Shuttling of Automatic Metro Train Between Stations

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Abstract: This project aims to illustrate the use of innovation in metro train development. This proposed framework is a programmed train and it wipes out the need of any driver. In this undertaking Arduino has been utilized. Whenever the train shows up at the station it stops naturally, as detected by an IR sensor. It is likewise furnished with passenger counting segment, which counts the passengers present in the train. The passenger counts are shown on a serial monitor of the Arduino. Further the undertaking can be upgraded by making this framework further developed by showing the situation with the train over an LCD screen. The voice module IC is utilized for the sound declaration of stations.

Keywords – Metro, Automatic, LCD, Arduino.

I. INTRODUCTION

There has been a lot of progression in the metropolitan rail line travel, turning over from motor to metro trains and to ongoing programmed metro trains. [1] Driverless metro train is an innovative and intelligent mass transportation solution. Driverless system meets many numbers of objectives, including high limit, consistency and speed, decreased functional expense, versatility, and adaptability, it satisfies the possibility of new way to deal with portability. [2] This venture is intended to show the innovation utilized in a metro train movement, which is seen commonly in most developed countries. This train consists of a controller. This allows the train to run automatically from one station to the next. This proposed solution is an autonomous train that does not require a driver. As a result, any human error is eliminated. [3] The CPU in this project is an Arduino. When the train arrives at the station, the infrared sensor senses it and stops automatically. The doors open and passengers can board the train. There is a passenger counter that counts the number of passengers boarding and exiting the train. There ought to be a passenger limit, such as 10 passengers - after 10 passengers board the train, it should display overload.

II. REQUIREMENTS

Hardware Requirements

Fig 1. Arduino Uno

Arduino Uno

- Fig 1, an open-source designs. [4] Its benefit being open-source platform is that there is a large community of people using it to troubleshoot. This makes it easy to find someone to help debug your activity.
- It's an easy USB interface. The chip connects straight to your USB port and registers as a sequential port for your PC. It allows you to interact with it as if it were a serial device. It has an advantage that is it makes serial communication very simple and makes USB connection to modern PCs extremely convenient.

IR Sensor

Infrared sensor [5] emits as well as identifies IR radiation to detect its surrounding factors show in Fig 2.

IR transmitter or Infrared transmitter is a light emitting diode which sends out infrared radiations. They are also considered as IR LED's.

Receiver: Infrared recipients identify the radiation from an IR transmitter.

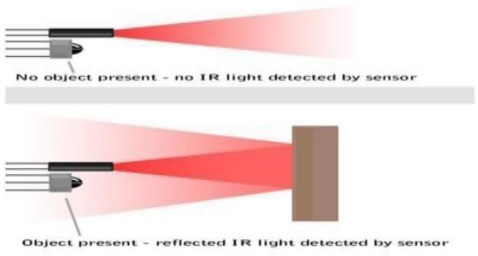

Fig 2. IR Sensor

PIR Motion Sensor

These sensors detect motion or movement and are used to detect whether a human has moved into or out of the sensor's limit or range. They are commonly found in gadgets and appliances used in households and companies. [6] They are even known as PIR, "Passive Infrared", "IR motion" or "Pyroelectric," sensors.

They are mainly composed of a pyroelectric sensor that emits low-level radiation. It is actually divided into two parts, see Fig 3.

The main reason for this is that we want to detect mobility or change rather than average IR levels.

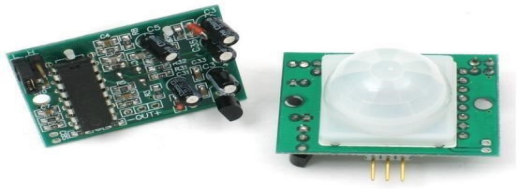

Fig 3. PIR Motion Sensor

Motor Driver L298N

The module L298N (Fig 4) is a double full bridge motor driver for DC and stepper motor control. [7] You can control the speed and direction of rotation of the two DC motors. This module uses the L298 double channel H-bridge motor driver IC. This module involves two ways to control the rotational speed and direction of a DC motor. These are PWM- to control speed and H-Bridge- to control direction. These modules can control two DC motors or one stepper motor simultaneously.

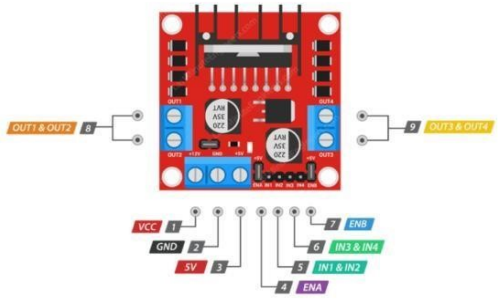

Fig 4. Motor Driver L298N

DC Gear Motor

A DC gear engine (Fig 5) is a dc engine that utilizes a gearbox to increment or decline the speed of the engine. [8] The gearboxes are generally joined to the shaft of the engine and can be made of various materials like metal, plastic, or considerably elastic. A higher gear proportion will bring about a slower however more impressive engine, while a lower gear proportion will bring

about a quicker yet less strong engine. Gear engines are utilized in various applications, like electric vehicles, mechanical technology, and clinical gadgets.

Fig 5. DC Gear Motor

NRF24L01 Wireless Module

NRF24L01 (Fig 6) is fundamentally a wireless transceiver, [9] which is utilized to send and get information by utilizing radio waves. It involves SPI convention for communicating information. Its information transmission speed depends on 2Mbps. NRF24L01 is ordinarily utilized in modern gadgets and ventures for information transmission. It is for the most part utilized in PC, toys, controller, games, and other electronic gadgets. In the present instructional exercise, I will examine its working, convention, pinout, and highlights. I will likewise impart a few connections of its communicating to Arduino and some other microcontrollers.

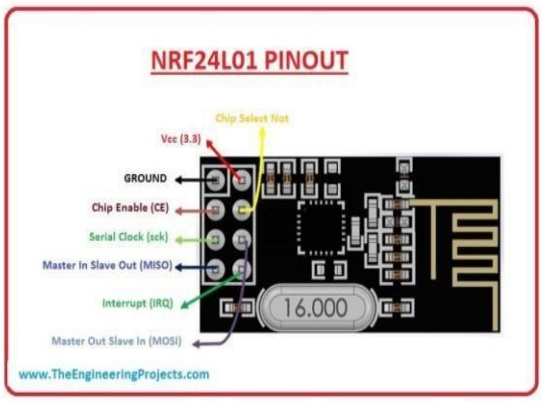

Fig 6. NRF24L01 Wireless Module

Software Implementation

The software utilized in this project (Fig 7,8) is the ARDUINO IDE programming [10] Arduino is a prototype platform in light of a simple to utilize equipment and programming. It comprises of a circuit board, which can be programmed-known as microcontroller and a ready-made software called Arduino IDE, which is used to compose and transfer the PC code to the actual board. Arduino gives a structure factor that divides the elements of the microcontroller into additional open bundles.

III. BLOCK DIAGRAM

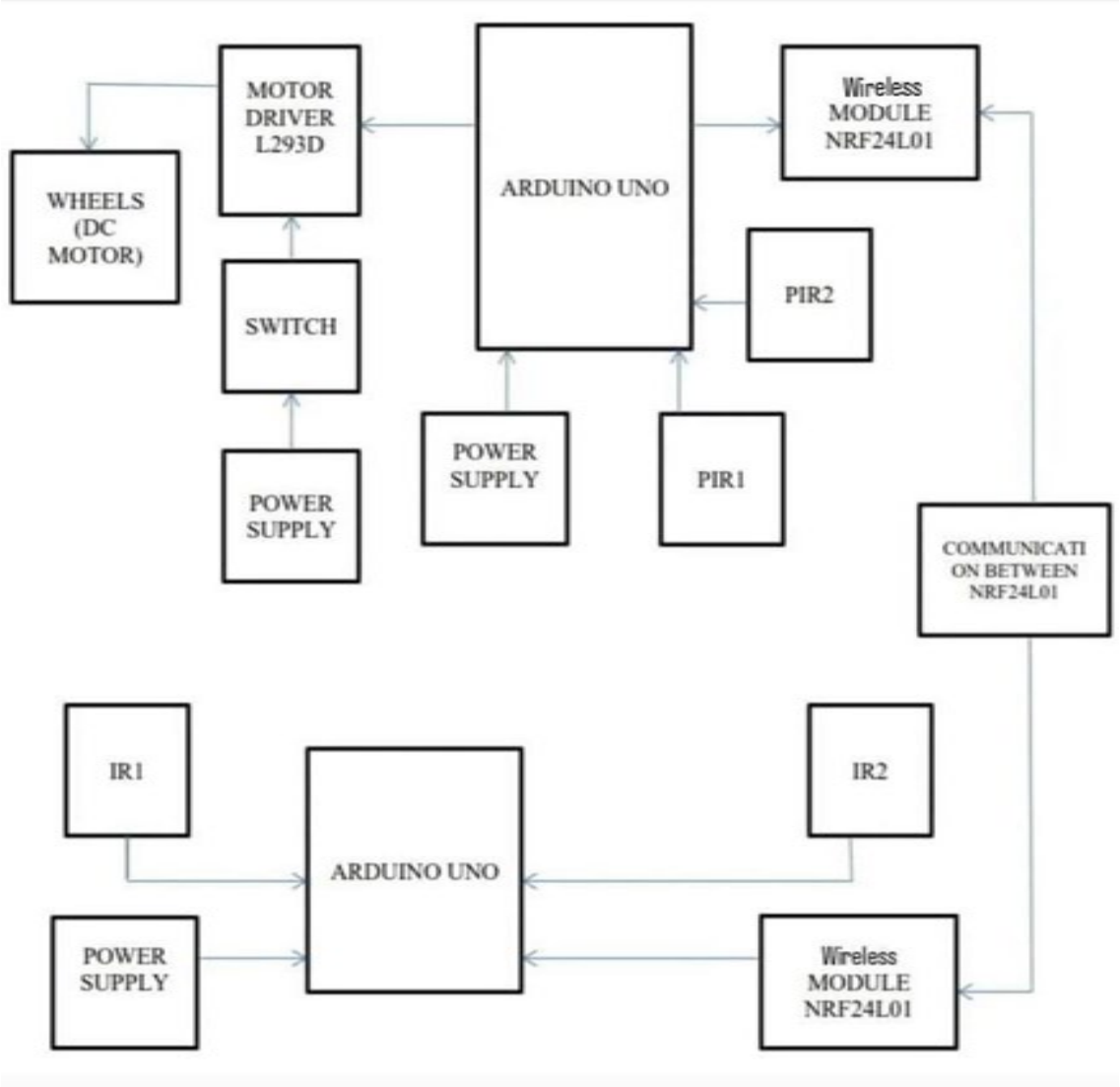

Fig 7. Block Diagram

IV. FLOWCHART

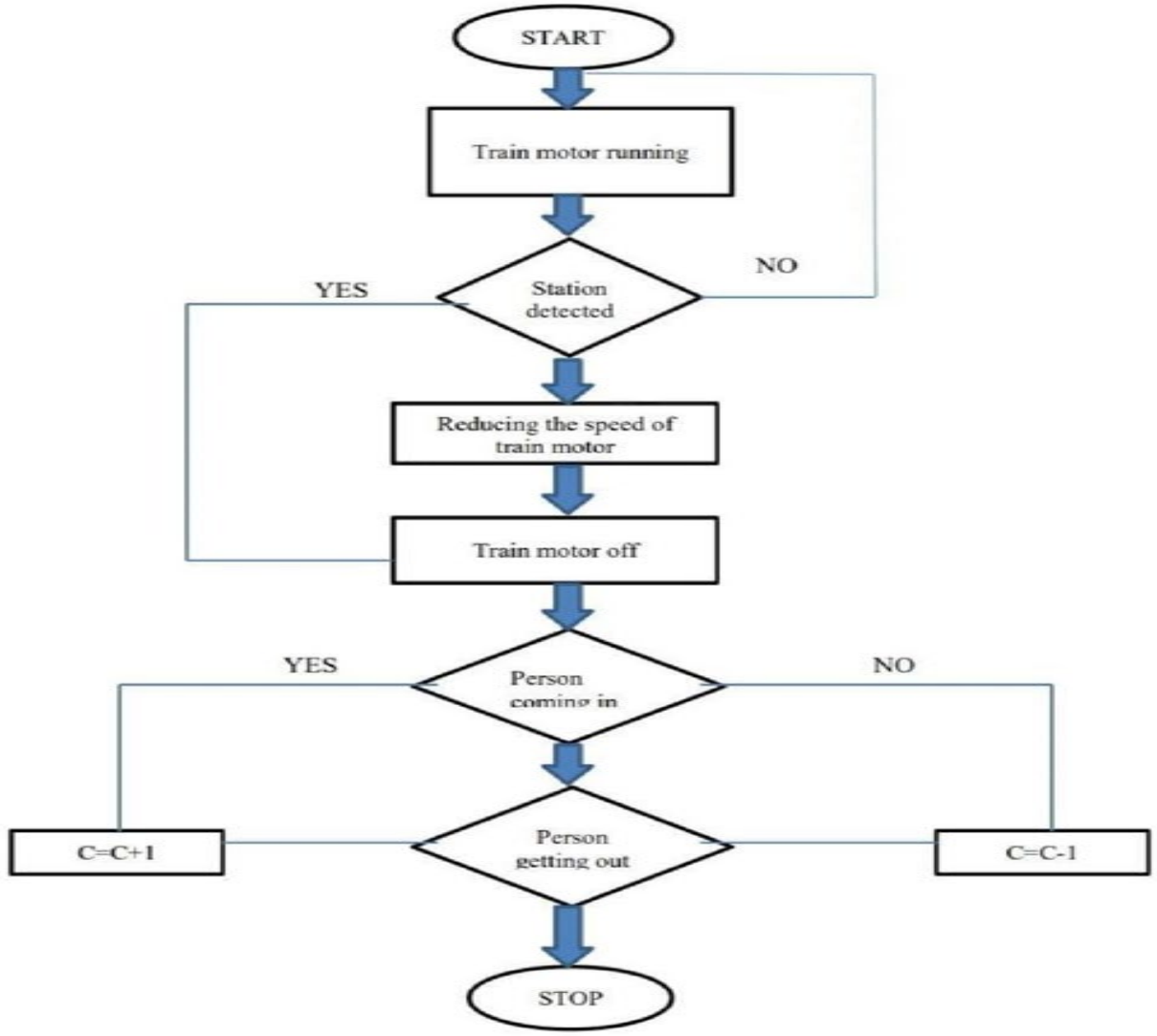

Fig 8. Flow Chart

Working

The working of this project is divided into 2 segments (Fig 9).

- Controlling the motion of the train
- Counting the number of passengers present in train

*Controlling the motion of the train***:** When the train is in motion, the IR LED photodiode arrays are typically placed with one at the beginning of the station and the other at the opposite side of the station. Now as the train approaches a station first it gets detected by first sensor and signal is sent to reduce the speed of the motor. Later as it moves it gets detected by the second sensor at other end and then the signal is sent to stop the motor. The signals are sent using wireless module.

*Counting the number of passengers present in train***:** This is done using a passenger counting system. It consists of two PIR sensor arrays. Both at the top inside of the door. We have to place in section i.e.one counts the passengers entering and other exiting. So, the passengers entering must maintain a queue**.**

V. RESULTS

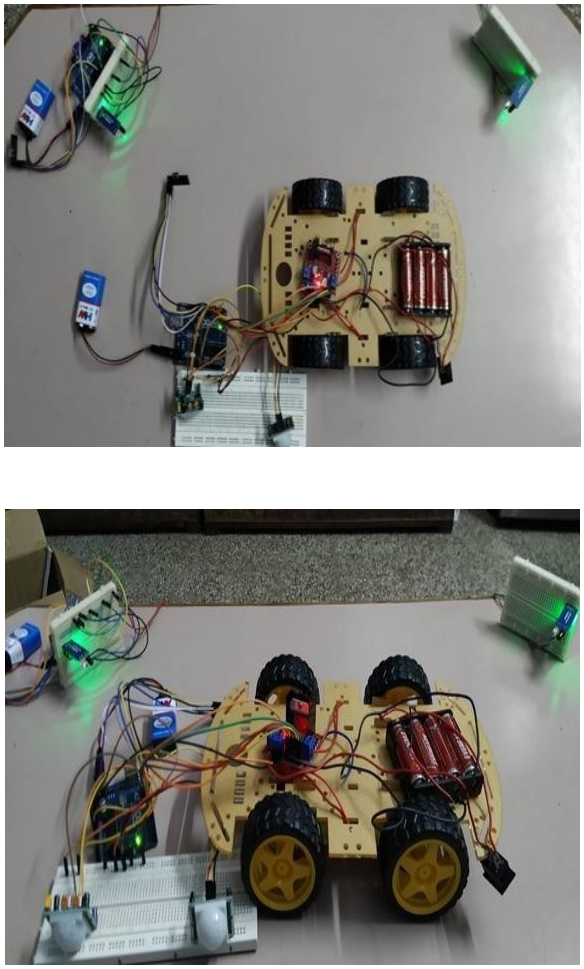

Fig 9. Output

VI CONCLUSION

This project is only a small part of what the future and technological integration may look like for the modernization of various service sectors, including transportation. Researching and creating a working prototype boosts confidence and ensures that it is possible to design a system and use it to solve a specific problem by gathering the necessary information. Furthermore, the development of a prototype system could be the basis for a much more advanced and complex control system, such as a true driverless train system. We have described how a metro train can be automated using the paper presented above, with the main benefit of automatically counting the number of passengers as they enter the train. This counting helps in reducing the train's overcrowding. The counting, on the other hand, appears on the serial monitor. In this way, the venture "Shuttling of Automatic Metro Train Between Stations" is extremely valuable from all perspectives.

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