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AUTOMATIC RAILWAY CRACK LOCATOR

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Communication:

Abstract - *The Indian railway is the India's biggest mode of transport. Indian railways have 121,407 km (75,439 mi) of track over a route of 67,368 km (41,861 mi) and 7,216 stations. It is one of the busiest networks in the world, transporting 8.107 billion passengers per year. This big and complex system requires fully control and secure network. This paper is for monitoring the condition of rail on train tracks and more specifically has the object of the identification of defects detected by monitoring equipment on the tracks to be checked to allow maintenance crews to subsequently find these defects. The paper relates to the location of singular points in the automatic control of railway tracks. The control equipments is provided with sensor orientated to detect the crack. IR Sensor and Ultrasonic sensor is used to detect the crack and distance respectively.*

Key Words: Railway Network, Automatic control, crack detection, IR Sensor, Ultrasonic sensor

1. INTRODUCTION

Depending on the fast developments in railway systems, high-speed trains are used, and rail transportation is increased day by day. Today's most of the people uses railway for transportation, it is essential for transferring the goods and passengers from one place to another place. And also the railway system are provide facility such as high speed, with economical, environment friendly, safety, and better characteristics of railway systems[1].These characteristics can be performed by time to time maintenance and control measurements. But depending on different factors, deformations and derailment may occur on the superstructure of railways. These derailments and other problems of railway system like, improper maintenance and the currently irregular and manual track line monitoring mistake from workers [2]. Such deformation and derailment are determining on time and taking precautions is very important for the safety of railway systems. Therefore effective solution system is design on this problem is introduced in this paper.

The solution is a comprehensive GSM based train tracking system, which provides accurate, dependable and timely information to the controller [1]. The inbuilt GPS module identifies the train location with a highest accuracy and transfers the information to the central system via GSM.

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.

Fig -1: Cracks on railway tracks

Positioning data along with train speed helps the administration to identify the possible safety issues and react to them effectively using the communication methods provided by the system.

Additionally, this paper proposes a system which monitors the track in front of a train for obstacle detection using multi sensor setup. If an obstacle is detected, the inbuilt GPS module identifies the train location with a highest accuracy and transfers the information to the central system via GSM.

Fig -2: Tree fallen on the railway tracks

2. PROPOSED SYSTEM AND ITS COMPONENT

In this proposed system we use ARDUINO board having microcontroller ATMEGA328 to control all the functions as CPU. Microcontroller controls the rotation of motor. When we give the supply to the device, the DC motor gets start through relay driver circuit. IR sensors are fixed in front of the train is used to find out the crack on the rail [3]. Sensor will produce the signal related position with the rail. If the track is normal on its position the sensor gives the constant sensed output. Ultrasonic sensor is also used to measure the distance of crack.

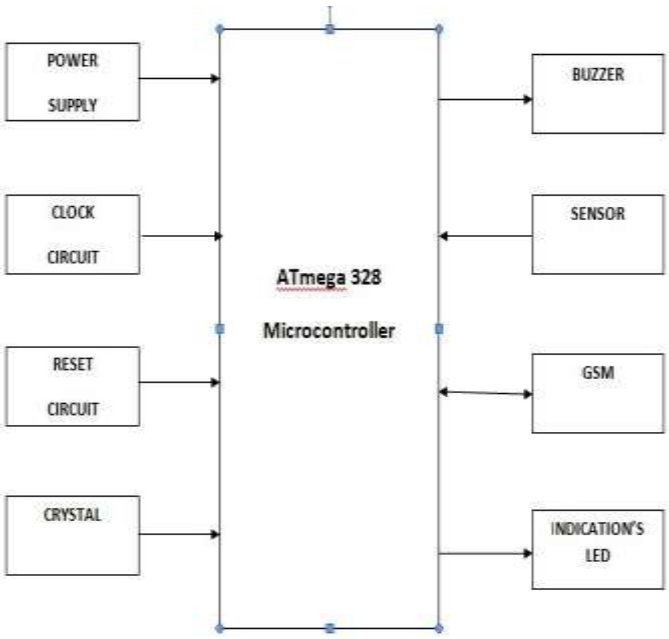

Fig -3: Functional Block diagram

3. REQUIRED COMPONENTS

List of component used in this proposed system which is as follows:

1) Microcontroller:

The ATmega328 is high-performance Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timers 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 TQFP 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.

2) GSM Module:

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

3) LED-LDR Assembly:

The common 5V LED and cadmium sulphide LDR was found to be sufficient. The LED is powered using one of the digital pin of the ARM controller. The LDR and a 45kΩ resistor form a potential divider arrangement. The output of the potential divider is given to one of the analog input channel of the ARM. The LDR is calibrated every time the robot is used. The light dependent resistor or cadmium sulfide (CdS) cell is a resistor whose resistance decreases with increasing incident light intensity.

4) GPRS Module:

In this system the GPRS module is used to know the exact location of the broken rail track. The GSM modem sends the coordinates of the faulty rail track to the GPRS which then sends the exact location to the mobile.

5) DC Motor:

The proposed design uses 4 DC motors (Torque Rating: 10Kg and Speed Rating: 500 rpm) interfaced with the ARM With a wheel diameter of 5.2 cm and the total mass of around 5 Kg. The approximate speed of the robot is around 0.5 meter/sec.

6) Infrared Sensor:

IR Sensors [3] work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

7) Ultrasonic Sensor:

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

8) Buzzer:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

4. CONCLUSIONS

In this paper, we have presented the Ultrasonic sensor and IR sensor [3] based crack detection and train tracking system with GSM & GPS technology. The crack can be detected easily & it does not give the false output. GSM base crack detection system automatically detects the faulty rail track without any human interface. This method having many advantages on traditional detection techniques. The main advantages of this system like less cost, low power consumption, on time data operation and minimum analysis time. The simple idea can be implemented in large scale in order to have long run to facilitate better safety and provide effective testing infrastructure for achieving better results in the future

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