

AUTOMATIC METRO TRAIN USING RFID

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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 a controller 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 ATmega328P has been used as CPU. Whenever the train arrives at the station it stops automatically, as sensed by an RFID card and RFID Module. Then the door opens automatically so that the passengers can go inside or come out of the train.

Key Words: RFID Module, Aurdino, WIFI Module, Drive Circuit.

1. INTRODUCTION

Metro is short form of metropolitan and this train is used only for metropolitan city. The 1st metro train in the world was run 1863 in London, The first rapid transit system in India is Kolkata Metro, which started operations in 1984. For the implementation of a metro rail system, to all Indian cities having a population of more than 1 million. In May 2015, the Union Government approved the Union Urban Development Ministry's proposal to implement metro rail systems in 50 cities.

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 ATmega328 used as CPU. Whenever the train arrives at the station it stops automatically, as sensed by the RFID reader. Then the door is opens automatically so that the passengers can go inside the train / outside the train. The door then closes after a prescribed time set in the controller by the program. It is also equipped with a passenger counting section, which counts the number of passengers leaving and entering the train. The passenger counts are displayed on a LCD display. The movement of the train is controlled by a motor driver IC interfaced to it. As the train reaches the destination the process repeats thus achieving the desired operation. The train is automated as we know which will work without a driver. Thus this train will avoid human errors. Thus this train will be very beneficial to us. If we use this type of trains then the timetable of trains also will be maintained. Our proposed system uses RFID module which will detect the station. The train

incorporates a station by using command on WIFI module start the train start and reach station the RFID card reader is read the card action for stopping train, at that time display the station one is arrived as well as by door is open automatically for 5 second then door is close then wait one second train is reaches to next station. When next station is arrived the controller send vacancies by WIFI module it display on the LCD display which mounted on the train coach. At that time the RFID card reader detects RFID card which fixed on the station, that time display station 2 on LCD display the door open for 5sec to enter/leave passenger after 5sec door of coach is closed wait for 1sec and reach to next station.

1.1 Literature Survey

The system is studied that there are few disadvantages of the existing system that is: Constant human intervention, High cost, More Manpower is required. Installation and integration is time consuming. The proposed system overcomes the above disadvantages and has the merits as shown:

- Automated system requires less manpower.
- It is time efficient system.
- It also displays vacancy in the coach.

The various papers studied that were presented and found the below things in the paper. First, the paper written by Prakash Ratan and Chandra Jogi named Auto Metro Train to Shuttle between Two Stations in this paper we saw that they proposed IR sensor for detecting if the station has arrived and they also displayed the station name on the LCD display. But we found out that IR sensors are not so reliable for detecting the station. Sometimes IR may not detect the station. So we decided to improvise in this project.^[1]

Then read another paper written by Guruprasad Patil, Dr. C. R. Rajashekhar which was named RFID based Metro Train System. In this system they used RFID technique for the detection of the station and they had a place announcement system in their project. We found this system to effective so we decided to use RFID module in our project for the detection of station. Thus this paper was very useful for us in our project.^[2]

Then read some more papers and found the project Full automation in Driverless Trains: A Microcontroller- Based Prototype written by Thabit Sultan Mohammed, Wisam Fahimi Al-Azzo, Mohammed Ahmed Akaak, Mohammed Laheeb Suroor. In this paper they also used IR sensors for the detection of station but some technology such as station name display and number of passengers display were used in this paper which were very useful for us.^[3]

Thus from the above papers we found out some answers and decided some important things that are to be used in the project and thus it became very easy for us to design our project.

1.2 Architecture Diagram



Fig.1

2. HARDWARE SPECIFICATION

- a) ATmega328
 - b) ESP8255 WiFi module
 - c) RFID Reader
 - d) IR Sensor
 - e) LCD module
 - f) Relay board.
- a) *ATmega328:*

ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per Mhz. This empowers system designer to optimize the device for power consumption versus processing speed.



Fig.2

High Performance, Low Power Atmel® AVR® 8-Bit Microcontroller Family

Features

1. Advanced RISC Architecture
2. 32KBytes of In-System Self-Programmable Flash program
3. Memory

b) *RFID Module:-*



Fig.3

RFID is only one of numerous technologies grouped under the term Automatic Identification (Auto ID), such as bar code, magnetic inks, optical character recognition, voice recognition, touch memory, smart cards, biometrics etc. Auto ID technologies are a new way of controlling information and material flow, especially suitable for large production networks. The RFID technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier, through the use of inductive coupling or electromagnetic waves.

The data carrier is a microchip attached to an antenna (together called transponder or tag), the latter enabling the chip to transmit information to a reader (or transceiver) within a given range, which can forward the information to a host computer.

The middleware (software for reading and writing tags) and the tag can be enhanced by data encryption for security-critical application at an extra cost, and anti-collision algorithms may be implemented for the tags if several of them are to be read simultaneously

c) LCD:

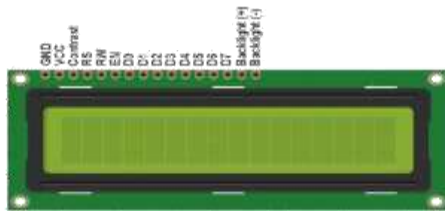


Fig.4

This is the display part of our system. All the changes or the required action needs to be taken will flash on this LCD. This LCD is of 16*2 configurations. That means they are having 16 columns and 2 rows. Each row and each column can be individually programmed to display the characters with the help of Microcontroller.

d) ESP WIFI Module:

Espressif Systems' Smart Connectivity Platform (ESCP) is a set of high performance, high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wifi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement. ESP8266EX offers a complete and self-contained wifi networking solution; it can be used to host the application or to offload wifi networking functions from another application processor.

When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications. Alternately, serving as a wifi adapter, wireless internet access can be added to any micro controller based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated wifi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.



Fig.5



2. WORKING

The automated metro train is first started through the train application which is accessed by the authorized person. This is done with the help of ESP8266EX (WIFI Module). The train then starts its journey following its path. When the train reaches the station, the train stops. This process of detection of station is done with the help of RF card and RF Module. The RF module which is mounted on the train detects the RF card which is mounted on the station. The RF card contains a unique code which defines the particular station. Thus when this RF card is detected, the train stops and then the door starts to open.

When the door is opened, the station name and vacancy is displayed on the LCD screen. The vacancy that is displayed on the train is sent via ESP8266EX (WIFI Module). Thus this vacancy display is beneficial for the passenger for the passenger to identify if the seat is available in the coach. Then the door starts closing after a defined time interval and the train starts moving towards the next station. Then when the next station arrives, the same process above is repeated.

Then after certain time there comes a position when the last station of the journey of the train arrives. At this last station, the train stops but it stops completely; it will not move to the next station for the further journey. This last station is detected in the same way as above. The unique code of the last station is detected by the RF module and the train stops.

There is also a facility in the system to stop the train in the case of an emergency. This facility provides service in some cases such as track faults, accident on the track, etc. Thus in these extreme cases, the train can be stopped and this facility is provided with the help of ESP8266EX (WIFI Module) which sends the stop signal to the train. Thus is the working of the circuit which is mounted on the train.

2.1 OUTPUT



Fig.6



Fig.7

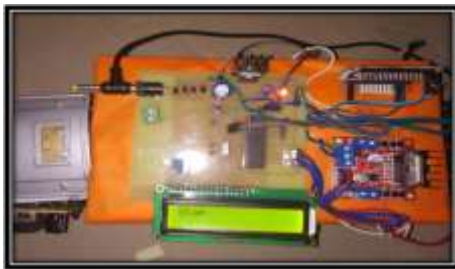


Fig.8

Above Fig shows the interfacing of RFID reader with WIFI Module display which shows the content fed to RFID card. LCD Display shows user information which is programmed in RFID card.

3. FUTURE SCOPE

This Project is useful in developing countries & this project has a bright future as it is being used in countries like Germany, France & Japan. This project helps us to control train without a driver and the stations are shown on the LCD so the passenger doesn't have any type of difficulty. This project will lead to increase in technological trends & this will help the people in many ways.

4. CONCLUSIONS

The driverless train prototype that is presented in this paper is in fact a final year project. A general conclusion that can be said about such engineering projects is that they are introducing students to an open horizon of developments. Such projects can only represent a minor part of what the future and technology integration may look like for the modernization of different service sectors including transport. Researching and developing a working prototype enhance self-confidence and assure that it is possible to design a system and apply it for solving a particular problem by acquiring the necessary information. Moreover, developing a prototype system can serve as a basis of a far more sophisticated and advance form of control system such as a real driverless train system.

The main aim of this project is to make an automated system for stopping of the train from station to station using RFID and the radio frequency wireless card for tracking the station data. Automated metro lines are more energy-efficient and optimize passenger service automatically in real time. In terms of operational efficiency and cost-saving, driverless networks offer many advantages, such as lower expenditure for staff, avoiding human error and providing reliable auto metro train.

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