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Shuttling of Metro Train between Stations

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Abstract: ***This project is designed to demonstrate the technology used in metro train movement which are used in most of the developed countries. This train is equipped with Arduino microcontroller that enables the automatic running of the train from one station to another. This proposed system is an autonomous train and it eliminates the need of any driver. Thus any human error is ruled out. In this project Arduino Atmega328 microcontroller has been used as CPU. Whenever the train arrives the station it stops automatically, as sensed by an IR Sensor. Then the door is opened automatically so that the passengers can go inside the train. The door then closes after a prescribed time set in the controller by the program. It is also equipped with passenger counting section, which counts the number of passengers entering the train. The door closes when it reaches maximum occupancy level irrespective of time allotted for the door to remain open. The passenger counts are displayed on the LCD Display interface to the microcontroller. The movement of the train is controlled by the motor driver IC interfaced to the microcontroller. The train equipped with a buzzer to alter the passengers closing the door and also warn them before starting. As the train reaches the destination the process repeats thus achieving the desired operation.***
Keywords: ArduinoUno(Atmega328) microcontroller, IR Sensors, LCD Display, Motor Driver, automation.

I. INTRODUCTION

Shuttling metro train between station project is established to shuttle metro train between stations in most of developed countries.It aims at representing the technology used to shuttle metro trains between stations. It is implemented in most of the developed countries such as France, Germany etc. The train mainly consists of IR sensors that are used to detect upcoming stations and it stops as the station arrives. This system mainly allows for running trains without any human intervention, so that it reduces the possibilities of human errors. The train and stations are equipped with IR sensor pairs. This helps train to detect station as it arrives and make a train to stop near station automatically. And also the train doors are equipped with IR sensors which help to determine the number of passengers in the train. The passengers count is displayed on LCD. If train reaches its maximum passenger capacity, the doors closes automatically. The door opens for specified time interval at each station, closes after a prescribed time set in the microcontroller by the program. The system also consists of a buzzer like alarm which alerts the passengers as soon as the doors begin to close. The process is repeated at each station. The whole system works using Arduino Uno (ATmega328) microcontroller which is also known as mini CPU as it controls the train. In other way it is specified as the train is equipped with a controller that enables the automatic running of the train from one station to another station. Here in this system two motor drivers are used for opening and closing of the door and also for the movement of the train. At the present time accidents of trains is rising day by day, of these main disasters are happening due to human mistakes. A man can do a fault but an automatic processor doesn't have a possibility of doing error. By using this auto metro train, the train timings will be correct and it keeps away from a share of problem with the passengers. This proposed system is an autonomous train and it eliminates the need of any driver, in other way it reduces the human interference.

II. LITERATURE SUVERY

The existing conventional signalling system most of the times relay on the oral communication which means the human existences, but there is large scope for miscommunication of the communication gap or the information due to a lot of human interference in the system. This miscommunication may lead to wrong allocation for the trains, which approximately leads to train collision. The statistics in the developing countries showing that 80% of worst collisions occurred so far is due to either human error or incorrect decision making through miscommunication in signalling and its implementation. A decision to implement driverless operation on a new or existing metro system requires the costs and benefits to be systematically assessed, the moderate passenger numbers is mainly done by IR sensors. Here Arduino is used as mini CPU which controls the activities and even IR sensors are used to detect the upcoming stations as IR transmitter is placed near stations and IR receiver is placed in the train. The count of passengers and time limit is displayed on the LCD display, thus technology transfer may therefore have some potential to accelerate development

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and reduce the cost of these systems for the driverless train and also reduces the collisions and reduces the difficulty range to the passengers.

III. PROPOSED SYSTEM

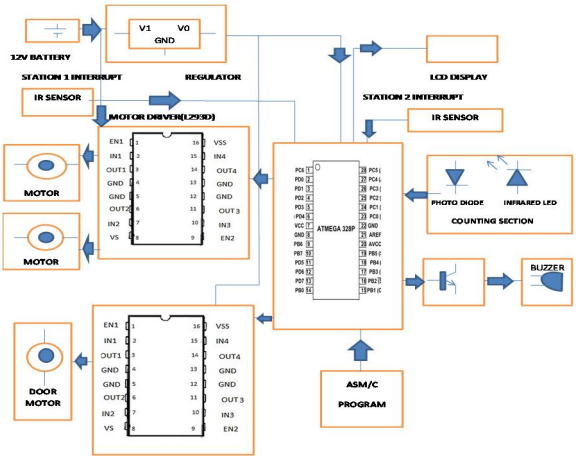


Fig 1 Block Diagram

A. The Automatic Station Sensing and Door Control System

It consists of an IR sensor for the detection of the station and count of passengers getting in. When the sensor senses the upcoming station, the motor driver automatically drives the motor such that the train halts at the station and with the buzzer sound alerting the people that the door is opened and senses the count of people.

B. Passenger Counter System

The metro train is also prepared with a passenger counter system which counts the number of passengers entering the train and when the count reaches a certain allotted time limit the door is automatically closed and the train will start moving after a certain allotted time limit.

C. Controlling the opening and closing of doors

As the train reaches at the station it stops automatically , i.e. the ATmega328 Arduino microcontroller shows an interrupt signal to the motor driver to stop the motors; the ATmega328 microcontroller also sends a high signal to the door motor driver such that it drives the motor to open the door for the passengers to get in. the ATmega328 microcontroller is programmed such that the door is opened till the number of passengers entering reach a limit assigned by the program and then the ATmega328 microcontroller is programmed to signal the motor driver to rotate the motor so as to close the door.

D. Arduino UNO (Atmega328)



Fig 2 ArduinoUno

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Arduino Uno is a microcontroller board based on the Atmega328.It has 14 digital input output pin(of which 6 can be used as PWM output)6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack,an ICSP header and a reset button.It contains everything needed to support the microcontroller.

E. Lcd Display

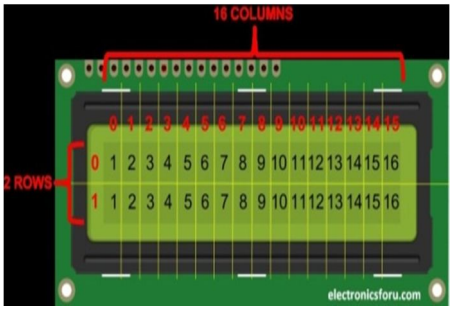


Fig 3 16x2 LCD Display

In this proposed system LCD Display is used to display time limit and count of passengers getting into the Train. A 16X2 LCD means it can display 16 characters per line and they are 2 such lines.

F. IR Sensor

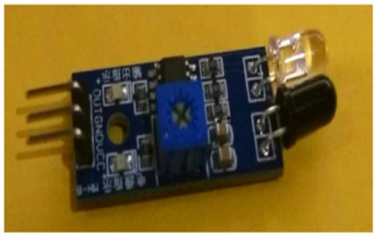


Fig 4 IR Sensor

The IR sensor is used to detect or sense the upcoming stations and the passenger's entry into the train. An object can be detected with an infrared system consisting of an infrared transmitter, also known as IR LED, which sends an infrared signal with certain frequency compatible with an IR receiver which has the duty to detect it. The IR sensor used here is H809.

G. Motor Driver

The IC is used here is L293D. It has dual H – bridge motor driver integrated circuit in its common mode operation, two dc motors can be driven simultaneously both in forward and reverse direction.

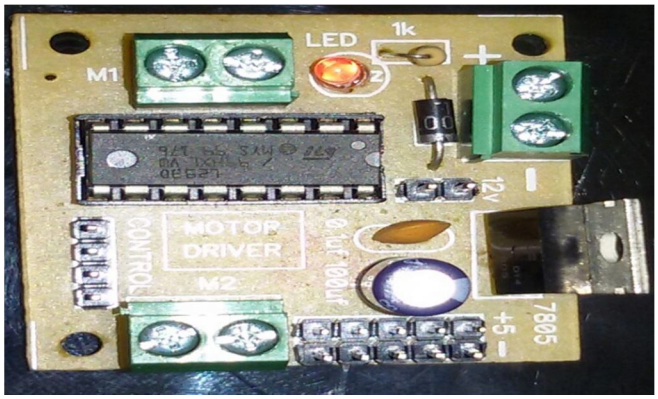


Fig 5 Motor Driver

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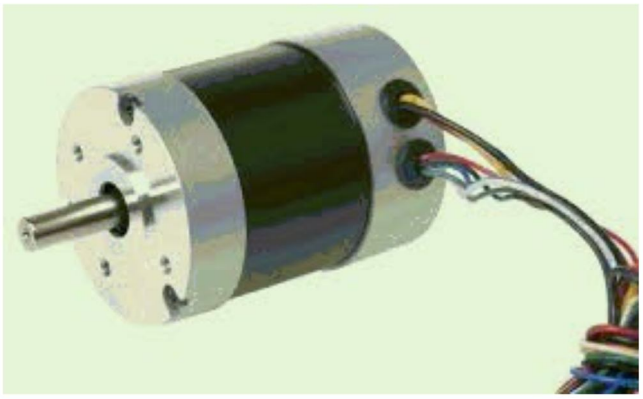


Fig 6 DC Motor

A DC motor is a device that converts direct current(electrical energy) into mechanical energy.Nearly all types of dc motors have some internal mechanism , either electromechanical or electronics , to periodically change the direction of current flow in part of the motor .A DC motor using either a variable supply voltage or by changing the strength of current in it field windings.

IV. EXPERIMENTAL SETUP

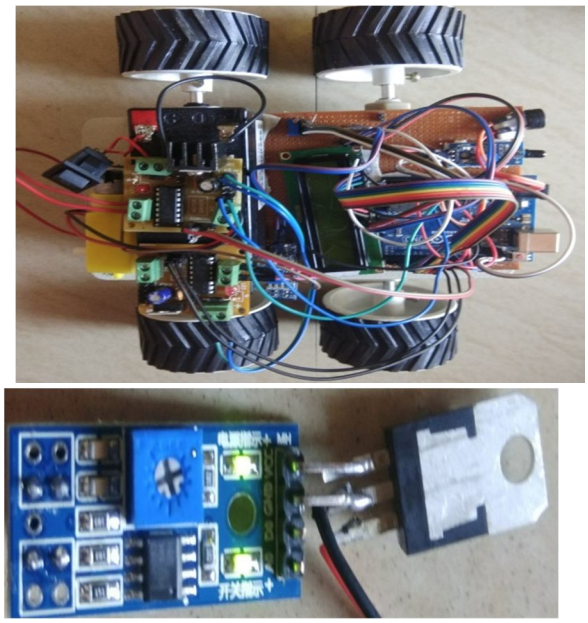


Fig 7 Overall setup

V. CONCLUSION

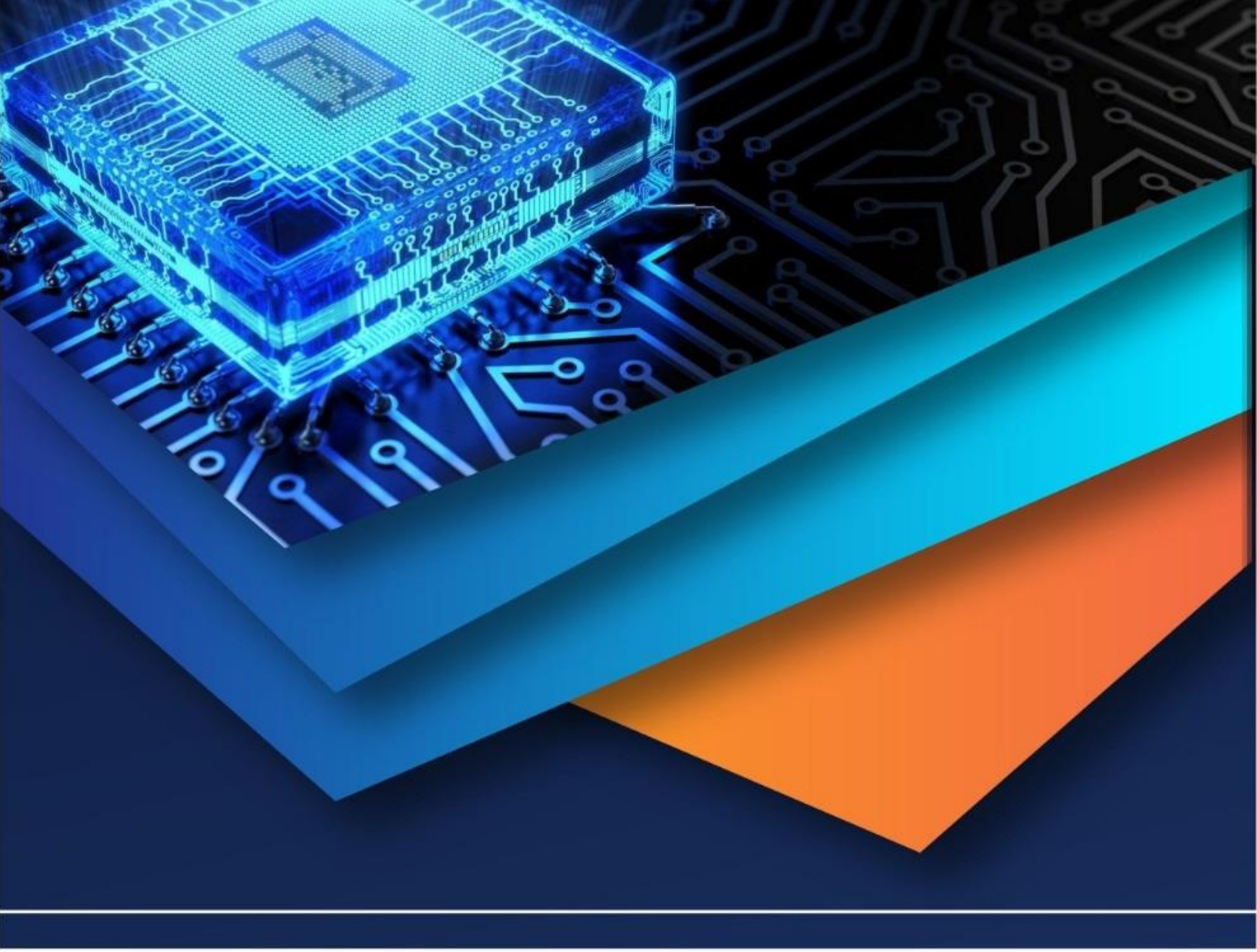
The shuttling of metro train between stations is a framework presented and a general conclusion is that they are presenting to an open horizon of developments. As this system eliminates driver or reduces human effort it is also known as driverless metro train. Such proposed techniques and projects can represent a minor part of future and technology integration which mainly describes about the modernization of different service sectors including transport. Developing these kind of prototypes improves self-confidence, Researching enhances and assures that it is possible to design a system and apply it for solving a particular problem by acquiring the necessary information. Moreover developing such prototype can serves advance form of control system and also serves as a basis of a far more sophisticated system such as a real driverless train system. In this system it has been described that how metro train is been automated and shuttles between stations, mainly counting the number of passengers occurs automatically as they enter the train and even buzzer alerts he passengers when the door gets opened and closed based on the station arrival. This helps the passengers and reduces their difficulty, this counting people helps to reduce the overpopulation inside the train. The counting is displayed on 16x2 LCD display.

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