

# Automated Driverless Metro Train

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**Abstract:** The main aim of the paper is illustrate a driverless metro train constructed using AT89C52 micro controller which controls the train to move automatically from one station to another station. This system is a driverless metro train equipped with control systems and which eliminates the human risks . Thus, any human error is removed from the system. In this project AT89C52 micro controller has been used as CPU. When the train reaches the source or the destination station the train stops and start automatically as sensed by an IR LED & LCD sensors. Then the door of the train opens automatically and the passenger can enters into the train and leave from the train and after the prescribed time which set in the microcontroller program the door of the train closes automatically.

**KEYWORDS:** AT89C52, IR LED & LCD sensor, DC motor, Rectifier, Camera.

## 1. INTRODUCTION

The automated system for metro rail is integrated applications which makes announcements and display the relevant stations. The rail transport system has undergone a high transformation, starting from the early steam operated engines to the most recent bullet train. The intent of this project is to drive the train automatically with the help of sensors and safety of passengers has more importance. Then the numbers of rail lines are automated to reduce the operation cost and improving the security and safety of services. In this project is the Metro train equipped with the CPU, which is used to control the operation to and from the movement of the train which is given according to the code programmed path. When the train reaches at the station the sensor will activate automatically and generates the passengers leaving or entering count in each compartments.

## 2. OBJECTIVE

On analysing rail accidents from several years due to human mistakes and faulty tracks. We must have to

improve the technology in railway departments.so this automated metro train is designed.

- Automated Passenger counting helps to solve the robberies and train crashes.
- Service monitoring technology helps to identify the system operations and tracking vehicle location and quality and adequacy of service, automatic train supervision (ATS), and automatic vehicle location (AVL).
- The train incorporates a buzzer to alert the passengers before closing the door and also intimate them before starting.
- The movement of the train is controlled by a motor drivers interfaced in the aurdino.

## 3. PROPOSED METHOD

This circuit diagram is used for interfacing components with micro controller is used for assembling the hardware of metro train which is shown in figure 1

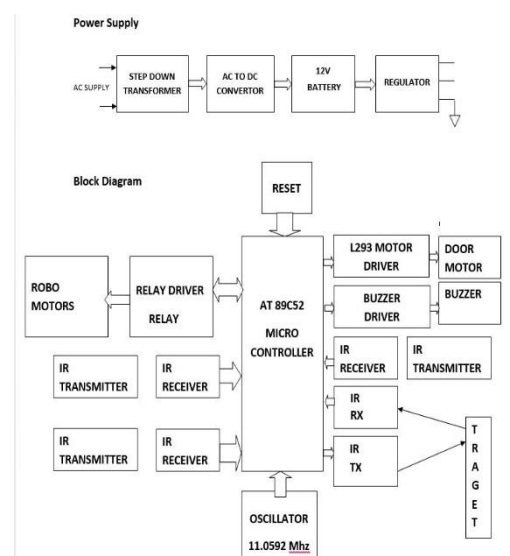


Fig 1: Block Diagram

Figure 1 explains the methodology and connection of components used in this paper. The description of the components is given below.

### MOTOR DRIVER L293D

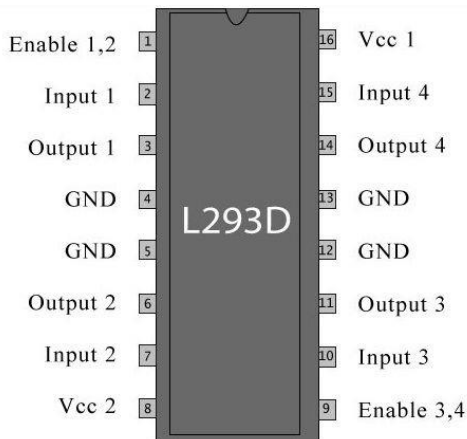


Fig 2: L293D Motor driver

Pin diagram of the motor driver is shown in figure 2. L293D is a dual H-bridge motor driver, so with one IC we can interface two DC motors which can be controlled in both clock wise and anti-clock wise direction and if you have motor with fixed direction of motion. We can make use of all the four input and outputs connect to DC motors. The output supply has a wide range from 4.5 volts to 36 volts, which has made L293D a best choice for DC motor driver.

### IR SENSORS



Fig 3: IR LED

The IR sensor used in Fig 3 is used in this project. It is a semiconductor diode having radioactive recombination. It requires a definite amount of energy to generate an electron hole pair. The same energy is

released when an electron recombines with a hole. This released energy may result in the emission of photon and such a recombination. The amount of energy released when the electron reverts from the conduction band to the valence band appears in the form of radiation.

### LCD

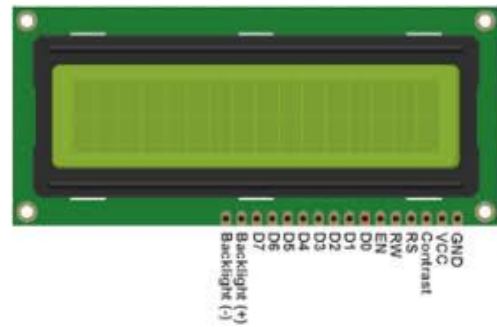


Fig 4: LCD.

In a color display, after the light passes through the liquid crystal matrix, it passes through a color filter (usually glass). This filter blocks all wavelengths of light except those within the range of that pixel. In a typical RGB display, the color filter is integrated into the upper glass colored microscopically to render each individual pixel red, green or blue. The areas in between the colored pixel filter areas are printed black to increase contrast. After a beam of light passes through the color filter, it passes through yet another polarizer to sharpen the image and eliminate glare. The image is then available for viewing. The display is as shown in Fig 4.

### DC MOTOR

A stepper motor is an electro-mechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motor's rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied. When a phase winding of a stepper motor is energized with current a magnetic flux is developed in the stator. The direction of this flux is determined by the "Right Hand Rule" which states: "If the coil is grasped in the right hand with the fingers pointing in the direction

of the current in the winding, then the thumb will point in the direction of the magnetic field.” Figure shows the magnetic flux path developed when phase B is energized with winding current in the direction shown. The rotor then aligns itself so that the flux opposition is minimized. In this case the motor would rotate clockwise so that its south pole aligns with the north pole of the stator B at position 2 and its north pole aligns with the south pole of stator B at position 6. To get the motor to rotate we can now see that we must provide a sequence of energizing the stator windings in such a fashion that provides a rotating magnetic flux field which the rotor follows due to magnetic attraction.

#### 4. WORKING PRINCIPLE

In order to execute the program onto the microcontroller, microcontroller requires basic configuration like 5V regulated power supply, clock, and reset circuit Train moves with the help of motors fixed to the controller with the help of Hbridge. Working Principle of Driverless metro train using AT89C52.

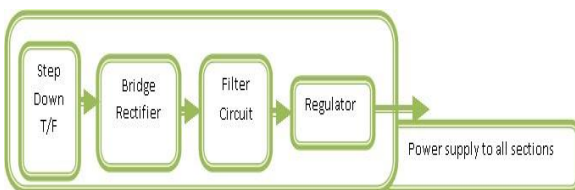


Fig 5: Power Supply unit

The proposed system employs a AT89C52 microcontroller and for the power source, a battery is used. Four infrared sensors are connected to the microcontroller, in which two IR sensors are used to show two stations and the other two sensors are used to control the train door. Three motors are interfaced with the microcontroller through an L293D (motor-driver IC) wherein two motors are employed to control the train movement and the other one is used for controlling the door. A piezo buzzer is used to give an alert to the users, which is interfaced to the microcontroller. A set of seven segment display is interfaced to the microcontroller to display the number count.

Whenever the metro train reaches the station it stops automatically activated by the sensors. Then, the train door opens routinely, such that the travellers can get in the train. After that, the door closes after a set time as per the microcontroller program. It also counts the number of passengers departure and incoming the train by

sensing the IR break of the sensors and displays that on the 7-segment display.

This project in upcoming can be improved by making it more advanced by showing the status of the train on an LCD screen, which is due for entrance and exit for the convenience of the waiting passengers.

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. This is the major reason behind this project. This is a highly superior technology which is now used in developed nations. By using this auto metro train, the train timings will be correct and it keeps away from a lot of problem with the passengers.

#### 5. SOFTWARE USED

Embedded c is actually the extension of c language. It consists of c language sets that can be used for different purposes. It was extending by the standard committee c in 2008 for solving the issues provide by c language. It mostly used the syntax and standard c semantics. This language has so many features as compared to c language such as it used the fixed point arithmetic, spaces between maned address and hardware input, output addressing. As we look around ourselves, we have so many embedded systems such as washing machine, digital camera and mobile phones all these the examples of embedded system, in all these things embedded c language is used. So many extra characteristics have added in embedded c such as operation or mapping register, number of memory area and representation of fixed point.

Our Embedded System tutorial includes all topics of Embedded System such as characteristics, designing, processors, microcontrollers, tools, addressing modes, assembly language, interrupts, embedded c programming, led blinking, serial communication, lcd programming, keyboard programming, project implementation etc.,

#### 6. RESULTS AND DISCUSSION

- Easy way of transport from and to remote area, fully air conditioning trains.
- By using this train system we can travel a safe journey with high speed technology

- Whenever the train arrives at a station, the IR line is interrupted and the train stops automatically.
- After the train is stopped the doors of the train will be opened and a buzzer will be blown indicating the passengers that the station is arrived.
- Meanwhile the passenger counting section will count the no. of passengers present inside the train and displays it on a LCD screen.
- After a prescribed time set in the controller, a buzzer will be blown and the doors will be closed automatically.
- Then the train will move to the next station and process will continue at every station.
- In Metro monitoring equipment for preventive maintenance, together with service monitoring, improves service reliability.



Fig 6: Driverless Metro Train

The prototype of driverless metro train is shown in the above figure 6. the results are verified for the above project shown.

## 7. CONCLUSION

The driver less train prototype that is presented in this paper is a final year project .Such projects shows a minor part of what the future on technology integration may look like for the advanced services for better transportation in this paper we have discussed about how metro train is automated .The main advantage is counting the passengers in each compartment .This can reduce crowd in the train and avoid illegal activities .It can also detect faulty track and it will stop the train by using IR sensors and micro controller.

## 8. REFERENCES

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