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Multi Sensor Obstacle Detection on Railway Tracks

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ABSTRACT - Nowadays in railway systems, it is more necessary to have safety in order to avoid accidents. One of the causes that can provoke serious accidents is the existence of obstacles on the tracks. To avoid accidents, a multi-sensory barrier consisting of infrared (IR) and ultrasonic (US) sensors- and a vision system, is proposed in order to inform the monitoring system of the existence of obstacles. The multi-sensory system is used where the safety and reliable environments is needed. Principal Components Analysis is applied to the data obtain from the barrier and from the vision system. If there are obstacles on the tracks; and with the vision system information about moving objects is obtained from this technique

Key Words: Node MCU, Ultrasonic sensor, LCD, power supply, Buzzer

I. INTRODUCTION

In order to achieve increased flexibility automated trains would be a promising step ahead. Automated train control is not a technical challenge any more. The only task .which have not been automated yet is surveying the railway track with respect to obstacles and crack. Today a human train driver reduces the risk of an accident by visual perception, triggering appropriate system reactions like whistling and/or braking. Asking for fully automated train operation thus means requiring a technical system, capable of surveying the track in the same way as the human driver does and guaranteeing at least the same integral reduction of risk. In fact, this requires a very high performance in detection and a wide detection range. At the same time an extremely low false alarm rate is required.

To get maximum information about a fact object we exploit the concept of complementary physical principles and strategies. To get maximum confidence in interpretation the concept of redundancy is used. Another concept is modularity: one can add new modules to the system till the claim is reached or replace modules if new ones do the job more efficiently. The entire concept is applied in measurement principles, hardware, software architecture and algorithms. In our project we use ultrasonic sensor to detect the obstacle and cracks onthe railway track. All the collected information transfer to the station master using thinks speak.

OBJECTIVE

1. To detect obstacle for railway
2. Generate alert if obstacle detect
3. Send data to server

II. LITERATURE SURVEY

A multi-sensor obstacle detection system for the use on railway track was specified, implemented and tested. The applied look-ahead sensors are: Video cameras (optical passive) and LIDAR (optical active). The objects delivered by the sensors were fused, classified and their description is sent to the central vehicle unit. [1].

It has been shown that the fusion of active and passive optical sensors and a railway track data base lead to very robust performance. The overall detection performance has shown to be comparable to thatof a human driver. They successfully demonstrated a multi sensor obstacle detection system prototype having an up to reactions like whistling and/or braking.

Locomotives are at risk to collisions and derailment due to obstacles on the track. Trains do not have the ability to steer around obstacles, they are confined to the track and depend on stopping to avoid hazards. These accidents often result in loss of life and revenue. Due to the great momentum of the locomotives stopping distance required exceeds the operator's sight distance [2]

III. BLOCK DIAGRAM

In this proposed system we are using Node MCU board. The Node MCU is an open source integrated development environment which simplified the coding greatly. The proposed system consists of Ultrasonic sensor for obstacle detection

Node MCU controller is used to control the sensor outputs and transmit the information through an iot module whose function is to send the signal whenever it detects a obstacle to the base station through an TCP. Hence the proposed system is efficient and cost effective.

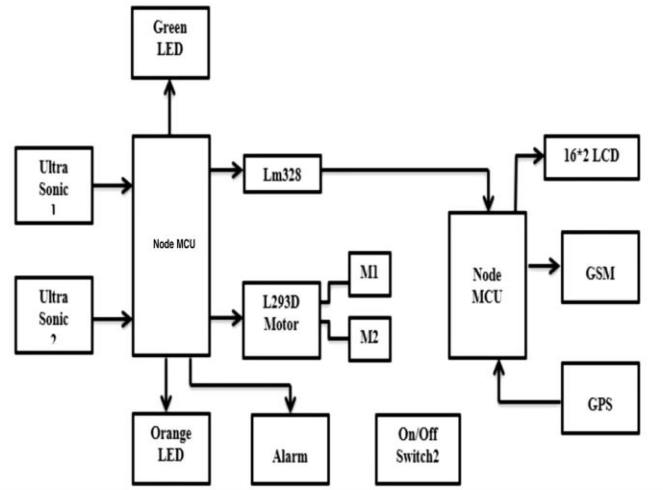


Figure 1: Block Diagram

IV. CIRCUIT DIAGRAM

In above circuit diagram we design 5 v power supply for that bridge rectifier and lm7805 regulator ic is used which give fixed 5v output After that we interface 2 ultrasonic sensor to node MCU for detect obstacle on track and message is display on LCD which 16x2 alphanumeric display. If obstacle detect then buzzer is on and message send to server using IOT.

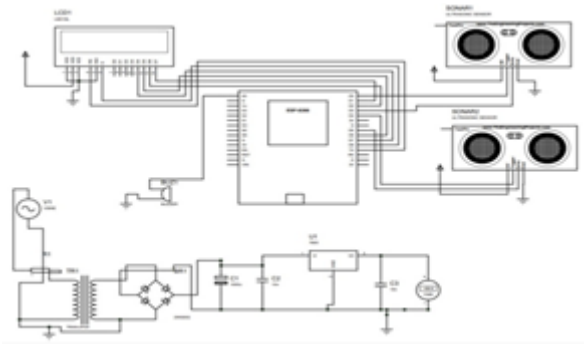


Figure 2: Circuit Diagram

IV. HARDWARE INTERFACES

A) Power supply 5V

B) Ultrasonic sensor SR04

C) LCD 16x2

D) Piezo Buzzer

E) Node mcu ESP 8266

F) Atmega 328 microcontroller

(A) Ultrasonic Sensor

Figure 3: Ultrasonic sensors

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception.

(B) Liquid Crystal Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.

Figure 4: Liquid Crystal Display

(C) Buzzer

The two most common technologies used in buzzer designs are magnetic and piezo. Many applications use either a magnetic or a piezo buzzer, but the decision regarding which of the two technologies to useis based upon many different constraints. Magnetic buzzers operate at lower voltages and higher currents (1.5~12 V, > 20 mA) compared to piezo buzzers (12~220 V, < 20 mA), while piezo buzzers often have greater maximum sound pressure level (SPL) capability than magnetic buzzers.

However, it should be noted that the greater SPL available from piezo buzzers requires larger footprints.In a magnetic buzzer, a current is driven through a coil of wire which produces a magnetic field. A flexible ferromagnetic disk is attracted to the coil when the current is present and returns to a "rest" position when the current is not flowing through the coil. The sound from a magnetic buzzer is produced by the movement of the ferromagnetic disk in a similar manner to how thecone in a speaker produces sound.

(D) NodeMCU

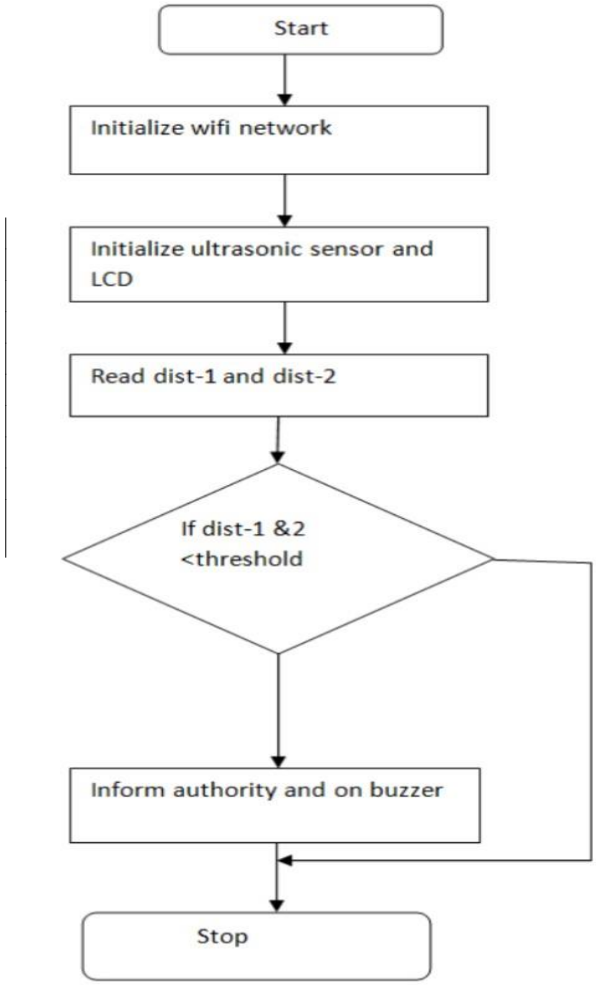
The Node MCU (***N***ode ***M***icro***C***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi),and even a modern operating system and SDK. That makes it an excellent choice for the Internet of Things (IoT) projects of all kinds.

However, as a chip, the ESP8266 is also hard to access and use. You must solder wires, with the appropriate analog voltage, to its pins for the simplest tasks such as powering it on or sending a keystroke to the "computer" on the chip. You also have to program it in low-level machine instructions that can be interpreted by the chip hardware. This level of integration is not a problem using the ESP8266 as an embedded controller chip in mass-produced electronics. It is a huge burden for hobbyists, hackers, or students who want to experiment with it in their own IoT projects.

SOFTWARE INTERFACE

- Arduino

V. FLOW CHART



VI. FEATURES

A) The system run on low voltage

B) The system is less complex

C) Operating voltage 5v

D) Easy to use

VII. ADVANTAGES

A)Less cost

B) Easy to use

VIII. APPLICATIONS

A) It is used for detecting obstacle and crack on railway track.

B) Monitoring the tracks.

C) We can use this system for other vehicles also

IX. CONCLUSIONS

The cost of the proposed system is very less. It also checks obstacle and crack in the railway track. Transmitting signals are immediately transferred and accidents are reduced. It can work in any terrain 24*7and detects obstacle on railway track accurately.

The project is developed and designed to improve rail track management and the main aim of project, is to reduce man power. By using this project we can detect obstacle on the track. In the proposed method Ultrasonic sensor is used to detect the crack and to detect object on the track. The system continuously checks the crack and obstacle & Information send to the authority.

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