



Avoidance of accident in train tracks using IOT

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ABSTRACT

Railway crack and object detection is a forward step to improving the railway system. In this project we mainly focused on the safety. This project makes the Indian railway more reliable. The system performs two main functions. The first one is detecting the crack on the railway track by using the IR Sensor and the second one is detecting the object by using ultrasonic sensor. Also, the location is sent where the accidents occur by using the GPS and cloud. The wifi will send the message to cloud web based application which is monitored by the authority. The authority get alert and send the man power as required according to the situation. This will increase the safety of Indian railway system.

Keywords: Railway accident, railway cracks and railway track detection.

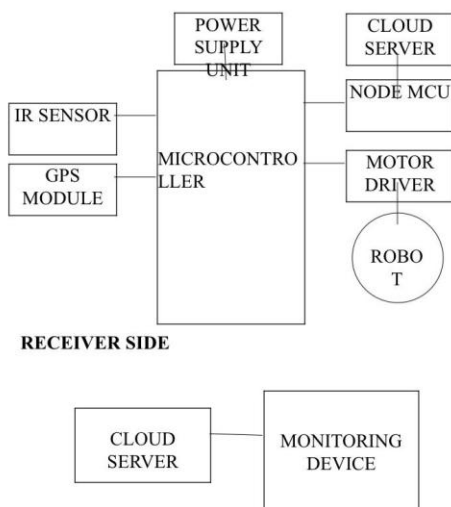
1. Introduction

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 Arduino 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 store the value in cloud using ESP8266. It will provide the live feed of the track. The live feed and the data from the GPS will be updated in the web application. By using this technology, we will be able to prevent the loss of precious life or property.

1.1. Objective

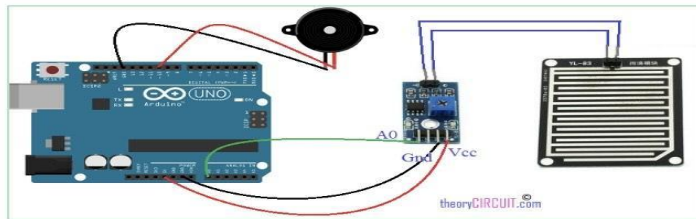
Most of the accidents in the train are caused due to cracks in the railway tracks, which cannot be easily identified. The manual inspection of railway track took more time and human fatigue. The proposed system introduces Bluetooth based technology, to prevent the train accident. Two IR sensors are installed at front end of the inspection robot which monitors the track and gives the status to Arduino controller. If there is crack found it immediately sends the location of crack via Bluetooth to mobile phone. The proposed broken rail detection system automatically detects the faulty railway track without any human interference. There are many advantages with the proposed system when compared to the traditional detective techniques. The advantages include less cost, low power consumption, and less analysis time and also facilitate better safety standards for rail tracks and provide effective testing infrastructure.

1.2. Block diagram



1.3. Components

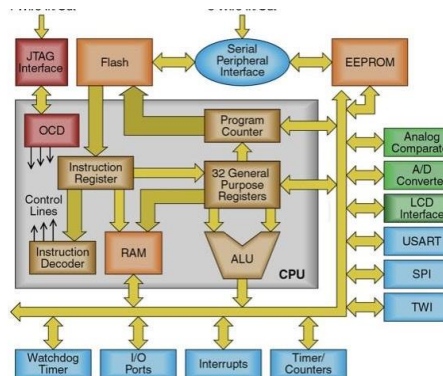
Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.



ARDUINO UNO INTERFACE WITH SENSOR & BUZZER

1.4. Pin diagram

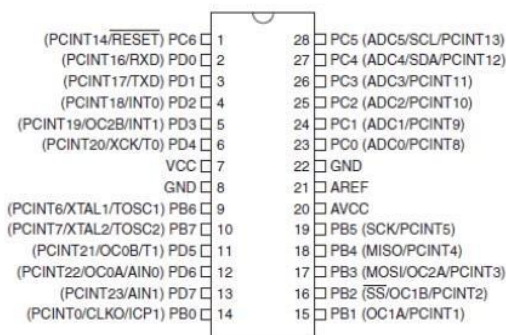
- High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family
- Advanced RISC Architecture
 - 131 Powerful Instructions
 - Most Single Clock Cycle Execution
 - 32 x 8 General Purpose Working Registers
 - Fully Static Operation
 - Up to 20 MIPS Throughput at 20MHz
 - On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory Segments
 - 4/8/16/32KBytes of In-System Self-Programmable Flash program memory
 - 256/512/512/1KBytes EEPROM
 - 512/1K/1K/2KBytes Internal SRAM
 - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM C(1)°C/100 years at 25°Data retention: 20 years at 85
 - Optional Boot Code Section with Independent Lock Bits In-System Programming by On-chip Boot Program
 - True Read-While-Write Operation
 - Programming Lock for Software Security Atmel® QTouch® library support
 - Capacitive touch buttons, sliders and wheels–QTouch and QMatrix® acquisition
 - Up to 64 sense channels
- Peripheral Features
 - Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
 - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
 - Real Time Counter with Separate Oscillator
 - Six PWM Channels
 - 8-channel 10-bit ADC in TQFP and QFN/MLF package
 - Temperature Measurement
 - 6-channel 10-bit ADC in PDIP Package
 - Temperature Measurement
 - Programmable Serial USART–Master /Slave SPI Serial Interface
 - Byte-oriented 2-wire Serial Interface (Philips I2 C compatible)
 - Programmable Watchdog Timer with Separate On-chip Oscillator
 - On-chip Analog Comparator
 - Interrupt and Wake-up on Pin Change



1.5. ATmega328

The ATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TOFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

ATmega328P IC



2. Proposed system

The proposed system identifies the faulty part to overcome the limitations of the existing system. We get the exact location of the broken rail track by the latitude and longitude positions of the location. In our system, we have introduced the infrared sensor with wireless module called Node MCU to transmit the information to the cloud. If any crack is occurs in the railway rack, suddenly the IR sensor sense that unequal surface and send a output voltage to the controller. IR sensor is fitted in front of train engine to detect any obstacle present on track with in the line of sight. It can be operated in tunnel also without interruption. It totally reduced the manpower because it is fully automated. The IR transmitter will be attached on one rails track and the IR receiver mounted on opposite rail track. During normal operation, when there are no cracks, the light from transmitter does not fall on the receiver and hence the set value is low. This design is very simple and sensible therefore device easily works. The times taken for detecting the crack in the track are less and operate easily. It totally overcomes the manpower by fully automated.

3. Conclusion

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. Cracks in rails have been identified to be the main cause of derailments in the past. Hence, owing to the

crucial solution of this problem, we have worked on implementing an efficient and cost effective solution suitable for this application. This system automatically detects the faulty rail track without any human intervention. There are many advantages with the proposed system when compared with the traditional detection techniques. The advantages include less cost, low power consumption and less analysis time. By this proposed system, the exact location of the faulty rail track can easily be located which will mended immediately so that many lives can be saved. By using LED-Photodiode assembly for railway track crack detection system we got accuracy up to 80%.

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