR sensor
- Ultrasonic sensor
- Touch sensor
- Arduino UNO
- Node MCU for IoT
- DC Motor
- LCD
- Light
- Fan
- Power supply circuit

A. IR SENSOR

An infrared sensor emits infrared rays to sense the obstacles in the surroundings. An IR sensor can assess the heat of an thing as well as detect the motion [10]. These type of sensors measures only infrared radiation.

IR radiation are unseen to our eyes, that can be detected by an infrared sensor [11]. When the IR light falls on the photodiode, its output voltages changes based on the IR light received.[12]

B. ULTRASONIC SENSOR

The principle of ultrasonic sensor is based on SONAR and RADAR. This sensor is used to detect the distance of the two objects by generating high frequency signals. The high frwquency signlas falls on the objects it is reflected from the object. The reflected waves are used to find the distance of the objects.

C. TOUCH SENSOR

A touch sensor detects the physical touch by its vibrations.

D. ARDUINO UNO

The Arduino UNO is a microcontroller board using ATmega328P microcontroller This is a open source microcontroller. It has The board is equipped with sets of analog and digital input/output pins that may be to interfaced to various expansion boards and other circuits.

V. SOFTWARE REQUIREMENTS

The software used in the IoT based crack detecting, obstacle avoiding and energy consuming robot for Railway track includes,

Arduino IDE
Proteus

A. ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a cross – platform application that is written in the programming language Java.It is used to write and upload programs to Arduino board.

B. PROTEUS

The Proteus design software is used to design automation in electronics circuitry.

VI. IMPLEMENTATIONS

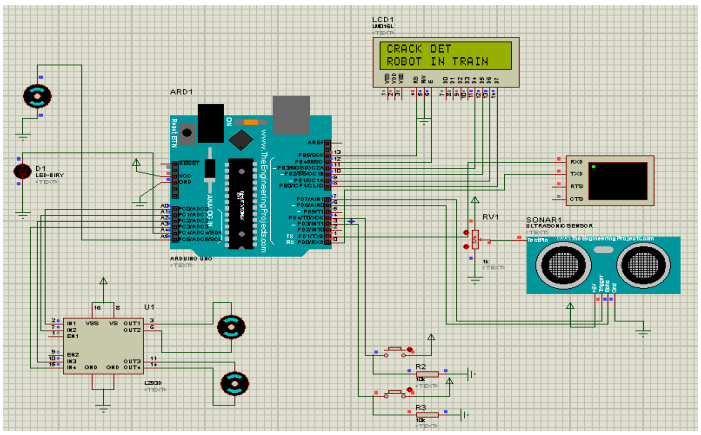

Fig 3: Initial Condition

At normal condition, the measured details are displayed at the LCD.

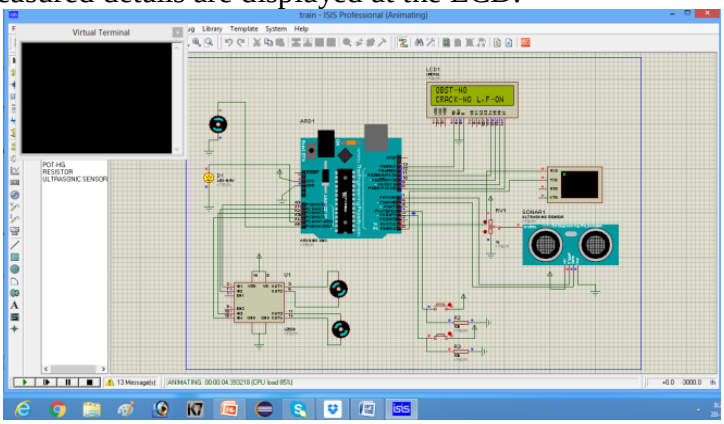

Fig.4- Switching On and Off the light and fan automatically regarding the presence of passenger

When the train detects the passenger, then light and fan will be automatically turned on and the information is displayed in the LCD for reference.

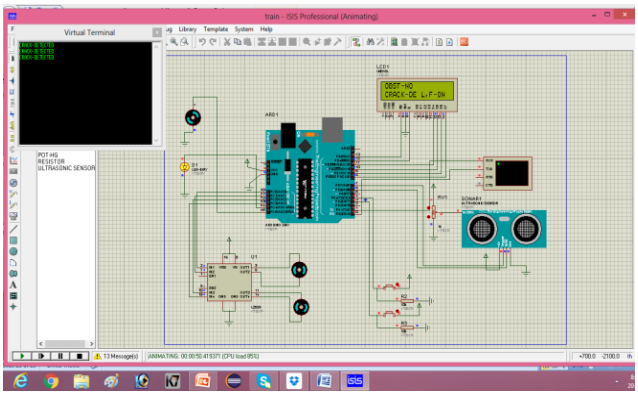

Fig.5- Crack detection in the track

When the IR sensor detects the crack in the track, it stops the train slowly and the message is passed to the specific IoT website for further action.

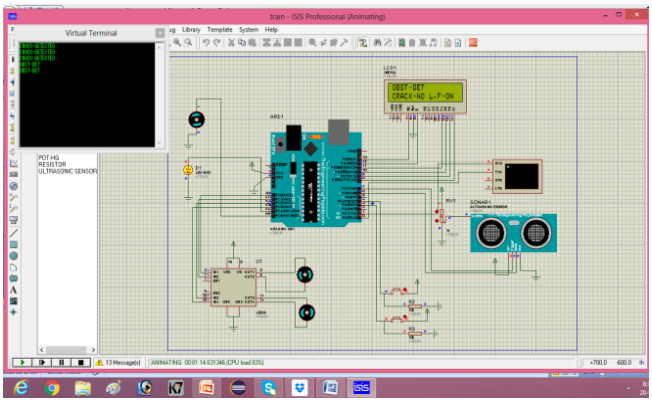

Fig.6-Obstacle detection in the track

When the ultrasonic sensor detects any obstacle in the track it automatically stops the train and the information is sent to the specific IoT website for further action.

VII. CONCLUSION

By using this IoT based crack detecting, obstacle detecting and energy consuming robot in the railway, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents. By using this robot for the purpose of railway track inspection and crack detection , an automated message will be sent to an IoT specific website. This will greatly help in maintaining and monitoring the condition of railway track. And also it greatly helps to conserve energy by automatically turning ON and OFF the lights and fan in the train by detecting the passenger in the train.

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