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Intelligent Train Engine to Avoid Accidents and Railway Gate Controlling

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Abstract:-Now-a-days public is facing many threats from the railway department by which they are hesitating to plan a train journey. Railway accidents may occur due to various reasons like an obstacle on the railway track or near the railway gate, fire inside the train and so on. Though the railway department is trying to take actions to reduce such informal things but couldn't see the face of success completely. This project has designed a system which will help the railway department by overcoming accidents. This project is introduced to add automation in railway transportation. Here obstacle sensor is used to monitor the track and sense any obstacle, if sensed in short distance signal is transmitted to the receiver section which will give horn i.e. buzzer and train stops. If any person or vehicle is trying to cross the railway gate then also train stops and the gate is kept open by the DC motor for the person or vehicle to pass. Fire sensor is used to detect fire which will buzzer to alert passengers as well run motor to spread water on the fire detected surface. RF transmitter and receiver are used to continuously transmit and receive signals to control the movement of train. DC motor is fixed at the railway gate to open and close the gate, as well as spread water based on signal received. Here AT89S52 microcontroller is employed for the functioning of the system.

Keywords:-Microcontroller AT89S52, Fire Sensor, Obstacle Sensor, DC motor, Buzzer, RF Transmitter and Receiver, RF Encoder and Decoder.

I. INTRODUCTION

This project adds automation to railway system. Here IR sensor is employed as an obstacle sensor which detects obstacle on track, if any obstacle is detected on track within short distance the buzzer will horn and the train stops immediately. The RF transmitter and RF receiver is fixed to the train as well as at the railway gate. RF transmitter continuously transmits signals to the RF receiver, which controls the operation of train. The RF receiver section fixed at the railway gate open or closes the railway gate based on the signal received from transmitter. DC motor is employed at gate for closing and opening the railway gate. Now suppose the train is approaching railway gate and at the same time a person or vehicle is trying to cross the gate, the IR sensor detects the object and transmits the signal through RF transmitter. With this the gate will be kept open and the train stops until the object passes. If the fire is detected by the fire sensor, then water is spread automatically on the detected surface with the help of DC motor. Also the sensor will buzzer to alert all the passengers. In this way the rail accidents can be avoided and also controlling of the gate is done perfectly without injuring people while crossing the railway gate. Even after taking precautionary measures, if the train misses the track then immediately message is sent to the control room to take the necessary action to save people.

II. BLOCK DIAGRAM

Functional block diagram of the proposed system in which the Microcontroller 8051 is interfaced with obstacle and fire sensor, DC motor, buzzer, RF transmitter and receiver, RF encoder and decoder, LCD and LEDs.

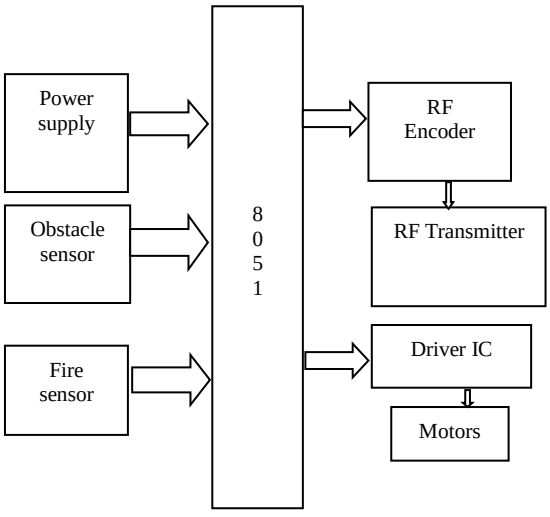

Fig.1 Transmitter Section at Train Side

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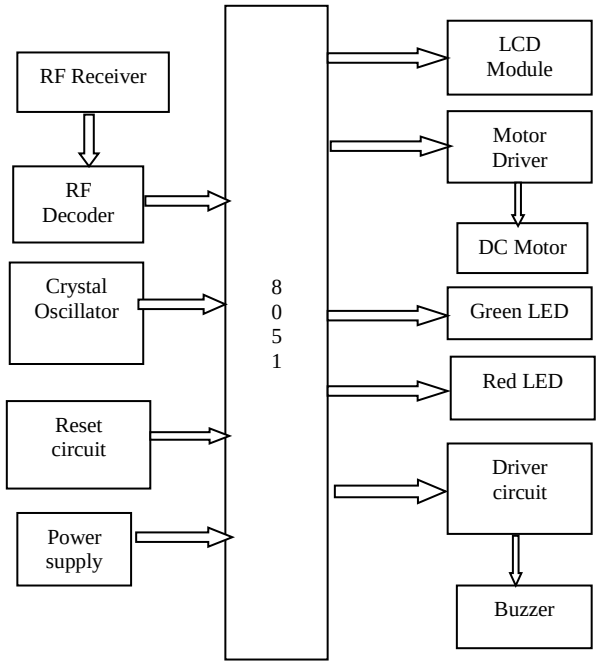

Fig.2 Receiver Section at the Train Side and Railway Gate

III. RELATED STUDY

A. AT89S52 Microcontroller

It is a low power, high performance CMOS 8-bit microcontroller with 8Kbytes of Flash, 256 bytes of RAM, 32 I/O lines, watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two level interrupt architecture, a full duplex serial port, on-chip oscillator and clock circuitry.

B. DC Motor

For closing and opening the railway gate, we are using DC motor. It is operated by 12V DC power supply. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; and to the strength of the external magnetic field we are placing DC motor for controlling the railway gate activity depending on the instructions passed from micro-controller.

C. Liquid Crystal Display(LCD)

To display any character on LCD, microcontroller has to send its ASCII value to the data bus of LCD. LCD display used here is 16*2 which means 2 lines each with 16 characters.

D. Light Emitting Diode(LED)

Light Emitting Diodes consume less power and gives more life. Here we have used red and green LED's.

E. L293D Driver IC

It is a dual H-Bridge motor driver, so with one IC we can interface two DC motors which can be controlled in clockwise and counter clockwise direction. L293D has output current of 600mA and peak output current of 1.2A per channel. The output supply(VCC2) has a wide range from 4.5V to 36V which has made L293D a best choice.

F. Power supply

The AC input i.e 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output of the rectifier is a pulsating DC voltage which is passed through a filter to remove AC components. Now, this voltage is given to a voltage regulator to obtain a pure constant DC voltage.

G. Buzzer

A buzzer is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke.

H. HT12E Encoder and HT12D Decoder

The HT12 encoders are a series of CMOSLSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12_N data bits. Each address/data input can be set to one of the two logic states. The programmed address/data are transmitted together with the header bits via an RF or infrared transmission medium upon receipt of a trigger signal.

The HT12 decoders are a series of CMOSLSIs for remote control system applications. The decoders receive serial addresses/data from encoders which are compared with the serial input data continuously. If no error the data codes are decoded and transferred to the output pins.

I. RF Transmitter and RF Receiver

- Features of STT433 RF Transmitter: Low cost, 433.92MHz frequency, 1.5 to 12V operation.
- Features of STR433 RF Receiver: Low cost, 433.92MHz frequency, 5V operation.

J. Obstacle sensor and track sensor

An object can be detected with an infrared system consisting of an infrared transmitter and a receiver. The IR transmitter is a particular LED that emits radiation in the frequency range of infrared, invisible to the naked eye. An infrared LED works with a voltage of 3V DC and a current consumption of about 20mA. The IR receiver detects infrared radiation emitted from the IR transmitter. The sensor has very good and stable response even in ambient light or complete darkness.

K. Fire sensor

Flame detectors respond to the production of one or a combination of ultra-violet or infrared spectrums of electromagnetic radiation. These detectors are often used in situations where there is a potential for the rapid development of fire such as flammable liquids. These detectors comprise an electronic circuit with an electromagnetic radiation receiver. Flame detectors are actuated when they receive electromagnetic radiation from one or more defined wave

lengths are received according to design in the ultra-violet or infrared spectrum. If the fire is detected by the fire sensor, then water is spread automatically on the detected surface with the help of DC motor. Also the sensor will buzzer to alert all the passengers.

IV. SOFTWARE IMPLEMENTATION

For the software implementation, we deploy two software packages. First one is the keil uvision 3.0. second one is the Flash magic simulator. The keil uvision debugger accurately simulates on-chip peripherals. Simulation helps to understand hardware configuration and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using Keil IDE software will be stored in microcontroller. Keil development tools for the microcontroller architecture support every level of software developer from the professional applications engineer to the student for learning about embedded software development. The keil development tools are designed to solve the complex problems facing embedded software developers. Flash magic is used to dump the code to microcontroller from PC. Flash magic is a free, powerful, feature-rich windows application that allows easy programming of Philips Flash microcontroller. Build custom applications for Philips microcontroller on the flash magic platform, use it to create customer end-user firmware programming application or generate an in-house production line programming tool. The flash memory in-system programmer is a tool that runs under windows 95/98/NT4/2K. It allows in-circuit programming of Flash memories via a serial RS232 link. Computer side software called Flash magic is executed that accepts Intel HEX format file generated from computer Keil to be sent to target microcontroller. It detects the hardware connected to the serial port.

V. CONCLUSION

The proposed design has every chance to reduce accidents. By deploying obstacle sensor, any obstacles within short distance are continuously monitored and immediate action is taken to stop the train. With the help of fire sensor, water is spread on fire detected surface as well as passengers are alerted. Flame detectors respond to the production of one or a combination of ultra-violet or infrared spectrums of electromagnetic radiation. This design is a useful tool for railway department to reduce the accident rate. Here controlling of the railway gate is also done without injuring people while crossing the gate. Even after taking precautionary measures, if the train misses the track, then immediately message is sent to the control room to take necessary action to save people. Hence it is expected that, major train mishaps can be prevented and human life saved with this proposed project.

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