Self-Activated Commuting Of Train Allying Between Stations

G. Srinivasa Rao, S.V. Jagdeesh Chandra, A. Narendra Babu, E.V. Krishna Rao
G.Lakshmi Teja, G. Likitha, Y. Arun Kumar Reddy

Abstract: ***The main aim of proposed work is to illustrate the driverless Metro train module. A driverless prototype train is designed using arm7 microcontroller that permits the operation of the train from one station to other. The proposed system aims in lowering the human intervention in Metro trains to as minimum as possible which in flip reduces the opportunity of human mistakes. In this work LPC2148 microcontroller has been used as CPU. The automatic stopping of the train is carried by RFID reader, which permits the train to stop while the RFID reader senses the RFID tags located inside the stations. The train is geared up with an obstacle detecting unit using ULTRSONIC sensor which stops the train when it senses the distance between obstacle and the train is less and results are displayed on an liquid crystal display.***

Index Terms: LPC2148 Microcontroller, RFID, Ultrasonic Sensor, DC Motor, LCD.

I. INTRODUCTION

There has been much advancement in the urban railway transit, starting from the engine to the metro trains and to recent automatic metro trains. Driverless metro train is an intelligent and innovative mass transit solution. Driverless technology meets a certain number of objectives involved, including high capacity, speed and regularity, reduced operational cost, adaptability, and flexibility in terms of human resources; it fulfills the idea of new approach to ability. Automatic train control (ATC) as definition, the ATC refers to the whole system which includes all the other automatic functions. The overall ATC system must incorporate the functions of Automatic Train Operation (ATO), Automatic Train Protection (ATP), and Automatic Train Supervision (ATS). These are the three functional areas of the ATC, they can be briefly described as;

• Automated train operation (ATO) - This subsystem is responsible for the automatic operation of throttle and brake commands to move trains between stations and stopping locations.

• Automatic Train Protection (ATP) – This subsystem is responsible for the safety - critical functions including train protection.

Revised Manuscript Received on June 05, 2019

G.Srinivasa Rao, Department OF Electronics & Communication Engg, Lakireddy Balireddy College Of Engineering, Mylavaram, Andhra Pradesh, India.

S.V.Jagdeesh Chandra, Department OF Electronics & Communication Engg, Lakireddy Balireddy College Of Engineering, Mylavaram, Andhra Pradesh, India.

A.Narendra Babu, Department OF Electronics & Communication Engg, Lakireddy Balireddy College Of Engineering, Mylavaram, Andhra Pradesh, India.

• Automatic Train Supervision (ATS) makes use of machines to perform all or most of the functions of the train control in the normal mode of operation. ATC procurement specifications vary greatly in terms of approach and level of detail; but the trend in the newer systems is toward a more quantitative form of specifications, particularly for reliability, maintainability, and availability requirements. Automatic train control reduces the involvement of human in the operation of trains. There exists a need for effective and efficient transport system with all the increase in population. The driverless trains provide effective solutions to many issues such as time delay or irregularities, high capacity and cost etc. On this project a prototype model is enabled with a CPU to carry out the regular operations robotically. Arm7 microcontroller is used as CPU, it is used to perform the automated operation as well as the automatic opening and closing of the door, the train is prepared with a RFID reader which allows the teach to forestall mechanically whilst it reads the data from the RFID reader, the train is likewise enabled with obstacle detecting unit which detects any limitations in front of the train and stops it.

II. LITERATURE REVIEW

S. Jayachitra, Santhosh,Shivani (MVJC,Bangalore) concept on "Automatic Shuttling of Metro Train Between Stations" The device idea proposes a technique to a number of the primary demanding situations related in existing metro trains structures. They used Microcontroller as CPU and to forestall the train automatically they used IR sensors. The unmanned train operation (UTO) which doesn't require a motive force's supervision is not a latest improvement. Numerous other international locations along with France, Japan, were trying out new technologies in this aspect, but there are absolutely functional driverless systems in countries like Dubai [2,8], which has the arena's longest [3,7] is likewise one of the a success completely automatic machine . The first driverless metro in Torino, ital. metro systems inside the international. They used the siemensval technology as a key element to enforce a fully computerized metro device to offer a completely excessive stage of overall performance. Their principal intention became to cope with the traffic congestions and also to deal with the structural flow problems.

V. Sridhar wrote a paper on "Automatic gadget layout for metro educate" [5], it offers sure new applications consisting of computerized declaration device the use of voice IC and radio frequency for monitoring station facts. It additionally mentions the usage of encoded RFID tags which might be located in every station, at the same time as the educate is geared up with a reader, when the reach comes in touch with the RFID tags the reader receives the records and is programmed to stop when receiving the records even as saying the station information with the help of a voice chip.

A. Problem in current system

Rail based totally 'Mass rapid transit system' has been extensively regular as a solution for most of the visitors and environmental pollutants related issues which most important cities are facing for the duration of the sector. With the increasing in site visitor's call for, coupled with growing in variety of automobiles on avenue, the visitor's congestion has notably improved over the last years. With the intention to improve the public transportation device, the mass fast transit structures were furnished or being planned in diverse elements of the arena. Metro rail is a shape of mass transit public shipping system using trains. The main issues present within the device are

- Steady need of human interference to make certain safe operation.
- The implementation requires high price and the installation consumes extra time.
- Current IR based modules cannot sense the distance between the obstacle and train.
- Since the modern-day machine relies upon on man strength for operation there exits chance of safety and many discrepancies.
- Over occupancy is also one of the main issues within the present device as it could cause train delays and disrupt the time table.

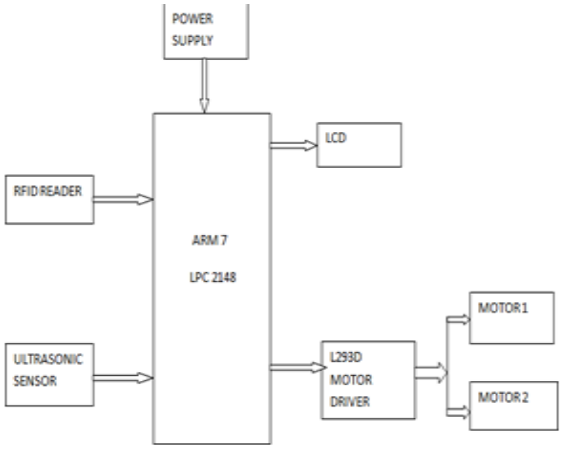

Fig: 1 Block Diagram

III. PROPOSED SYSTEM

This system reduces human intervention by asking the train operation safer therefore reduces the scope of accidents and Time. The obstacle detecting unit prevents from any accidents by sensing any obstacle present in front of the train with some distance and stops the train if anything is present and it also measures the distance and displays it on the LCD. This module will also display the details about the stations on the LCD display. When the train reaches the stations the RFID reader reads the 8 bit data stored in the RFID tags and the train stops automatically. Motor driver used in this project will function according to the instructions from CPU for the train movement. Power supply of 12V is used for operation.

A. Working of ARM 7 LPC2148

The Figure:1 consists of ARM 7 LPC2148 Microcontroller, RFID reader, ULTRASONIC sensor, DC motors, motor driver, buzzer, battery and LCD. The main part of this project is ARM 7 controller. It acts as CPU and has an LCD, RFID, ULTRASONIC sensor and the motor drivers are interfaced to it. The Fig.1 shows the block diagram if the circuit where the Microcontroller acts as the CPU and it takes input from RFID through universal synchronous and asynchronous protocol (UART ports). The input from ULTRASONIC sensors is input is programmed to stop the train automatically with the help of motor drivers L293D. Microcontroller takes the supply of 12V from the battery.

The motion of the prototype is controlled by the L293D motor driver interfaced with the ARM7 microcontroller by controlling the rotation of two motor. Name of the each station is displayed in the LCD as the prototype stops after reading the RFID tags. The LCD displays the status of the train. The front of the train is mounted with an ULTRSONIC sensor which is interfaced to the microcontroller. It acts as an obstacle detection unit along with the buzzer, when the sensor senses any object in front of the train, the train stops as the motors has no input.

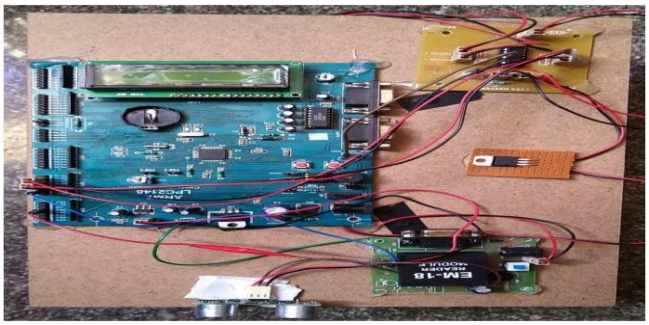

Fig: 2 Proposed Design

B. COMPONENTS

- LPC2148 microcontroller
- RFID reader and TAGS
- ULTRASONIC sensor
- L293D motor driver
- Buzzer
- DC motors
- LCD display

- From figure:2 LPC2148- It is a microcontroller based on a 32 bit ARMTDMI-S CPU with 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory. It also has In-System Programming or In Application Programming (ISP/IAP) via on-chip boot. It consists of Multiple serial interfaces including two UARTs (16C550), two fast I2C-bus (400 kBit/s), it has 64 pins out of which 48 are general purpose and the rest are reserved pins.
- It has up to 45 of 5 V

tolerant fast general purpose I/O pins in a tiny LQFP64 package. It also has On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz. It consists of two Analog to digital convertors.. CPU operating voltage range of 3.0 V to 3.6 V (3.3 V, ± 10 %) with 5 V tolerant I/O pads. IT also has Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog timer and a Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input

- LCD-A fluid precious stone presentation (LCD) is a level board show, electronic visual showcase, or video show that utilizes the light adjusting properties of fluid gems. Fluid gems don't discharge light specifically. LCD (Fluid Gem Show) screen is an electronic showcase module and locate a wide scope of utilizations. A 16x2 LCD implies it can show 16 characters for every line and there are 2 such lines. In this LCD each character is shown in 5x7 pixel lattice. This LCD has two registers, specifically, Direction and Information. The order register stores the direction guidelines given to the LCD. A direction is a guidance given to LCD to complete a predefined assignment like instating it, clearing its screen, setting the cursor position, controlling presentation and so forth. The information register stores the information to be shown on the LCD. The information is the ASCII estimation of the character to be shown on the LCD
- L298H driver- It is a dual H bridge motor, it can drive two motors can simultaneously in forward or reverse direction. It can work in 5to 35 volts and up to 2 amps per channel.
- L293D motor driver- It is quad Half H Bridge motor driver integrated circuit. The motor operations of two motors can be controlled with the pins 2 and 7. Its supply voltage ranges between 4.5 to 36 volts. It has separate input- logic supply.
- ULTRASONIC sensor: It works on the principle of emitting sound waves at a frequency very high for humans to hear. They then wait for the echo to be return back, and that distance can be calculated by time. This is similar to how radar measures the time it takes a radio wave to return after hitting an object
- RFID- RFID stands for radiofrequency identification. It comprises of a small chip with a small antenna and a small integrated circuit. The RFID tags will have 8 bit data encoded in them. RFID reader will have coils and when the RFID tags come in range of the reader, it detects the data in the tags.
- Buzzer- piezoelectric buzzer is used to alarm when the IR sensors detect any obstructions to the train.

IV. EXPERIMENTAL RESULTS

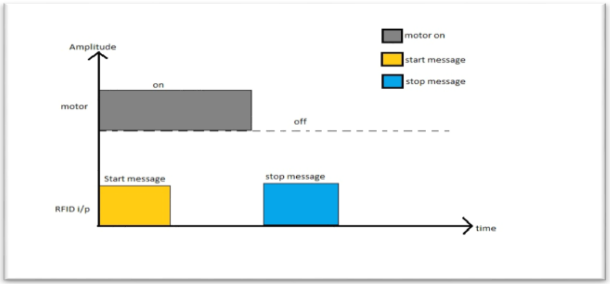

Fig: 3 Motor Vs RFID

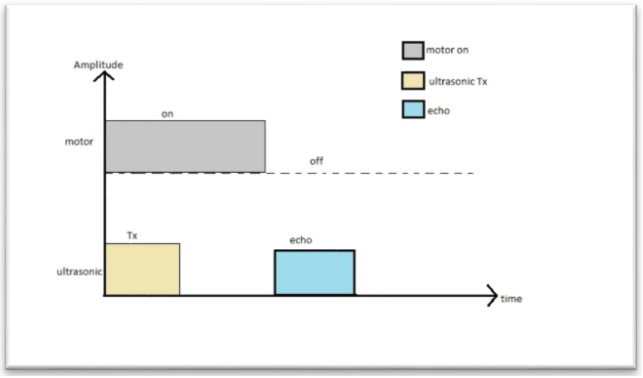

Fig: 4 Motor Vs Ultrasonic

Fig: 5 RFID Output for Stop Instruction

Fig: 6 RF ID Output for Start Instruction

Fig: 7 Ultrasonic Output for Obstacle Detection

- The x-axis is time and

y-axis is amplitude of the signal shown in figure 3. The motors will be ON when the RFID receives the start signal and Whenever the RFID receives the stop signal the motors will OFF.

- The x-axis is time and y-axis is amplitude of the signal which is shown in figure 4. The motors will be ON until there is no input from the ULTRASONIC sensor, whenever we get an input from ULTRASONIC the motors will be stopped.
- Whenever the RFID receives the stop instruction from the RFID tags the motors will be stopped and the status is displayed on LCD as shown in figure 5.
- Whenever the RFID receives the start instruction from the RFID tags the motors will be ON and the status is displayed on LCD as shown in figure 6.
- Whenever the ULTRASONIC sensor detects any obstacle within its range the motors will be stopped and the status is displayed on LCD as shown in figure 7

V. CONCLUSION

By implementing this human intervention can be further reduced as results it reduces the threats which are caused by human errors. This system can be further improved in future by making use of high-speed sensors which enables fast and more efficient operation. As we can find the distance using Ultrasonic sensor based upon the distance we can slow down the train module rather than stopping.

REFERENCES

1. S.Jayachitra1, Santhosh H2, ShivaniG3 ”Automatic Shuttling Of Metro Train Between Stations” issn (print): 2393-8374, (online): 2394-0697, volume-5, issue-5, 2018.
2. Miryam Hernandez, “Metro automation: A proven and scalable solution,” Euro Transport, Vol.12, pp.30-32, December 2014.
3. Dapeng Zhang and DianweiQain, “Study on leader-Follower Control in the Metro Unattended Train Operation,” in proc. International Conference on Advanced Mechatronic Systems(ICAMechS), Melbourne , Australia Nov. 30-Dec.3, 2016
4. Cohen and M.Judith, “Impact of unattended Train Operations on Productivity and Efficiency in Metropolitan Railways,” Transportation Research Board 94th Annual Meeting 2015
5. Thabit sultan Mohammed, Wasam fahmi AlAzzo,Mohammed Ahmed Akaak, Mohammed Laheeb Europe “Full Automation in Driverless Trains:A Microcontroller-based prototype”. , Vol 3, Issue 7,July 2014 pp. 10417- 10422.
6. Automated Metro – Ensuring Safety and Reliability with Minimum Human Intervention: Yap KweeSeng, Ng Hon Wai, Dr Samuel Chan, Leong Kwok Weng Systems Assurance & Integration Division Engineering Group Land Transport Authority, Singapore
7. Ashok Kumar P.M., Vaidehi V, “A Transfer Learning Framework for Traffic Video using Neuro-Fuzzy approach”, Sadhana, Indian academy of science, Springer, vol 42, issue 9, pp: 1431-1442, Sept 2017.
8. Ashok Kumar P.M., Vaidehi V, “ Detection of Abnormal Temporal Patterns from Traffic Video Sequences Consisting of Interval Based Spatial Events”, KSII Transactions on Internet and Information Systems, vol 9, issue 1,pp:169-189, jan 2015

AUTHORS PROFILE

S.V.Jagadeesh Chandra obtained his B.Tech, M.Tech and Ph.d in ECE from SV University. He authored more than 30 articles in reputed journals, conferences. His main research interests include Speech processing, Data mining, Machine learning. He executed several Projects from DST, SERB

A. Narendra Babu obtained his B.Tech, M.Tech and Ph.d in ECE from SV University. He authored more than 30 articles in reputed journals, conferences. His main research interests include Speech processing, Data mining, Machine learning. He executed several Projects from DST, SERB