Automatic Mobile Platform Assistance for Elderly and Physically Challenged Persons

Sunakar Prusty, S.L.Sri Harsha, P. Himabindu

ABSTRACT--- With the construction of stairs and installment of escalators in the railway stations transportation of human being and materials from one platform to other has become easy, but elderly people and physically challenged people are facing a lot of problems while availing the facility in most of the times due to their inner fear and weakness. Hence a simple transporting medium can solve both the problems. This paper presents the development of a programmed mobile platform that helps the elderly and physically challenged people to move easily from one railway platform to another. The arrival and departure of the train in both the directions is detected by ultrasonic sound sensors and indicated by LEDs. This also gives prior intimation to the railway authorities if there are any chances of train collisions. The geared stepper motor is used to assist the movement of the mobile platform accordingly, using the Rack and pinion mechanism.

Keywords- Arduino, Ultrasonic sensors, Stepper motor, Rack and Pinion mechanism.

I. INTRODUCTION

In present Indian Railway system, staircases, escalators and lifts are available for the people to move from one platform to another. But most of the times it is very difficult for the elderly and physically challenged people to avail them due to their inner fear, ignorance about the updated systems and physical weakness. People moving in wheel chairs cannot use escalators and the lifts cannot accommodate more number of people at a time. Also, it is very easy to transport goods from one platform to another if any direct route is available. So, the programmed mobile platform serves in better way, by overcoming the issues and increasing the safety of the physically challenged people [5], [6], also reducing the time to cross from one platform to another.

Normally the bridge connects the two platforms through which the passengers walk to reach the next platform. But this paper presents about the design and construction of a mobile platform which is installed below the platform base and runs over the train tracks.

II. EXISTING SYSTEM

Taking the difficulty into consideration several authors have proposed several methods.

For example, a railway track pedestrian crossing between platforms has been proposed by G. Prabhavathi, et al. [1]. Here the arrival and departure of the train is sensed by the IR sensors. After receiving the information from sensors the Pic controller is sending pulses to the stepper motor either to open the bridge platform or to close it.

Banuchandar J., et al. [2] have proposed an automated unmanned railway level crossing system. A RF tag has been fixed on the train, which emits clock pulses. The RFID reader has been mounted on a pole adjacent to the track. When the train passes through the sector of the reader the tag picks up these clock pulses and sends the Electronic Train Code (ETC) to the reader. After detecting the tag reader sends a signal to the microcontroller. Based on the signal microcontroller sends the necessary command to the motor either to open or close the gate.

Kanchan, Manu, and Ankur Bansal [3] have proposed a design and concept to transfer handicapped or old people from one platform to another.

A design of automated unmanned railway level crossing system using wheel detector (Sensor) technology has been proposed by David, et al. [4]. It has to stop all road users before passing of a train. A special attention is paid on wheel sensor which is used to detect the train accurately, direction and speed of the train are monitored in the process. Two wheel sensor are used located before (Strike-in point) and also after (Strike-out point) the level crossing. On the other hand, the proposed system comprises of other warning devices such as automatic barrier, LED flashing lights and the alarm device. MicroLok II is used as the controller to execute all the signals and programs.

The existing system is partially automated, with no train arrival indication. The detection of the arrival of the train and its departure from the platform is possible only in one direction.

III. PROPOSED SYSTEM

The proposed system is Bidirectional detection system. The idea to implement a prototype of the proposed method has been acquired from the Zen Toolworks[10] and the investigation work about the rail accidents of pedestrians crossing the station, carried out by Branch, Rail Accident Investigation[8]. The arrival of the train is detected by one of the Ultrasonic Sound sensors and the platform moves back. The departure of the train is detected by another sensor and after some delay, the programmed platform connects the two platforms. The arrival and departure of the train is conveyed to the passengers through LED indication and buzzer.

Revised Manuscript Received on February 11, 2019.

Sunakar Prusty, Department of Electronics and Communication Engineering VFSTR, Guntur, AP, India. (E-mail: Sunakar175@gmail.com)

S.L.Sri Harsha, Department of Electronics and Communication Engineering VFSTR, Guntur, AP, India. (E-mail: slsharsha7@gmail.com)

P. Himabindu, Department of Electronics and Communication Engineering VFSTR, Guntur, India.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

IV. COMPONENTS AND DESCRIPTION

HARDWARE COMPONENTS

A. Arduino Uno micro-controller
B. Ultrasonic sound sensors
C. Stepper motor
D. Stepper motor driver
E. Buzzer
F. LEDs
G. Resistors

COMPONENTS DESCRIPTION

A. Arduino Uno micro-controller board:

In this project Arduino Uno board has been used with ATmega328P microcontroller to control the motion of the stepper motors and other safety controls. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. Extensive built-in libraries are available online with custom code for various applications [9].

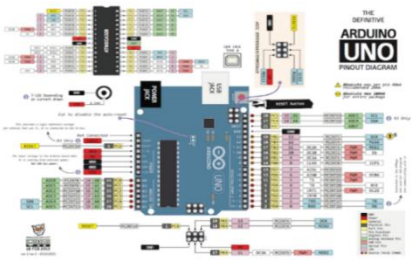


Fig.1: Arduino Uno micro-controller board

B. Ultrasonic sound sensors:

In this project ultrasonic sound sensors are used to detect the arrival and departure of the train. It 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. The sensor has two openings on its front. One opening transmits ultrasonic waves, the other receives them.

Specifications:

Working voltage: Dc 5v
Working current: 15mA
Working frequency: 40Hz
Max range: 4m
Min range: 2cm
Measuring angle: 15 degree
Trigger input signal: 10uS TTL pulse
Echo output signal: Input TTL lever signal and range in proportion

Fig.2: HC-SR04 Ultrasonic sound sensor

C. Stepper motor:

In this project a Stepper motor has been used to move the mobile platform forward or backward. A Stepper motor is a brushless DC electric motor that divides a full rotation into number of equal steps. Brushed DC motors rotate continuously when DC voltage is applied to their terminals.

Stepper motor effectively has multiple toothed electro-magnets arranged around a central gear-shaped piece of iron. The electromagnets are energized by an external driver circuit.

Fig.3: 28BY J-48 stepper Motor

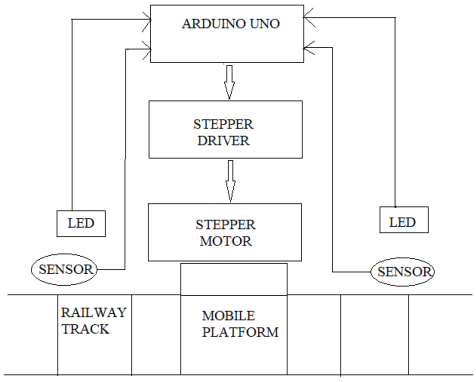
D. Stepper motor driver:

In this project L293D is used as a motor driver to control the rotations of the stepper motor.L293D are fourfold high-ebb and flow half-H drivers. The L293D is intended to give bidirectional drive streams up to 600-mA at voltages from 4.5V to 36V. The L293D is utilized to work a mobile platform unit and the elevator unit. It controls the mobile platform to close or open between two intersection platforms.

Fig.4: L293D stepper motor driver

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

V. BLOCK DIAGRAM



VI. WORKING

The arrival and departure of the train is detected by ultrasonic sound sensors. The transmitter section of Ultrasonic sound sensors continuously transmits sound waves. Whenever train reaches near the sensor, transmitted waves gets reflected and received by receiver section. Based on the velocity and time difference between transmitted and received waves sensor calculates the distance and gives it to microcontroller. For the first detection (arrival of the train) microcontroller gives commands to the buzzer and to red LED to alert the people about the train arrival. After some delay it gives commands to stepper motor driver to drive the stepper motor in anti-clockwise direction which opens the mobile platform and allows the train to pass by. For the second detection (departure of the train), microcontroller gives commands to buzzer and green LED to inform to the people that they can use the mobile platform to move from one platform to another platform and at the same time it gives commands to the stepper motor driver to drive the stepper motor in clockwise direction to open the platform to facilitate the people to pass by. To facilitate bidirectional detection after each detection cycle the microcontroller is being reset.

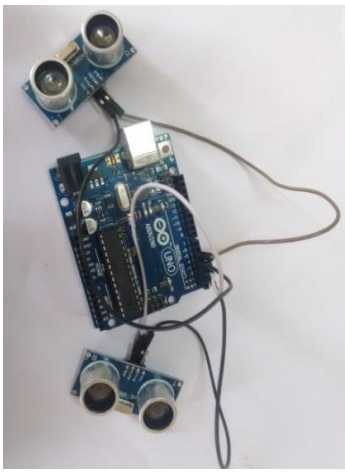


Fig.5: Ultrasonic sensor interfacing with Arduino

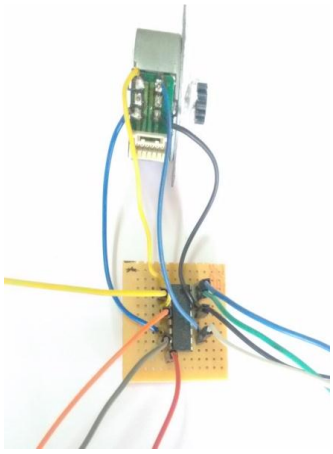


Fig.6: Stepper motor interfacing with driver

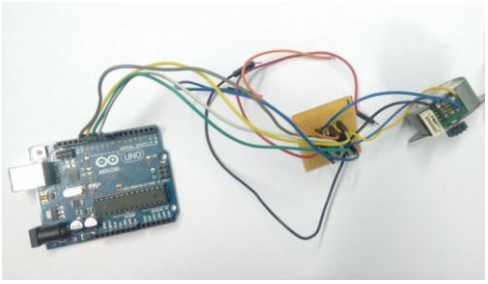


Fig.7: Driver interfacing with Arduino

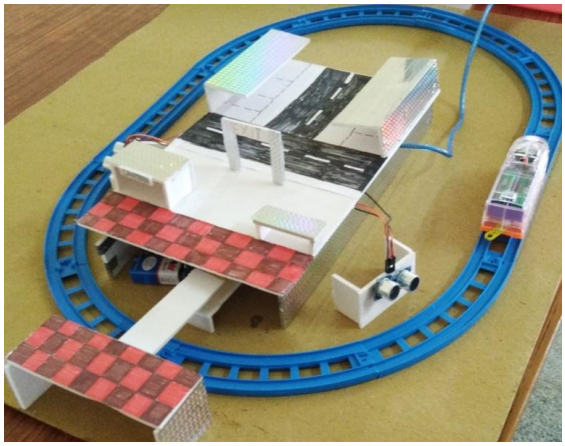


Fig.8: Output-mobile platform connecting the individual platforms

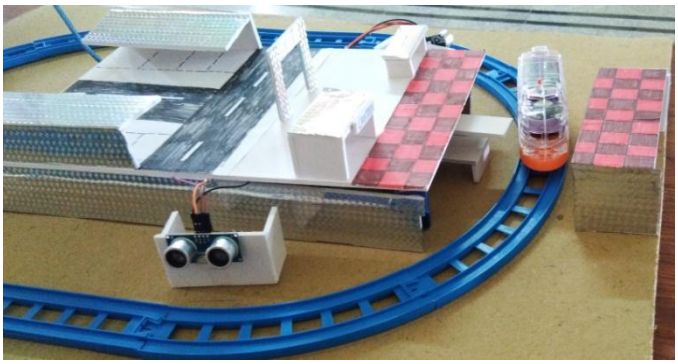


Fig.9: Output-mobile platform is open when train is approaching

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

VII. CONCLUSION AND FUTURE SCOPE

This paper involves the detection of the train arrival and departure and moving the automated mobile platform accordingly with the instructions of the microcontroller. It also allows the bidirectional detection of the train. This is possible in case of small railway stations with single railway track between platforms. This project can further be improved by implementing it in railway stations with multiple tracks between platforms and displaying the present distance of the train from the station with the movable platform.

REFERENCES

1. G. Prabhavathi, B. Sanjana, and S. P. Dhivya. "Railway track pedestrian crossing between platforms." *IOSR Journal of Electronics and Communication Engineering (IOSRJECE) e-ISSN*: 2278-2834.
2. Banuchandar J., et al. "Automated Unmanned Railway LevelCrossing System." International Journal of Modern Engineering Research (IJMER) Volume 2 (2012): 458-463.
3. Kanchan, Manu, and Ankur Bansal. *Conceptual design to transfer handicapped or old people from one platform to another*. Diss. 2007.
4. David, and Riturai Riturai. "Design of Automated Unmanned Railway Level Crossing System Using Wheel Detector (Sensor) Technology."
5. Silla, Anne, and Juha Luoma. "Effect of three countermeasures against the illegal crossing of railway tracks." *Accident Analysis & Prevention* 43.3 (2011): 1089-1094.
6. Delmonte, Emma, and Simon Tong. "Improving safety and accessibility at level crossings for disabled pedestrians." (2011).
7. Branch, Rail Accident Investigation. "Rail Accident Report: Investigation into Station Pedestrian Crossings: With Reference to the Fatal Accident at Elsenhman Station on 3 December 2005." (2006).
8. www.arduino.cc
9. http://www.zen toolworks.com/CNC manual

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication