

# Design and Development of Controller for Driverless Train

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**Abstract** - In present world almost all industrial systems are based on automation system, as it has many advantages. The development of a fully automated train is capable of showing the station on the LCD display with other facility is also designed. The train is programmed for the specific path. Every station on the path is defined; stoppage timing of the train is predefined. Driverless train is rail-based, mass rapid transit systems that operate on an exclusive right-of-way, which is separated from all modes of transport in an urban area. Most often, the right-of-way is either underground or elevated above street level. These systems generally operate at an average speed of 20–35 km/h, and are characterized by their high capacity (50,000–75,000 passengers per hour, per direction) and high frequency of operation. The capital cost of construction is between 20–30 times that of the Bus Rapid Transit system, depending on whether the driverless systems are underground or elevated.

**Keywords:** Programmed, Driverless Train, Characterized, Elevated, Driverless System.

## I. INTRODUCTION

In India, manual method of operation has been adopted for the control of trains. Also the system has many disadvantages like late running of train, accidents etc. This may cause a lot of error in the manual control system. So here in this project we have adopted fully automated control system for train. A small prototype of the driverless train is developed that is able to show the names of the stations via LCD display. The train is designed to run on the DC gear motor. It has an additional facility of auto-stop at the different stations with the facility of voice announcement at each station.

We have used microcontroller as a CPU unit. The whole movement of the train is basically controlled by the DC gear motor. The system is integrated with the LCD display of two line which shows the station name on it. The train is designed for three stations. The train system is integrated with RFID technology. RFID card is installed at each station and also RFID reader is installed at the train so when reader detects the RFID card, train will get stopped. The stoppage timing is of 3second. There is a facility of showing various messages and

announcements via LCD display. It is also has the facility of emergency braking due to which train stop as soon as possible. When any obstacle is detected, train will get automatically stop & train blows the buzzer. Driverless train is rail-based, mass rapid transit systems that operate on an exclusive right-of-way, which is separated from all modes of transport in an urban area. Most often, the right-of-way is either underground or elevated above street level. These systems generally operate at an average speed of 20–35 km/h, and are characterized by their high capacity (50,000–75,000 passengers per hour, per direction) and high frequency of operation. The capital cost of construction is between 20–30 times that of the Bus Rapid Transit system, depending on whether the driverless systems are underground or elevated.

Promoters of driverless train systems often claim that one of the benefits of the driverless train is reduced congestion, due to the users' shift from road-based motorized modes to driverless train systems. This mode shift is then claimed to result in reduced air pollution and road accidents. The project is integrated with multiple facility including security system, voice announcement, display of stations name, buzzer etc. The train is designed for three stations named as Ambad, Sinnar & Satpur.

## II. MOTIVATION

In present scenario the load increasing on roads are very irritating and wastage of time, various people can't reach there workplace on time due to it, so that this idea could share some of the load which comes on road. And city could be freed from industrial transportation by which its flow of traffic maintains appropriate, to make country smart and to attract more and more companies, industries toward the country, the following technology can help us out. Most of the accidents occur due to human error only and also due to not proper maintenance of the track. People are not bothering about the small wear and tear of the tracks. Secondly in electric trains fault occurring chances are more. In Chennai metro train daily 10 to 15 trains are getting faulty due to the overload condition and lack of maintenance. By observing all these parameter we decided to make such a train mechanism which is not giving any overload problem and cost maintenance system (driverless).

This paper gives a closer look on the subject of the conversion of a conventional train in to a fully automated operation without interrupting or disturbing service.

### III. PROBLEM STATEMENT

In present scenario the load increasing on roads are very irritating and wastage of time, various people can't reach their workplace on time due to it, do that this idea could share some of the load which comes on road. And city could be freed from industrial transportation by which its flow of traffic maintains appropriate, to make country smart and to attract more and more companies industries toward the country the following device can help us out. Most of the accidents occur due to human error only and also track maintenance people are not bothering about the small wear and tear of the tracks. Secondly in electric trains fault occurring chances are more. In Chennai metro train daily 10 to 15 trains are getting faulty due to the overload condition and lack of maintenance. By observing all these parameter we decided to make such a train mechanism which is not giving any overload problem and cost maintenance system. A large number of miscellaneous problems include late running of trains, lack of passenger facilities like without displaying station name and voice announcement. The driver controlled mode, in conventional modes it's the manual driver who drives the train and control the train operation like starts, stops.

Following Concluded the Problem Statement as:

1. Full Automation in manual train.
2. Auto Stop of train at station using RFID Technology.
3. Collision Detection (Safety System).
4. Security System.

### IV. BLOCK DIAGRAM

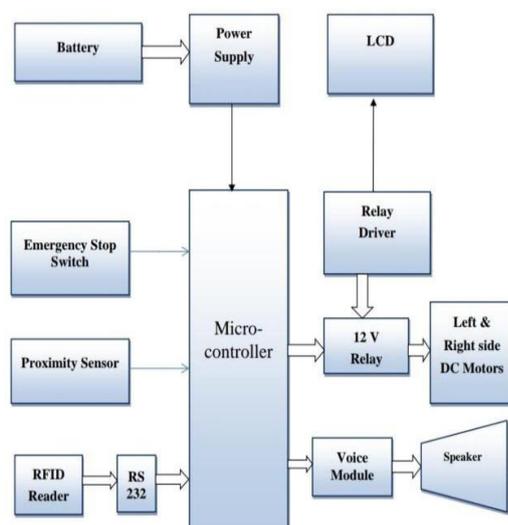


Figure 1: Block Diagram of the System

The blocks shown in the above figure 1 shows the complete flow of our project. It consist of the power supply, LCD display, Relay driver, Microcontroller, Voice module, RFID reader, Speaker, Proximity sensor etc. As the system is powered the welcoming message can be seen on the LCD display. Then train starts normally and stops at the stations using RFID technology. If there is obstacle detected in the route the train immediately auto stop and blows the buzzer till the route is clear. As soon as the obstacle is cleared the train starts normally with the delay of 3seconds.

**Power Supply:** The power supply section is the section which provide +5V for the transmitter section to work. IC LM7805 is used for providing a constant power of +5V.

**Decoder:** A decoder is a device which does the reverse of the encoder, undoing the encoding so that the original information can be retrieved.

**RF Receiver:** The RF signal transmitted by the transmitter is detected and received by this section of the receiver. This binary encoder data is sent to the decoder for decoding the original data.

**LCD:** This is the output unit in the receiver section. The station name is displayed on this display unit when the receiver comes in the range of the transmitter.

**Voice Alert:** This is another output unit in the receiver. This gives the voice alert of the station reached based on the RF transmitter signal received.

### V. EXPERIMENTAL RESULT

Our work aims to design a full automation in driverless train which is used for drive the train without driver. PIC 18f4550 is the heart of the system which provides the necessary resources of computation & communication among other components. The whole process of fully automatic driverless train goes through various steps while executing the task.

These steps are as follows:

1. After starting the system name of the project displays on the LCD screen for a while.
2. The LCD screen then displays, the station name Ambad. The PIC microcontroller receives data from the RFID reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Ambad station arrive.
3. The LCD screen then displays, the station name Sinnar. The PIC microcontroller receives data from the RFID

reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Sinnar station arrive.

4. The LCD screen then displays, the station name Satpur. The PIC microcontroller receives data from the RFID reader, reader read data from RFID card at specified identification code, and gives the relative digital using RS232 communication i.e. on LCD display. At same time voice announcement of station done like Satpur station arrive.
5. If there is obstacle in the path of train then this obstacle detected by proximity sensor. When sensor indicates the obstacle the buzzer goes ON. And stop the train automatically also buzzer is in ON condition continuously.

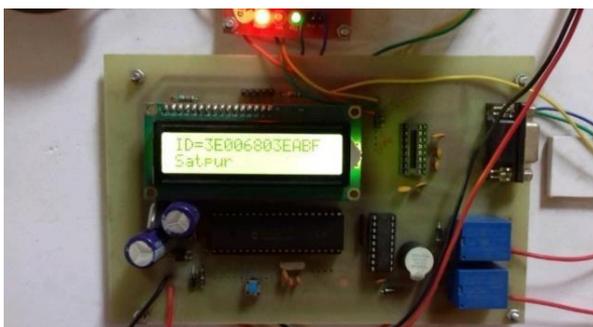


Figure 2: Display of Station Name

## VI. ADVANTAGES

- Auto-stop at the pre-defined stations.
- Safety system is integrated while sensing the obstacle in the route.
- Voice announcement facility helps the passenger to know the stations name.
- Load on city traffic will be divided.
- Less Human Error.
- No delay in train arrival.

## VII. DISADVANTAGES

- Its path will be limited so it will drop goods only on limited stations.
- The schedule could be disturbed due to technical reason.
- Its passenger capacity will be predefined so excesses entries are not possible.
- High maintenance will require.

## VII. CONCLUSION

The rail leads to be the easiest way in city map toward industrial area, so that the luggage and human transport will be preferred by public, by which smart city concept will not be away from this . In which time, money, and efforts will be saved. These types of devices are the real feature of the country which will attract more and more industries towards country.

The presented train control system represents an important step forward concerning the safety and automation of branch lines. The safety level achieved by this means will improve the system safety of traditional operational train control and will ease the automation of branch lines while making them at the same time more cost effective. Further development will take place in implementing new standards in satellite navigation.

## REFERENCES

- [1] B.W.C. Cooke. "Proposed New London Underground". The Railway Magazine (London) 101 (648): 279–281. April 1955.
- [2] E. Fischer. "Justifying automation". Railway-Technology.com. 23 August 2011.
- [3] S. Cappaert-Blondelle. Metro Automation Facts, Figures and Trends. The International Association of Public Transport (UITP). Technical report. Belgium. 2012.
- [4] J.M. Erbina, and C. Soulasa. Twenty Years of Experiences with Driverless Metros in France. VWT 19 proceedings. Dresden. 2003.
- [5] Transportation system division. The Dubai Metro, the World's Longest Fully Automated Metro Network.

Mitsubishi Heavy Industries Technical Review Vol. 49. No. 2. June 2012.

- [6] S. HAN, S. LEE, W.KIM. Development of Onboard Train Automatic Control System for Korean Standard EMU. Processing's of the ISIE 2001 conference. 2001. Pusan, KOREA.
- [7] H. Jun, and S. Choi. Development of a Multi-train Operation Simulator with Interactive Human Computer Interfaces. International Conference on Hybrid Information Technology (ICHIT'06). 2006. Cheju Island, Korea.
- [8] M. P. Georgescu. Driverless CBTC – specific requirements for CBTC systems to overcome operation challenges. WIT Transactions on the Built Environment, Vol 88. 2008. pp. 401-409.
- [9] H. Yun, and K. Lee. Development of the Train Control System Data Transmission Technology Using a Wi-Fi Mesh. Proceeding if the ICTC 2011. Seoul. Sept 2011. Pp 406-410.
- [10] M. Siemiatycki. Message in a Metro: Building Urban Rail Infrastructure and Image in Delhi, India. International Journal of Urban and Regional Research, vol. 30, pp. 289-92.

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#### Citation of this Article:

Aditya Kumar, Vishwajeet Aundhakar, Anup Bhingardive, Bhavesh Chaudhari, Dr. A. D. Shiralkar, “Design and Development of Controller for Driverless Train” Published in *International Research Journal of Innovations in Engineering and Technology* - *IRJIET*, Volume 6, Issue 4, pp 126-129, April 2022. Article DOI <https://doi.org/10.47001/IRJIET/2022.604029>

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