Automatic Railway Track Pedestrian Crossing

Sakshi Chillewar [1], Shaunak Deshmukh [1], Tanvi Gulhane [1], Spandan Wasnik [1], Shatakshi Pathak [1]

[1]*Student, Department of electronics engineering, Yeshwantrao Chavan College of Engineering, Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur, Maharashtra, India.*

Corresponding Author: sakshichillewar@gmail.com

Abstract: - This paper presents a design of an Automatic railway crossing for passengers. In this model we have designed a railway crossing platform which is located over the railway tracks and only operates when there is no train on the platform. The two sensors present on either side of the platform sense the incoming or outgoing train. They then send signals to the microcontroller to close or open the automatic platform respectively. The major limitation in current railway infrastructure is that it needs to be updated to cope up with the growing number of passengers. This model aims to do just that.

Key Words: —*Railway Crossing, Railway Platform, Automation.*

I. INTRODUCTION

The present railway system in India is not automated and is fully manmade. In railway stations, normally we use brides. It is very difficult for the elderly persons or handicapped persons to use a bridge.

Also, we can see a lot of accidents happening every year, where people who get on the railway tracks to cross them end up getting hit by the trains. 2/3 rd of all fatal accidents are because of people crossing the tracks rather than using the Foot-over-bride (FOB). So, to overcome these accidents mobile platforms can be used.

This proposed design will reduce if not eliminate the accident count caused by the current railway infrastructure. [1]

II. DESIGN AND FABRICATION OF EASIEST CROSSING PLATFORM FOR HANDICAPPED PERSON

The Automatic Mobile platform refers a type of system that can be used in production as well as in other industries, and particularly for railway station etc. This system includes a compressed operated remote sensing locomotive (carrier) on which a small lift is provided, specific path over which it moves, sensors for sensing the obstructions on the path of the carrier or track also sensors for sensing the load of the train from where load wants to carry and to where.

The remote sensing carrier moves using the electric electrical control from the control unit. It moves with a low and constant speed on the prescribed path. The path has a specific color. The bottom of the track have sensor which is always coupled with the path finder. From the remote station we send only information for moving the carrier, not for steering it. The path does the steering.

The front and rear side of carrier junction contains for pneumatic cylinders in both sides. As it reaches the collecting station, its top floor lift to a small distance and lift the stand that contains the parts wants to assemble, supply.

The carrier moves through the path and reaches the other plat form in railway station. The sensor provided on the carrier detected the station and unload the stand contains assembly parts at that station. And move to collecting stations again. Continues working cycles for making this project a reality. [1]

III. SYSTEM LEVEL ARCHITECTURE

The fig shows the block diagram of the model. It consists of the 2 LDRs, 2 IR sensors, 4 Sonar sensors, 2 stepper motors and 2 laser diode. Arduino UNO board is the controller used in the hardware; it controls the different actions in the working of the model. There are different components interfaced to the controller, which gets ON when it receives high input from the Arduino. [3]

Manuscript revised May 31, 2021; accepted June 01, 2021.
Date of publication June 02, 2021.
This paper available online at www.ijprse.com
ISSN (Online): 2582-7898

- The IR sensors are used to sense the presence of obstacle present in the path of the train with the help of infrared light.
- Sonar sensors are used for measuring the distance with the help of ultrasonic waves.
- Stepper motors are used to control the movement of the mobile platform.
- Laser diodes are used as an indicator in the model.

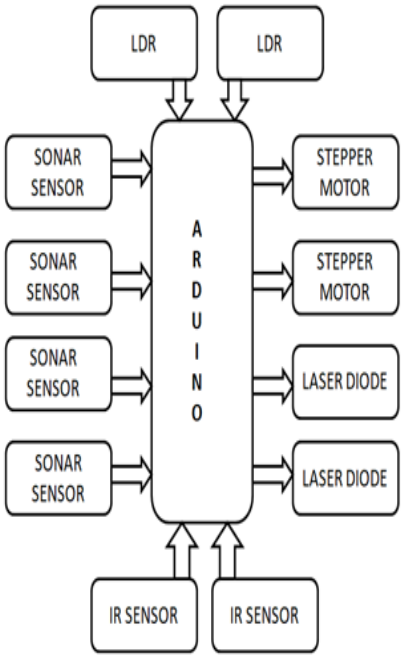

Fig.1. System Level Architecture

IV. COMPONENTS USED

A. Arduino Mega

Device Overview:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button [2].

The Features Include

- The ATmega2560 is a Microcontroller
- The operating voltage of this microcontroller is 5volts
- The recommended Input Voltage will range from 7volts to 12volts
- The input voltage will range from 6volts to 20volts
- The digital input/output pins are 54 where 15 of these pins will supply PWM o/p.
- Analog Input Pins are 16
- DC Current for each input/output pin is 40 mA
- DC Current used for 3.3V Pin is 50 mA
- Flash Memory like 256 KB where 8 KB of flash memory is used with the help of bootloader
- The static random access memory (SRAM) is 8 KB
- The electrically erasable programmable read-only memory (EEPROM) is 4 KB
- The clock (CLK) speed is 16 MHz
- The USB host chip used in this is MAX3421E
- The length of this board is 101.52 mm
- The width of this board is 53.3 mm
- The weight of this board is 36 g

B. Stepper Motor

Two 28BYJ-48 stepper motors were used in the project to control the gates at the level crossing. It is a four phase motor rated at 5VDC and has a pulling torque of 300 gf.cm Stepper motor has a high holding torque which means that it can hold the gate in position very firmly. It has a gear system housed inside the motor. It allows precise control of the rotor at the resolution of 1 step at a time. [2]

C. L293d Chip:

The L293D chip is a motor driver used in the project to drive the stepper motors. Each chip supports one stepper motor and so two L293D chips were required. It can handle a maximum current of 600mA and needs a supply of 5V DC.

L293D is a 16-pin IC that can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge Motor Driver integrated circuit (IC) [2]

Features

- Can be used to run Two DC motors with the same IC.
- Speed and Direction control is possible
- Motor voltage Vcc2 (Vs): 4.5V to 36V
- Maximum Peak motor current: 1.2A
- Maximum Continuous Motor Current: 600mA
- Supply Voltage to Vcc1(vss): 4.5V to 7V
- Transition time: 300ns (at 5Vand 24V)
- Automatic Thermal shutdown is available

- Available in 16-pin DIP, TSSOP, SOIC packages[2]

D. Ultrasonic Sensor

Four HC-SR04 ultrasound sensors were used in the project to detect the presence of train in the track. The HC-SR04 has an operating voltage of 5VDC and operating current of 15mA. Obstacle detection ranges from a minimum of 2cm to a maximum of 400cm with an accuracy reachable up to 3mm. The ultrasonic sensor has two membranes, one which sends out ultrasound into the air and the other which receives the reflected ultrasound from obstacles within the permissible range. Compared to other distance sensors such as PIR sensors, it has a higher immunity to noise and better suited to different weather conditions.[2]

E. Infrared (IR) LED:

An IR LED transmits infrared waves when connected in an appropriate circuit. The commonly available IR LED has a transmission peak range at 38 kHz but can be made to transmit other frequencies as well via control circuitry. It requires a voltage of about 1.5V DC and can handle a maximum forward current of 1A.

The IR LED can be modulated to send certain frequency pulses. It can also be encoded to transmit desired signal messages. These two features combined with very high transmission speed (speed of light) and range makes it an excellent choice as a transmitter. [2]

F. Laser Diode

Two 5mW red dot laser diode modules were used in the project as a part of the warning system. They are made of plastic and copper, operates at 3V and takes in less than 40mA of current. The sharp point source of light makes the laser diode a good complementary to be used with the LDR. [2]

G. Light Dependent Resistor (LDR):

Two LDRs used as part of the traffic/pedestrian warning system. [2]

The Light Dependent Resistor (LDR) is just another special type of Resistor and hence has no polarity. Meaning they can be connected in any direction. They are breadboard friendly and can be easily used on a perf board also. The symbol for LDR is just as similar to Resistor but adds to inward arrows as shown above. The arrows indicate the light signals.

H. Piezoelectricity

A piezoelectric substance is one that delivers an electric charge when a mechanical stress is applied like when the substance is pressed or extended. Alternately, a mechanical deformation is created when an electric field is connected. This impact is framed in precious stones that have no focal point of symmetry.

Each of the rail cars of a train has high weight.

When the wheels of a rail car rotate over the track, the metallic rail track encounters strong stress and pressure. We will provide piezoelectric materials under rail tracks along 2-3 km rail line near a station so that we can harvest electricity.

Energy can also be produced when a man ventures on tiles those component piezoelectric characteristics. The measure of vitality produced relies on the heaviness of the individual, most extreme redirection, and kind of development.[5]

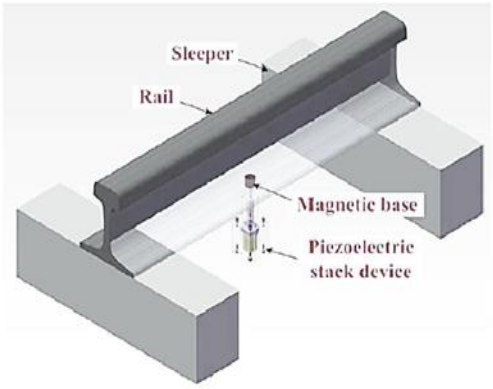

Figure 10: Schematic of piezoelectric stack. (J. Wang *et al.*, 2015).

Fig.2. Piezoelectric stack

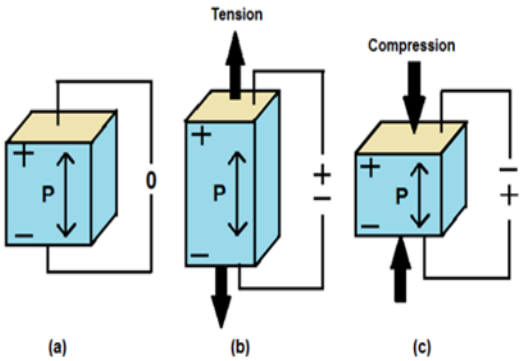

Fig.3. Piezoelectric effect

V. CIRCUIT DIAGRAM

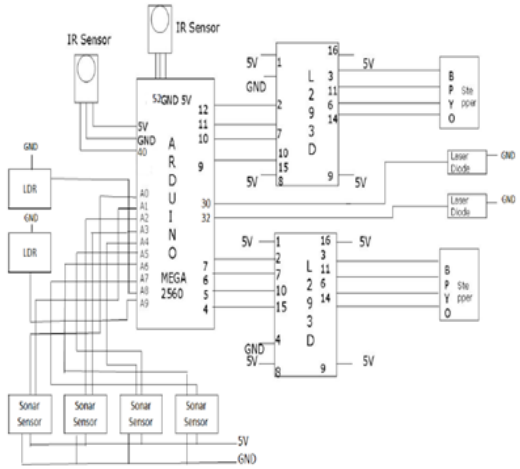

Fig.4. Detailed circuit diagram of system at crossing [4]

VI. ADVANTAGES AND FUTURE SCOPE

- This project is developed in order to help the Indian Railways.
- It helps the elderly to reach the next platform without climbing the over bridge, helps the people to move their heavy luggage easily from one platform to the other and also saves the time that is required to reach the opposite platform. It can also help avoid accidents on railway stations.
- Sensing of train can done by signal system method and thus can work more efficiently making the easy move of passengers from one platform to the other.[3]

VII. RESULT

With all the sensor installed on the train, we can reduce railway accident to a significant margin, which will lead to a smooth operation of the railway and increase profitability of the railway company. With the use of piezoelectric effect we are moving towards efficient conservation of energy.

VIII. CONCLUSION

- This project is used for automatically close/open the mobile platform
- It saves the time for passengers to cross the next platform.
- The sensing is made continuously whenever the trains arrive and pass through.
- Thus the tracking of train is sensed continuously, which is beneficial for passengers to cross the rail grade crossing.

REFERENCES

[1]. Adarsh K S ,Riya Robert, Kavia E. “Railway Track Pedestrian Crossing without using Staircase” International Journal of Emerging Technology and Advanced Engineering Certified Journal, Volume 5, Issue 12, December 2015.

[2]. Anarghya, Nischay M, Nachiket,Acharya.”Automation in Railway System.” International Research Journal of Engineering and Technology (IRJET) e- Volume: 06 Issue: 01 | Jan 2019.

[3]. Adoh Lucky Ugochukwu, Akello Fiona Mercy, Nyangassa Faraja, Ishimwe Pascasie. “Prevention of Railway Accident using Arduino Based Safety System.” International Journal of Engineering Research & Technology (IJERT) Vol. 8 Issue 09, September-2019EEE.

[4]. Prof. M. S. Mali, Poonam Somwanshi, Kajol Ingale, Geetanjali Jagtap. “Railway Track Pedestrian Crossing between Platforms.” International Journal of Research and Analytical Reviews 2011.

[5]. Md Ashiqur Rahman Laskar. “Piezoelectricity: An Energy Source for Future Railway Stations.” SEU Journal of Science and Engineering, Vol. 11, No. 2, Dec 2017.