AUTOMATIC SHUTTLING AND MONITORING OF DRIVERLESS METRO TRAIN

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ABSTRACT

The world is advancing ahead in terms of innovation step by step, which is contributing towards making our lives more comfortable and peace living. We are today encircled by many mechanical items which assist us with improving our work and working more efficiently. The world has been advancing with the up-gradation of innovation exponentially. Every innovation has been steadily becoming computerized, and so is the innovation utilized in transportation. Transportation is a most extreme need for individuals. In this way, there has been a steady improvement in the field of transportation as well. Prior, the trains were operated physically with the assistance of a driver. The issues confronted with the utilization of physically worked metro trains were that it was wasteful in their exhibition, similar to speed, delay, and so forth. Likewise, a solitary slip-up made by the driver can cause genuine outcomes which affect the passenger life. Serious issue is, that the manual metro train has no control over the long run, antagonistically influencing the railroad network the executives framework. To handle this issue, the need for drivers is dispensed with by the idea of driverless metro trains. The benefits of an mechanized metro framework are that travelers’ security is within proper limits, power utilization is brought down, accordingly, improving its working.

Keywords: Driverless Metro, Arduino UNO, Nord MCU, L293D Motor IC, L298N Motor IC, IR Sensor, DC Motor.

I. INTRODUCTION

In order to accomplish the man-less operation of the metro train, we will be using three microcontrollers to monitor and control the entire system. Our project involves the use of Battery-Operated Motors along with sensors e.g., IR sensor, I2C with Arduino Uno microcontroller, Nord MCU, LCD display, and a buzzer. The speed control is provided with the assistance of L293D Driver IC. Detection of stations accomplished by Light Dependent Resistor. The automatic door is set to open for 5 to 10 seconds and then the door closes again for departure.

Now, there is a section for counting the number of passengers, consisting of an IR module and LCD display. The LCD display is programmed to display "Nobody in train" when the train is getting started. When the train reaches the station, the LCD displays the number of passengers. The train is then set to depart with an alert by the buzzer. The motor operation is switched from OFF to ON and the train starts moving and does its functioning. Manual control will also be provided i.e., the train will be controlled with the help of a mobile.

II. LITERATURE REVIEW

There has been a lot of work done previously on this project using different approaches, different technologies, microcontrollers, other equipment etc.

In the paper titled “Automated System Design For Metro Train” by V.Sridhar, tell us how to use 8051 microcontroller as the main controlling unit of the system. The microcontroller inside the train is programmed in the kind of way that each station name saved inside the voice chip which is having a unique code. So, each time the bus or train reaches the station, the reader within the bus or within the train gets the codes, they are transmitted from the tag and the microcontroller gets this code and goes through inside the lookup desk, stored in the chip. In this project, the train stops for about 10-15 seconds in the station and then before leaving the station, it makes an announcement for the passengers to get into the train and the train starts to move to the next station. But in this project, there has been no provision given for the automatic opening and closing of the door. A toy train has been used for referencing the metro train. [1]

In the paper titled “A Driverless Metro Train using ARM7” by Parkash Ratan Tambare and Chandra Jogi, the driverless metro train is designed using ARM7 processor with the LPC2148 microcontroller, for the automated metro train system. This suggested framework is a driverless metro train that dispenses the need for installed...
staff and makes the total automatic train. There also is a passenger counting section, that counts the no. of passengers present inside the train and it is then programmed to display that on the LCD screen. [2]

The paper titled “Auto Metro Train Shuttle Between Stations” by D.Pradeep Simha, N.Ajay Kumar, K.Pavan and O.Anuf, discusses the use of IR sensors to detect the passenger going in or out of the metro train. IR sensors use infrared light to sense objects in front of them. An infrared sensor is an electronic gadget, that is used to detect some aspects of the vicinity. With the help of IR sensors, the number of passengers traveling is counted which is then displayed on the LCD display. [3]

Another paper titled “IoT Based Auto Metro Train Shuttle Between Stations” by A.Suman Kumar Reddy, A.Maheswar Rao have incorporated DHT11 Sensor in their project. The DHT11 is usually utilized as a temperature and humidity sensor that accompanies a devoted NTC to gauge temperature and an 8-bit microcontroller to yield the measurements of temperature and humidity as serial data. They have accompanied this technology to further enhance the project so that the prototype also detects the temperature and humidity inside the train, along with the rest of its working. [4]

The paper titled “A Survey Paper on Driverless Metro Train” by Chavan Rohit Dnyaneshwar, Dabhade Swapnil Dilip, Kesbhat Amol Surendra, Nage Mohan Ramadas, and Mrs.Gauri. K. Jagtap discusses the use of the LPC2148 microcontroller as the main controlling unit of the proposed system. LPC2148 microcontroller. With 512 KB on-chip flash ROM, In-System Programming (ISP) and In-application programming, #2 KB of RAM, two 10-bit ADC channels, USB 2.0 full-speed device Controller and two UART links, LPC2148 is a 16/32-bit RISC microcontroller with 512 KB of flash ROM, two 10-bit ADC channels, and two UART links, one of which can interface with a DSP. LPC2148 is costlier than other microcontrollers e.g., Arduino. [5]

III. BLOCK DIAGRAM

In our project, we will be using three microcontrollers- two Nord MCUs and one Arduino Uno. The first Nord MCU will be connected to L298N IC driver, which controls the two motors and the second Nord MCU will be connected to three Light Dependent Resistors. The LDRs used to detect the presence of train at the station so it gets Nord MCU to provide a message notification on our mobile. Both Nord MCUs can be controlled using mobile via server. Arduino Uno will be connected to L293D, which is used to control the CD trolley’s action. It will also be connected with four IR sensors, an I2C, buzzer, and a LCD Display.

IV. METHODOLOGY

Our project can be roughly divided into three parts; the first segment deals with the detection of each station, the second includes the mechanism for the movement of the train prototype, and the last segment deals with the monitoring of the metro train. We shall discuss each segment elaborately.

There are three stations in our prototype. The model train has to stop at each station and then move to the next one and then again, perform the same function. In order to achieve this, we have used Light Dependent Resistor (LDR). The output of each LDR will be connected to Nord MCU. The Nord MCU will be placed to the track. Light
signal will be provided during the incoming of train on the station, which is detected by the LDR and that helps Nord MCU that the train has reached the particular station.

The wheels of the train are moved using motors (Battery operated motor), which is connected to L298N motor driver IC. The forward and reverse movement of the train is achieved using Nord MCU. Four pins of the L298N motor driver IC will be interfaced with Nord MCU. Nord MCU will be connected to the server. This is done in order to communicate our instruction to the train, via mobile. The forward and backward motion can be controlled using our mobile, with the help of the Blynk app.

The monitoring of the prototype is done using Arduino. It includes the passenger counting section, using IR sensor and LCD display. The number of passengers entering or leaving the train will be displayed on the LCD screen. The location of the train will also be displayed on our mobile. L293D motor driver IC is used for the functioning of CD trolley (sliding door). The CD trolley will be connected to the motor. The motor is connected to L293D motor driver IC. For obstacle avoidance, Arduino is interfaced with Infrared (IR) sensor, that detect any obstacle on the track within its proximity.

These are the three steps in which our whole project system working is define i.e., getting notification at the time of metro train reaching at the station, forward and reverse movement and monitoring.

V. FLOW CHART

![Flow Chart Of Project](image)

VI. HARDWARE SETUP

![Metro Train Prototype](image)
VII. FUTURE SCOPE

In future, new elements like seats not involved data can be shown. In case if any failure in the system occurs then with the assistance of Viewer Team the administrator at the station can get to the control of the system physically.

Recurrence of train governed on the basis of the crowd: This is done to control the crowd in train and furthermore helps in check the wastage of energy. During top hours, the deferrals between ensuing trains are decreased and at the off period, the postponement is expanded.

VIII. ADVANTAGES AND APPLICATION

Driverless innovation can further develop dependability of the metro framework. The advantages related with ATO stem are reliable control of train speed profiles and more prominent potential for traffic the executives methodologies to be carried out straightforwardly, Automatic Train Operation (ATO) can build the recurrence of trains, it offers a superior recuperation from delays basically an expansion in the limit of the framework. With the help of driverless metro train there will be no need of staff which can reduced the fixed cost. Driverless Metro Train never again should be staffed, which can decrease staff costs, as the peripheral expense of running extra trains is highly diminished, numerous frameworks don’t have staff on trains and stations, the framework is fit for working with practically no individuals from staff present, if fundamental. This facilitates staff enlistment and rostering requirements, as well as making the framework stronger to modern activity in terms of professional career associations.

By eliminating the driver from the train, the human-risk factor is decreased and in general security and unwavering quality of the framework increments. It decreases the human mistake, and expands the wellbeing of the framework.

Our driverless metro train project gives the remarkable elements like it furnish completely programmed driverless activity with less voyaging time, less utilization of power. It tends to be a superior option for voyaging reason and give better metro rail administrations to the general public.

IX. CONCLUSION

In this work, we created an auto metro train which executes with high productivity on low power. This framework gives programmed running and also gives data about the quantity of passenger entered in our train and programmed opening and shutting of entryways at the station, display and source the destination on the presentation. The Metro Rail Framework has shown to be most productive concerning energy utilization, space occupied and passenger moved from one destination to the other.

- Outstandingly low ground space occupation 2-meter width just for raised rail.
- Eco-obliging causes no mess, significantly less upheaval chaos.
- As compared with road structure our system will consume energy 20% less per travel in Km.
- High breaking point conveys very high volumes of zenith hour bearing excursions.
- As compared to 7 ways of vehicular traffic or 24 ways of auto traffic it is very less trafficable.
- It will lessen and quicker the venture time from 50% to 75%.
X. REFERENCES


