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Safe Secure Sensible Railway

Aleesha Susan Abraham[1], Divya A[2], Saranya K P[3], Vibindas R[4], Vishnu K T[5], Srikanth K[6]

[6]*Asst Professor, Dept. of Electronics and Communication Engineering, Ammini College of Engineering, Palakkad*
[1,2,3,4,5] *Final year Students, Dept. of ECE, Ammini College of Engineering, Palakkad, Kerala, India*

Abstract – *In this paper, we design a more reliable and easy handle of railway-track system, which is controlled and co-ordinated by programmed embedded chips. A microcontroller with zigbee interface captures the informations from stations and start or stop train automatically according to signals received. It replaces the manual light oriented signaling to a more advanced and automated way. The railway stations also have controlling units which is working automatically according to the sensor inputs. The sensors give the informations of tracks to the control unit and the program loaded in the chip switch the tracks by handling switching motors. Here we also implement another section which automatically close or opens the mobile platforms in between the track trains. Normally the mobile platform connects the two platforms through which the passenger can walk on the platform to reach on the next platform. Sensors are placed on the two sides of track. If the train reaches one sensor the mobile platform will automatically close and allows the train to go through the tracks and then when the train leaves the second sensor the mobile platform will automatically open the bridging platforms.*

Key Words: ATMEL Microcontroller, Zigbee.

1. INTRODUCTION

Railways have one of the largest and busiest network in the world. So, it is very difficult to manage the railway track in real time especially in winter having dense fog. Accidents in rail road railings are increasing day by day.This project deals with one of the efficient method to avoid train accidents.There are sections in this project.

Here we design a more reliable and easily handled rail-track system, which is controlled and co-ordinated by programmed embedded chips. And it controls the railway track switching mechanism automatically. It will reduce the collision of train and will also manage the route of a particular train to avoid any delay in reaching its destination. Also,it replaces the struggle of platform to platform luggage transfers ,very helpful for old age peoples who may have problems by over or under bridge and it is possible to move fast from platform to platform with less effort.

2. BLOCK DIAGRAM

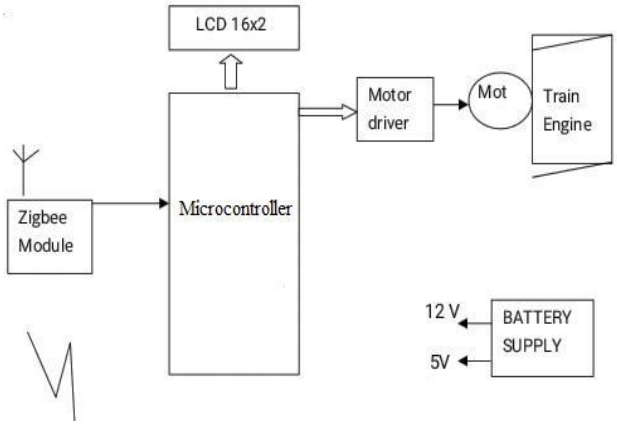


Fig -1: Block diagram of Train.

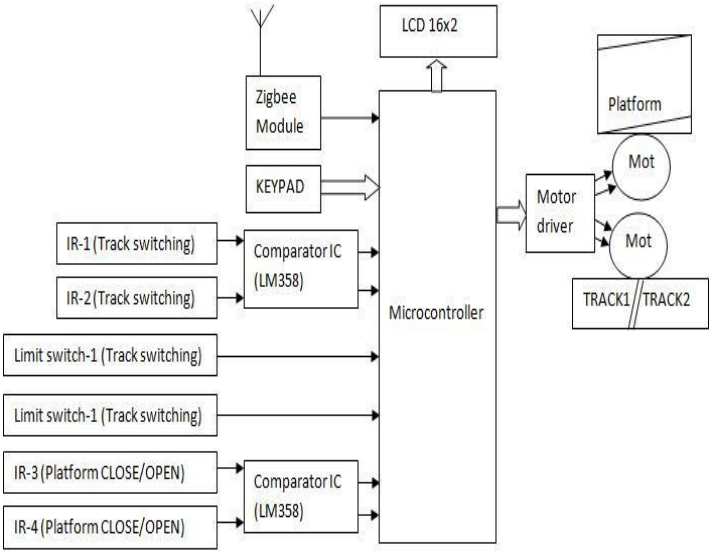


Fig -2: Block diagram of Station.

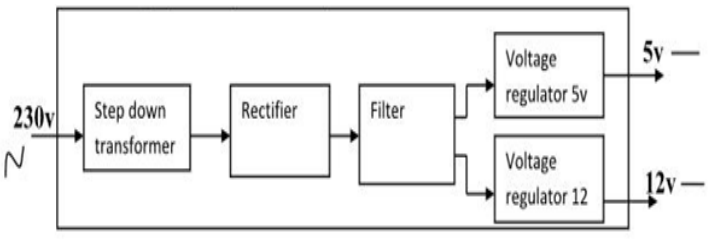


Fig -3: Block diagram of Power supply.

3. WORKING

Our project consists of 3 section: signalling, track switching and pedestrial cross. Signalling section contains a transmitting unit and a receiving unit. Zigbee module is used here for communication. The input is given through keypads and it is transmitted by the zigbee transmitter .Here, the transmitter unit is at the station and the receiving unit is at the train. The signal received by the zigbee receiver in the receiver unit which is in connection with the controller. The controller is connected to the engine by means of motor driver. According to the signal received the controller take the immediate action.

The next section is track switching. Switching section mainly contain two IR sensors, two limit switches and a motor that is interfaced with the microcontroller in the station. IR sensors will be placed at both ends of the track.IR sensors contain IR LED and IR photodiode. They are placed in the same direction. IR LED emits light. When the train enter to IR range the IR rays will get cut and photodiode conducts. The voltage received at the comparator terminal becomes high and other terminal will get low. Thus the analog voltage value get changed to a digital code at the comparator output. The controller switch the train to respective track as per the code received from the comparator. Limit switch is provided to limit the movement of track to a particular point.

The third section is pedestrial cross and the IR sensors are placed at both the end. When train enters the IR range the IR rays get cut and as per the signal received the microcontroller make the motor rotate to open the platform. When the train leaves the station the IR placed at the other end sense and the motor rotates in opposite direction to close the platform. Thus, it paves the way for people to cross the platform.

4. HARDWARE SECTIONS

Main hardware sections used in this paper are ATMEL 89S52 microcontroller, zigbee module, comparator ,motor driver, IR sensor, limit switch and LCD for displaying the words which is transmitted.

Fig-4: Hardware

4.1 Microcontroller-AT89S52

8051 is the name of a big family of microcontrollers. The device which we used in our project was the 'AT89S52' which is a typical 8051 microcontroller manufactured by Atmel.

Features

- A CPU (Central Processing Unit) 8 Bit.
- 256 bytes of RAM (Random Access Memory) internally.
- Four-port I / O, which each consist of eight bits
- The internal oscillator and timing circuits.
- Two timer / counters 16 bits
- Able to conduct the process of multiplication, division, and Boolean.
- The size of 8 KByte EPROM for program memory.
- Maximum speed execution of instructions per cycle is 0.5 s at 24 MHz clock frequency.

4.2 ZIGBEE module

The transceiver module used here is Zigbee. The operating frequency is about 2.4GHZ. One zigbee module is placed in the transmitter section. Also in transmitter section for serial communication from the PC, USB to TTL converter is used. Since PC doesn't have serial port.

Fig-5: Zigbee 2.4GHZ

Features

- Low power consumption.
- Available frequency at: 2.4 to 2.483 GHz

4. 3 Comparator IC LM358

The LM358 is a low power dual operational amplifer integrated circuit originally introduced by National Semiconductor. It is used in detector circuits. The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It consists of two internally frequency compensated, high gain, independent op-amps.

4. 4 LCD

A 16x2 LCD (Liquid Crystal Display) screen is used to show status of the product or provide interface for inputting or selecting some process. Its advantages are low power consumption, low cost, and good contrast.

4.5 Motor driver IC L293D

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

4.6 IR Sensor

IR sensors use infra red light to sense objects in front of them and gauge their distance. The commonly used Sharp IR sensors have two black circles which used for this process, an emitter and a detector.

A pulse of infra red light is emitted from the emitter and spreads out in a large arc. If no object is detected then the IR light continues forever and no reading is recorded. However, if an object is nearby then the IR light will be reflected and some of it will hit the detector. This forms a simple triangle between the object, emitter and detector. The detector is able to detect the angle that the IR light arrived back at and thus can determine the distance to the object.

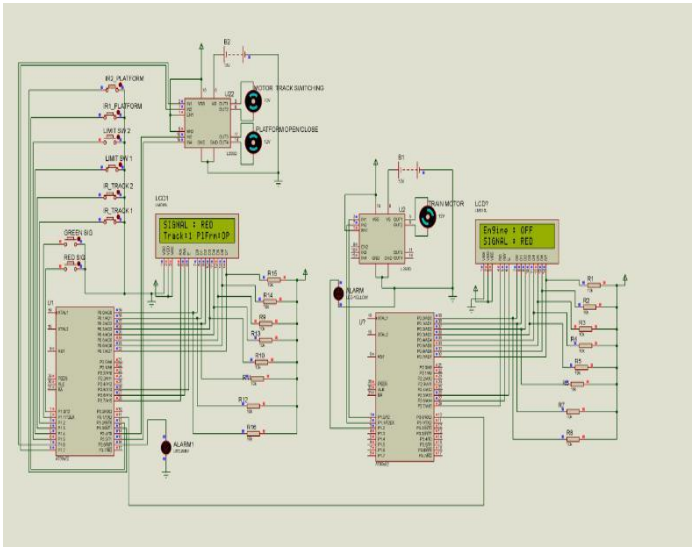
4.7 Limit switch

Limit switches automatically monitor and indicate whether the movement limits of a particular device have been exceeded.The limit switch then regulates the electrical circuit that controls the machine and its moving parts.

4.8 Voltage regulator

The voltage regulator here used is to regulate the DC voltage to a stable voltage level. In this project stable voltages 5V is required. For this 7805 voltage regulators is used for 5V.

5. SIMULATION OF THE SYSTEM



6. CONCLUSION

Here,in this paper we implement a reliable and efficient system for improving the present condition of Indian railway. Today the main problem faced by Indian railway are unexpected accidents. This paper mainly focus on this scenario and we successfully implemented to overcome this.

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BIOGRAPHIES

Srikanth. K received his B. Tech. degree in Electronics and Communication Engineering from CUSAT, in 2010, M. Tech in Embedded Systems from Hindustan University, Chennai, Tamilnadu, India, in 2014. Currently, he is an Assistant professor in Ammini College of

Engineering, Palakkad, Kerala. His area of interests cover Wireless Communications, Embedded Systems and Image Processing.

Aleesha Susan Abraham. is doing her B.Tech in Electronics and Communication Engineering at Ammini college of Engineering, Calicut university, Kerala.

Divya A is pursuing her B.Tech in Electronics and Communication Engineering from Ammini College of Engineering, Palakkad, Kerala.

Saranya K P. currently doing her B.Tech in Electronics and Communication Engineering at Ammini college of Engineering, Calicut university, Kerala.

Vibindas R. is with Ammini College of Engineering doing his B.Tech in Electronics and Communication Engineering, Calicut university, Kerala.

Vishnu K T. currently doing his B.Tech in Electronics and Communication Engineering at Ammini college of Engineering, Calicut university, Kerala.
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