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Automated Driverless Metro Train

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ABSTRACT
The project's goal is to create a metro train that does not require a driver. Automation is now totally driving modern technologies, as seen in recent history. This requirement gave us the idea to suggest an automated train system with the following features: It is designed to move automatically and follows the made plot line using IR sensors helps in improving the management system of the railway network, reduces human errors, and consumes less power. It can detect stations and stop on its own after detecting the station. It can also automatically open and close the door when it is in station. The system also displays the station name to make clear about the station to the passengers. A PIC Microcontroller serves as the system's main controller. The PIC16F877A microcontroller is interfaced to IR sensors, DC motors, motor drivers(L293d) and an LCD display. The microcontroller receives input from the IR sensor, which it uses to identify the station. When a station is detected, the microcontroller automatically stops the train and opens the door. On the LCD, the station name and the two-way visitor count are displayed.

Keywords: PIC16F877A, L293d, IR sensors, LCD, DC motors.

I. INTRODUCTION

Designing a metro train that functions automatically is the main aim of this project. The suggested automated train system can recognize a station and can open and close the doors on its own. The system also displays the station name and visitor count on the LCD display. Using an IR sensor, it is intended to move automatically and follow the created plot line. Nowadays, we may employ advanced technology in every aspect of our lives. As a result, the transportation sector has undergone substantial growth. In the past, accidents involving regular metro trains have happened for a variety of reasons, including driver error, signal issues, and a major factor is the human-operated metro train's lack of control over time, which results in timing errors that have an impact on the management system for the railway network. We have a novel idea for resolving this issue: the driverless metro train. A driverless metro train will improve the management system for the railway network, remove human inaccuracy, consume less energy, and provide safety and convenience for passengers as they travel. A PIC Microcontroller serves as the system's main controller. The PIC16F877A microcontroller is interfaced to IR sensors, DC motors, and an LCD display. The microcontroller receives input from the IR sensor, and using this input, it detects the station. When a station is detected, the microcontroller automatically stops the train and opens the door. On the LCD, the station name and the two-way visitor count are displayed. The microcontroller closes the door and the train moves after a specified amount of time. The train uses to IR sensors for path detection and this path detection happens between two stations. A L293d motor driver will be used to control the door DC motors that are used for train movement and door opening or closing. The PIC Microcontroller is preloaded with an intelligent program created using embedded "C" language to carry out the task.

II. LITERATURE REVIEW MATERIALS AND METHODOLOGY

Divyang Kaka, Harshad Sonawane, Hemang Jani and Abhishek Patel in “Driverless Metro Train” presents the driverless metro train which runs between two stations. The Arduino Mega was utilized in this project. Drivers are no longer required. A train has an RFID sensor fitted, and tags have been placed at the station to use

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RFID technology to detect the station. Using a GSM module, this project also allows for train tracking. For emergency smoke detection, this project also incorporates a MQ2 sensor. Utilizing this initiative, human errors can be reduced.[1]

Md Younus, Pooja Gadekar, Adhiraj Walse in "Line Follower Using Arduino and Its Applications" presents how a robot follow path using IR sensors to reach the destination. In this project, an Arduino UNO R3 was used. Two infrared sensors identify the path, and a motor driver drives the motors. The robot was designed in such a way that two infrared ray sensors were installed under the chassis of the robot. Therefore, one infrared sensor will transmit a signal to detect a black line, if it detects black line the infrared sensor will not get the signal. The signal only reflects back only if it detects white surface.[2]

III. MODELING AND ANALYSIS

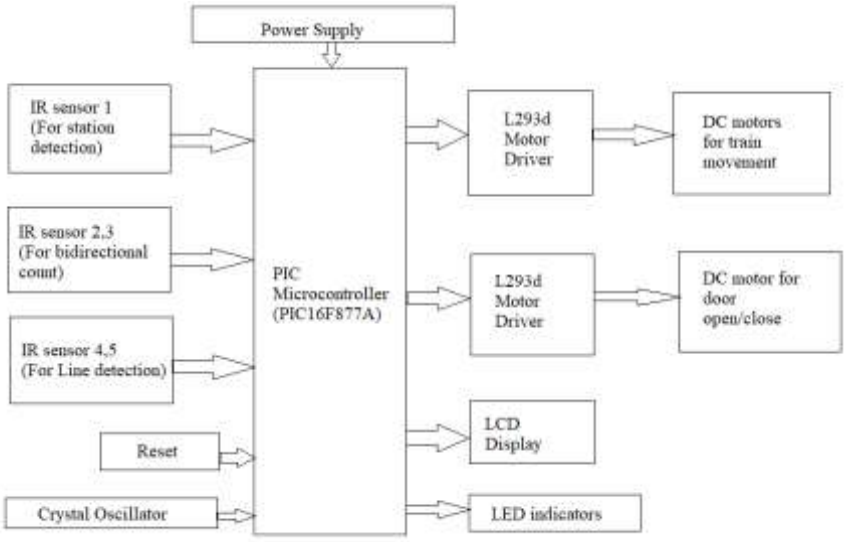

Figure1: Block Diagram of Automated Driverless Metro Train

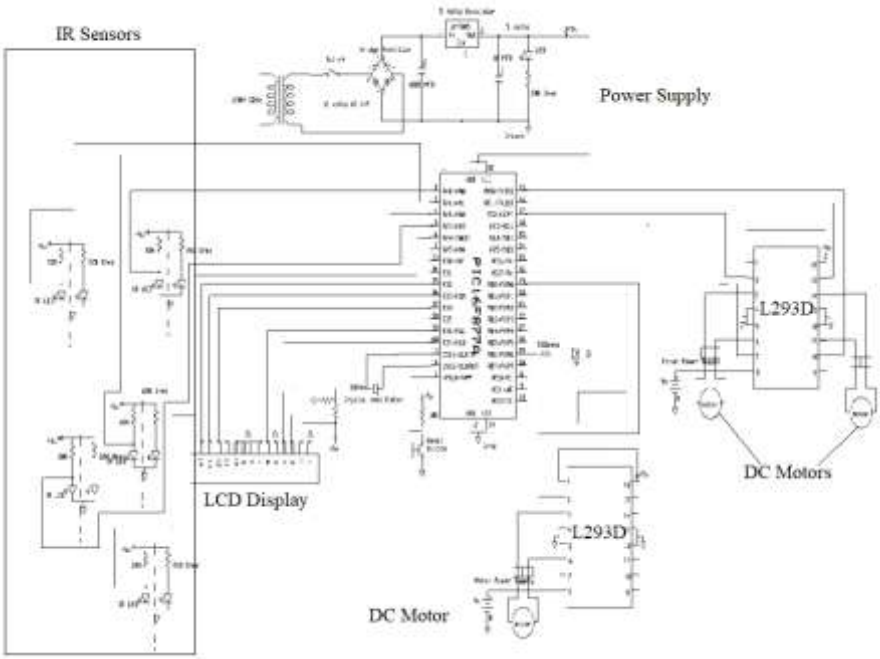

Figure2: Schematic Diagram of Automated Driverless Metro Train

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Hardware components:

1.PIC16F788A Microcontroller:

The RISC architecture-designed PIC16F877a is a 40-pin PIC microcontroller produced by Microchip. From Port A to Port E, there are five ports on it. We utilize a crystal oscillator to supply frequency to the PIC Microcontroller, and for the PIC16F877a, you can use a crystal oscillator with a frequency range of 4MHz to 40MHz.

2.IR Sensor:

A piece of equipment called an IR sensor emits light to find objects. An IR sensor can gauge both an object's heat and motion. Typically, all thermal imaging objects give off some form of thermal radiation. Infrared sensors can identify these radiations even though the human eye cannot see them.

3.DC Motor:

An electric motor that utilizes direct current is known as a DC motor (DC). DC motor transforms electrical DC energy into rotary motion. When a current-carrying conductor is exposed to a magnetic field, it experiences a torque and a tendency to move. In other words, a mechanical force is created when an electric field and a magnetic field interact. This is how a direct current motor, sometimes known as a DC motor, operates. Motoring action is the term for this.

4.LCD Display:

Liquid crystal displays, also known as LCDs, are used to display information. This sort of LCD is used in many portable computers as well as digital watches, and in this project, we utilize a 16*2 LCD that is a 4-bit 16*2 LCD and is used to display various strings. The LCD has 16 total pins and common and string modes.

5.Motor Driver:

L293D is a dual H-bridge motor driver, allowing us to interface up to four DC motors with just one IC. These motors can be controlled in both clockwise and anticlockwise directions, and if you have a motor with a fixed direction of motion, you can connect up to four DC motors by utilizing all of the input and output ports. The L293D has a max output current per channel of 1.2A and an average output current of 600mA.

IV. RESULTS AND DISCUSSION

The "Automated Driverless Metro Train" project's main objective is to design a driverless metro train. The suggested automated train system has the ability to recognize the station and opens

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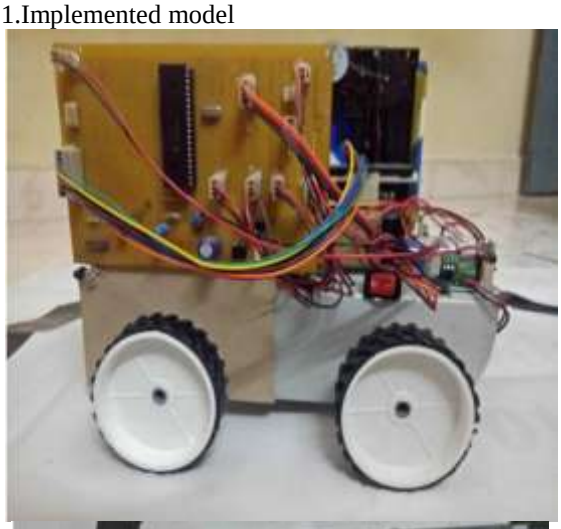
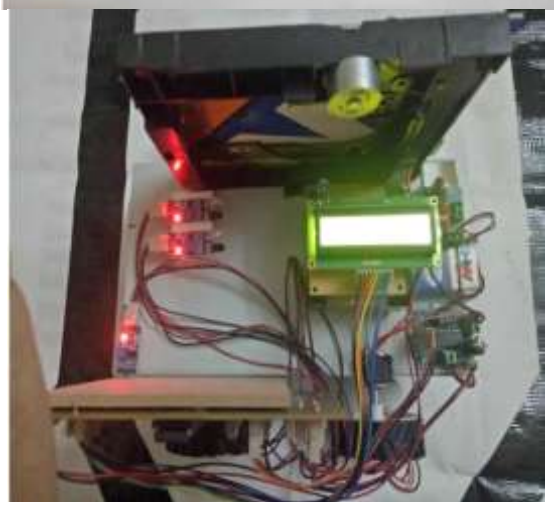
and closes the door automatically. The system also displays the station name and visitor count on an LCD screen. It uses an IR sensor to move automatically and adhere to the created plot line.

1.Implemented model





V. CONCLUSION

The project has established integrating capabilities for all of the hardware elements used. Each module's presence and placement have been carefully considered and have a positive impact on how well the unit functions. In addition, the project has been implemented effectively using cutting-edge ICs and advancing technology. Consequently, the project has been effectively developed and tested.

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