

DRIVERLESS METRO TRAIN TO SHUTTLE BETWEEN TWO STATIONS

A Sathvik¹, E Sathwika², S Anusha³, DR. Purnachadar Rao⁴

^{1,2,3}Sreenidhi institute of science and technology, Ghatkesar

⁴Associate Professor, Dept. of Electronics and Communication Engineering, Sreenidhi institute of science and technology college, Telangana, India

Abstract – Driverless metro train is a smart technology of this era. This can be used in most of the progresses countries to reduce traffic problems and also to enhance the safety. These trains are outfitted without a driver which reduces man power. It contains Arduino based controller programmed using Arduino C which facilitates the programmed stopping of train from one station to the other. There are three motives behind building this project. Our aim is reduce man power to large extent. This technology is used to generate automatic messages and warnings which enhance the safety of passengers. It also contains automated framework. This project helps people who travel huge distances to reach their workstations.

Key Words: Automated framework, traffic, Arduino, safety, driverless.

1. INTRODUCTION

This project is mainly based on the innovation utilized in driverless metro train frame which was used by Germany, France and Japan [1]. Driverless metro train between two stations reduces man power and also avoids overloading of train. The main reason for opting driverless metro train is to make a train travel between stations without usage of driver, it also limits capacity of the train and same train is used to travel in opposite direction. Pros of this technology include reduction of man power, speed of the train can be controlled automatically. It does not require constant human intervention. It reduces the consumption time of installation and integration. Cons include the installation cost as the technology is fully automated. This technology is mostly used in urban areas and densely populated areas where traffic matters and also reduces the time consumption for travelling. This was the main motive behind our project as we had thought that in developing countries like India automation is much more important to make more time for people to innovate more. In our project, we had developed a prototype of automated train which travels between two stations without help of man power, avoids overloading of passengers and also reduces consumption of electricity [2]. The basic principle on which it works is electromagnetism where a current carrying current generates a magnetic field.

1.1 Objective of the Project

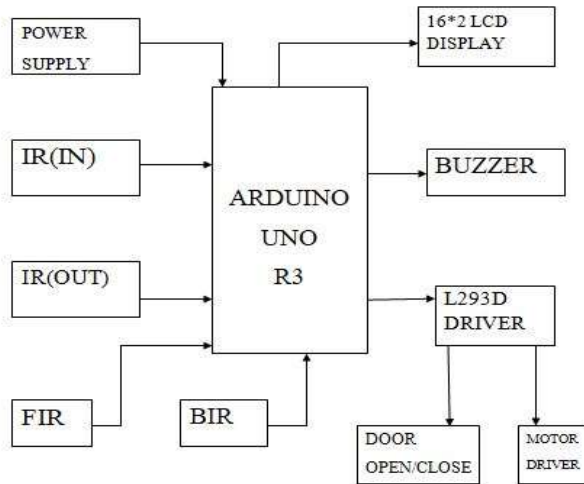
The objective of the project is to develop a prototype to show that trains can move without any help of driver and frame work can also be made automated so that automatic messages are generated to enhance the safety of the passengers.

1.2 Principle Involved

The project is designed to showcase the technology used in the metro rail movement, which is used in most developed countries. The train has a controller that runs automatically from one station to another. The controller is controlled using Arduino which is programmed by Arduino C language [3]. This project is designed to eliminate the need for any driver. Therefore, any human error can be ruled out. Whenever a train arrives at the station, it stops automatically and is detected by the IR sensor. Then the door automatically opens for passengers to get inside the train. It has a passenger count section which calculates the number of passengers leaving the train. Maximum passenger limit is 10. The doors do not get closed if passengers entered the train are more than 10. Doors automatically close after particular amount of time. The train starts after the program closes and at the specified time (there is already time for how many minutes the train stops at each station) is set in the controller by the program [3]. An LCD display that displays passenger counts and stations. Motor driver IC controls the movement of the train. The train has a buzzer to alert passengers before the door closes and alerts them in advance. When the train reaches the destination, the process is repeated so that the desired operation is accomplished. The project can be improved by further developing the system by displaying the train status through a large display unit for the convenience of passengers. Contains parameters such as train status, expected arrival and departure time.

2. PICTORIAL REPRESENTATION AND WORKING

2.1 Block Diagram



2.2 Hardware and Software Involved (components and their description)

ARDUINO UNO: The mostly used version of Arduino is the Arduino Uno. This board is what everyone is talking about when they refer to the Arduino. Legacy version of Arduino Uno consists of the NG, Decimila, and the Duemilanove. Some key features of Arduino Uno include:

- An open source design. This makes it easy to find someone to help you with debugging of projects.
- This can be connected with an external power source of 12v and it can be adjusted to both 5v and 3.3v. It also can be powered directly of a USB port without any external power.
- An easy USB interface. The chip which is present on the board is used as virtual serial port. The benefit of the setup is that serial communication is an extremely very easy protocol, and USB makes connecting it to modern computers really convenient.
- Highly convenient power management and inbuilt voltage regulation.
- 13 Digital pins and 6 Analog pins. These pins allow you to connect the external hardware to the Arduino. These pins are key for extending the computing capability of Arduino.
- Analog has two different types of input pins, those being analog and digital.
- Digital input pins only have two possible states on and off.

- These two on and off states are also referred as:
- HIGH and LOW
- 1 or 0
- 5V or 0V
- This input is commonly used to sense the presence of voltage when a switch is open or close. Digital inputs can also be used as basis for countless digital communication protocols.

L293D DRIVER: L293D is the typical motor driver or motor driver IC which allows DC motor to drive the either direction. L293D is an 16-pin IC which can control a set of 2 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). It works on the concept of the H-bridge. It is an circuit which allows the voltage to be flown in the either direction. The voltage needs to change its direction for being able to rotate motor in clockwise or anticlockwise direction. The H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are 2 h-bridge circuit inside the IC which can rotate two dc motors independently. Due its size it is very much used in robotic application for controlling DC motors. The maximum voltage for VSS motor supply is the 36V. It can supply a maximum current of 6000mA per channel. VCC pin 16 is voltage for its internal operation. The maximum voltage ranges from 5v and up to the 36v. There are 4 pins for L293D. pin 2, 7 on the left and pin 15, 10 on the right. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. Motors are rotated on the basis of inputs provided across the input pins as LOGIC 0 or LOGIC 1. In simple one needs to provide logic 0 or 1 across the input pins for rotating the motor.

16*2 LCD MODULE: It is an electronic display and is used in wide range of applications. It is mostly used in devices and circuits. This is chosen over 7 segment and multi segment LEDs. It can display up to 16 characters per line and there are two such lines. In this LCD each character is displayed in 5*7 pixel marks. These LCD's has two registers namely command and data. This command register stores the command instructions given to the LCD.

IR Sensors: It is used to emit or detect the Infrared radiation. **IR TRANSMITTER:** It is a light emitting diode and it emits Infrared radiations. Hence, they are called IR LEDs. **RECIEVER:** Infrared receives detect the radiation from an IR transmitter. It contains IR emitter and IR receiver. An IR emitter will emit infrared continuously when the power is supplied to it. On the other hand, IR receiver will be

connected and performs task of a voltage divider. IR The lower the intensity of the IR light cause higher resistance between collector-emitter terminals of the transistor, and limiting current from collector to emitter. The change of resistance will further change the voltage at the output of voltage divider.

Relay: It is a electrical switch which opens or closes under the control of electric circuit. In the original, the switch is operated by a electromagnet to open or close one or many sets of contacts. It can control the output circuit of high power. Relays are usually SPDT (single pole double through switch) or DPDT (double pole double through switch) but they can have more sets of switch contacts. These contacts can be normally Open (NO) or normally closed (NC), or changeover contacts.

2.3 Working

The entire project is based on three modules controlling the movement of the train, controlling the opening and closing of doors and counting the number of passengers in the train. Movement of the train is mainly based on the IR sensors that are used to send light pulses so that arduino gets low signal while the train is travelling. When train approaches a particular station, IR sensor gets interrupt due to which it does not conduct and arduino gets high signal. The arduino is programmed to stop the motors after a particular amount of time. Forward IR sensors are used to make train move in forward direction and backward IR sensors make the train move in backward direction. LCD display module is used to display the approached station. The doors get opened automatically when the train stops and closes after a particular amount of time. Buzzer is used to alert the passengers before closing the door. No of passengers entering the train and leaving the train are counted using IR sensors and are displayed on LCD. When the number of passengers entering the train exceeds a particular limit, the door closes automatically.

2.4 Circuit



Fig -1: circuit showing all the components

3. RESULTS

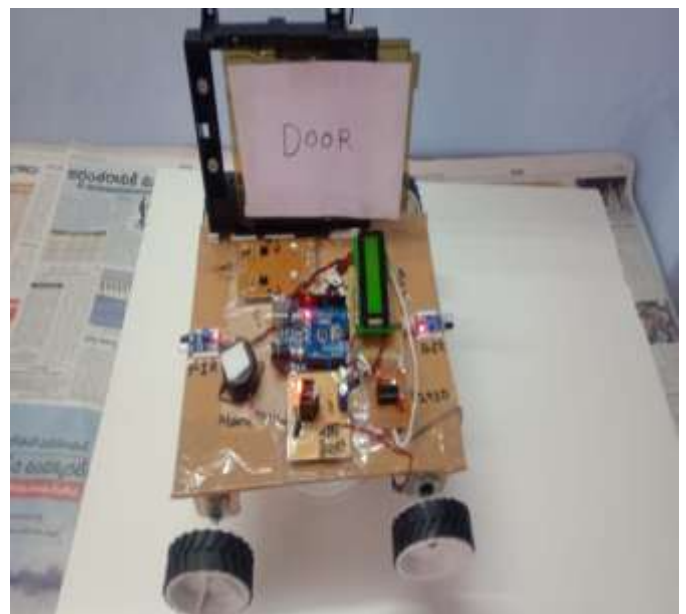


Fig -1: output showing door open

4. CONCLUSION

Our automatic shuttle between stations project offers fully automatic driverless operation with minimal travel time, low power consumption. One advantage of this system is that it

can transport more people than regular metro rail services. The main feature of this project is that it prevents the overcrowding in trains as it counts the passengers entering the train automatically and will not allow more than certain number of passengers to board on it. The system will build smart cities and make it a better way to provide better metro rail services to the community..

REFERENCES

- [1] H. Jun, and S. Choi. International Conference on Hybrid Information Technology (ICHIT'06). 2006. Cheju Island, Korea.
- [2] M. P. Georgescu. WIT Transactions on the Built Environment, Vol 88. 2008. pp. 401-409.
- [3] M. Verle. PIC Microcontrollers - Programming in C. mikroElektronika; 1st edition .2009.
- [4] H. Yun, and K. Lee.. Proceeding if the ICTC 2011. Seoul . Sept 2011. Pp 406-410.

BIOGRAPHIES



Edama Sathwika,
Studying at Sreendhi Institute of
science and technology, Dept. of
Electronics and Communication
Engineering



Adulla Sathvik Reddy,
Studying at Sreendhi Institute of
science and technology, Dept. of
Electronics and Communication
Engineering



Sama Anusha,
Studying at Sreendhi Institute of
science and technology, Dept. of
Electronics and Communication
Engineering