

AN MULTIPURPOSE MONITORING SYSTEM FOR RAILWAYS USING IOT

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ABSTRACT

Nowadays 25% of the accidents are due to trains. The train accidents which causes people death and injury that cannot be retrieved. Any error mistakes from control room board, it makes causes the train accidents. By using the intelligent secure system in this project, we can overcome the possibility of train accidents. It is very important to implement a new automatic system. All the departments needed the automation system especially for railways stations. Automatic train operating systems can be useful when the driver in the sleepy mode or in any emergency conditions. The contemplated system is a driverless metro & normal train and which eliminates the need for awaiting staff and build the complete autonomous train. This system is mainly used to make less any Human error. In our project, microcontroller has been acts as a CPU, used to control & processing all devices. The ultrasonic sensor has implementation the train collision avoidance system, to transmit and receives the ultrasonic signal, mainly used to identify the distance from one to another train.

KEYWORDS: IOT, Sensor, Arduino mega board.

I. INTRODUCTION

In Modern days ,lot of advancement in the field of rail transportation system .In the early system, steam engines was operated, but nowadays the rail transport system has undergone a high transformation ,by using the metro &bullet train .In early stage , the train are operated by the driver, the recent origin train are automatically operated by the train control system without drivers .So the rail lines are fully automated and make less the operation cost and elaborating the safety & security of services.

Railways is lifeline of India and it is being the reasonable modes of transportation are selected over all other means of transportation. Collisions with train are generally catastrophic, in that the devastating forces of a train usually no match for any other type of vehicle. Train collisions form a major tragedy as they cause severe damage to life and property. In the railway system, the latest technology was not eluding the train collisions. Railway safety is an essential aspect of rail operation the world over. Malfunctions resulting in accidents usually get wide media analysis even when the railway is not at fault and give to rail transport, among the inattentive public an unjustifiable image of incapability often fuelling calls for immediate reforms. This paper mainly aimed to helping the modern safety management and strengthen the safety monitoring the developing culture. Here two different entities with entirely different responsibilities, domains, realization come together and converge for a single cause of providing a facility to the road use. During the normal operation also, there is every possibility of accident occurring even with very little failure in procedure and the result is of very hard risk. The potential for accidents is made bigger as the railways control only half the problem. The other half meanwhile, cannot really be said to be controlled by one existence, as even through traffic rules and road design standards supposedly exist, the movements of road users are not organized and observed by one specific entity as rigidly as rail movements. Each year, accidents at level crossings not only cause fatalities or serious injuries to many thousands of road users and railway traveler, but also impose a heavy financial burden in terms of disruptions of railways.

II. OBJECTIVES

The objective is to get control of complications of train accidents due to swift increases of train system in modern globe. Our paper main objective is driverless in diesel train normally globe followed in this concept of

metro train. The driverless diesel train enhance the control of the railway organization. The objective is to reduce human mistakes, consume less power and it provides comfort and safety to passengers during traveling. In this system microcontroller are provided with the sensor. The sensor tap to find the distance, level of temperature and identify of signal. This project objective is most important, if driverless train is water spread to stop the fire, door open and close operation, distance to find & control the train and find the object in the track operation etc. In this project, train is intended to travel from one platform to another without the help of driver and by using the microcontroller (Arduino). Monitoring the tracks continuously if any obstacle or object is detected the message will send to the control room and the train will be automatically stop.

III. METHODOLOGY

The main methodology of this system is wireless sensor networks, IOT, embedded system. The wireless sensor network that can be used to monitor all the kind of physical parameters. It may include the ultrasonic sensor, flame sensor and temperature sensor. The embedded system that can be used in the way of controlling and monitoring all the task in the programming manner. The IOT cloud are used in this system that can transfer data from one system to another. In this systems all activities of the data are transferred from module to smartphone using blinky apps.

The all the activities of the system will also be displayed in LCD(liquid crystal display). The entire system is powered by 12V supply. The ultrasonic sensor and temperature sensor are connected in the digital pins and flame sensor are connected in analog pins. When the train reaches the station the door will be automatically open and when the train start moves door will be automatically close by using the dc motor. Any problem in the train , the automatically message are passed to the control room and also the train will be automatically stop.

IV. EXISTING SYSTEM

The human source is used to control the train and station announcement system in initial stage. Recent years, no more humans are required for control the railway transport. The maximum of accidents was happened due to electric or human error, so we improved the auto driverless train. This method and technologies for process & monitoring all the services.

Drawbacks:

Monitoring service is manual.
Passenger counting is manual.
More human force is required.
Time consuming is high.

V. PROPOSED SYSTEM

The whole system is manipulated by Arduino mega board. The hardware function module are ultrasonic sensor, temperature sensor, flame sensor, LCD, Dc motor, power supply, exhaust fan and water sprinkler.

In this project, the whole system is powered by 12V power supply. As the power supply is powered to the microcontroller, the train will be automatically ON. The ultrasonic sensor continuously senses the rail road track, if any movable or immovable object is detected, the train will be automatically stop. Temperature sensor which is interfacing with microcontroller, that sensor the current temperature and that will be displayed in the LCD. If the temperature exceeds above the threshold level, the exhaust fan will automatically ON. The door will be automatically open and close ,while entering and leaving the platform. If any fire accidents occurs in the train the message will send to the control room and water sprinkler will be automatically ON. The microcontroller is programmed such that it gets the indication of train`s door open and close through the sensor units. When the door open and close buzzer is sound, it is very useful to deaf and dumb people.

Here, multiple number of sensors are used for each and any part of the rail ways. In this system, automation technology is used to detect the railroad if any accidente or any problem is happened. It has higher efficiency compared to older system. Microcontroller is used for high performance. The main advantage of our system is the SMS could be sent to near control room, hospitals and ambulance by using IOT technology, if any

emergency happened.

The following block diagram will explained our proposed system

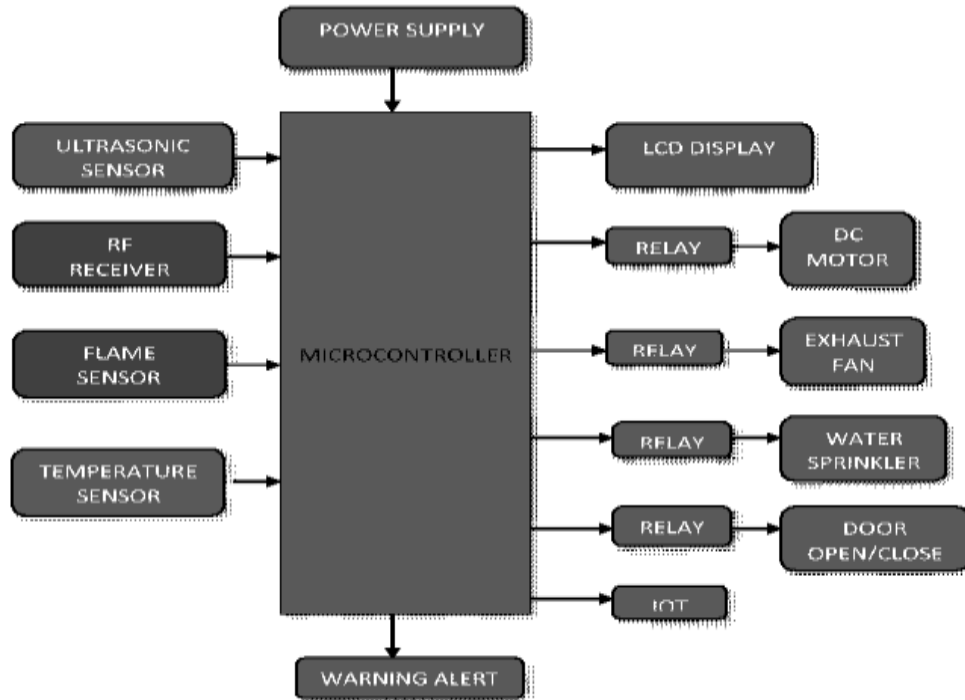


Fig-1: Block Diagram

This system model using large number of sensors, for automation control the microcontroller, as well as Android mobile device.

Implementation Setup

A) Hardware Description:

1.Ultrasonic Sensor:



Fig-1: Ultrasonic Sensor

The ultrasonic sensor is a electronic device. The ultrasonic sensor is used to avoid the train collision avoidance system. Sensor to be measured in distance the target object. Ultrasonic sensors are generate or sense ultrasound energy. In ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.

2. Flame Sensor:



Fig 2: Flame Sensor

The flame sensors used to manipulation the fire accident, whenever the fire accident in the train, the automatically messages pass and train stop with the help of emergency break. In the event of train fire, the water spray automatically turns ON. The flame sensor is used for detecting fire without any fire-protection for itself, please keep distance from the fire to avoid damage.

3. Temperature Sensor:

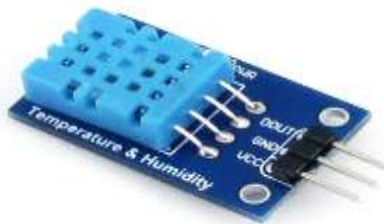


Fig-3: Temperature Sensor

A temperature sensor is an electronic device. The temperature sensor is a device that discover and measures the hotness. When the temperature above 50C the exhaust fan is automatically ON. It measures the amount of heat energy or even coldness. Temperature sensor is used in detect solids, liquids or gases over a wide range of temperatures. Non-Contact temperature sensor is used to detect liquids and gases the emit radiant energy. It is also used convection and radiation to monitor changes in temperature.

4. Rf Receiver:

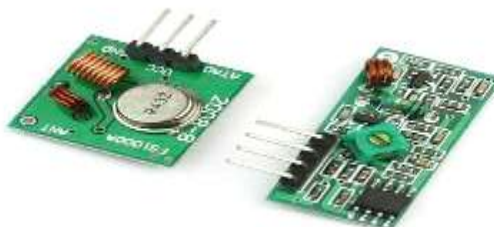


Fig-4: RF Receiver

The RF receiver is a small electric device. It is used to transmit and receive the radio signal between the two devices. In embedded system it is often desirable to communications with another device wirelessly. The transmit upto 500 feet RF modules are typically fabricated using RF CMOS technology.

5. LCD Display:

LCD (Liquid Crystal Display) screen is an electronic module and find a wide variety of applications. LCDs are used in a wide range of applications. Including (LCD televisions, computer monitors), and indoor and outdoor

signal LCD screens are also used on consumer electronics products such as DVD players and clocks.

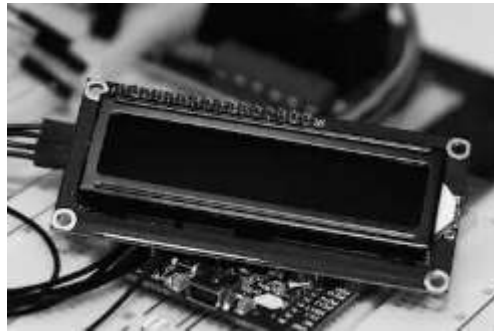


Fig-5: LCD Display

A 16x2 LCD display may be very simple module and may be very commonly utilized in various gadgets and circuits. These modules are favoured over seven segments and different multiphase LEDs.

A 16x2 LCD is able to display 16 characters according to line and there are 2 such lines. In this LCD each man or woman is displayed in 5x7 pixel matrix. This LCD has two registers namely command and data.

B) Software Description:

1. IOT:

The IOT (Internet Of Things) is a system of interrelated computing devices. The ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

The IOT has evolved due to the convergence of multiple technologies, real-time analytics, commodity sensors, and embedded systems. In the consumer market, IOT technology is most synonymous with products pertaining to the concept of "smart home", covering devices and appliances that support one or more common ecosystems.

It can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. There are a number of serious concerns about in the growth of IOT.

Especially in the areas of privacy and security and consequently industry and governmental moves to address these concerns have begun.

2. Arduino Ide:

The Arduino Integrated Development Environment (IDE) is cross-platform application. It is used to write and upload programs to Arduino compatible boards, other vendor development boards.

When the operating systems are windows, macOS, Linux. The Arduino platform is IA-32, x86-64, ARM. In used at Integrated Development Environment (IDE).

The source code for the IDE is released under the (GNU) General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring.

The Arduino IDE supplies a software library from the wiring project, which provides many common input and output proceducers. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

By default avrdude is used ass the uploading tool to flash the user code onto official Arduino boards.

VI. SCOPE OF FUTURE WORK

In future we will implement passenger counting in our project. Depending on the width of the passenger entrance, one, two or three sensors are used for counting passengers. They are installed above the entrance in a concealed manner. These sensors are actually invisible for passengers.

VII. CONCLUSION

By using the microcontroller, the efficiency always remains high to the train accident avoidance. By using this auto train the timing of the train will be exact and it avoids a lot of untimeless to the passengers.

The accident prevention with auto braking technology provides more service, to tract changes in traveler insistence and to track on time performance issues. This project will greatly curtail the human intercession in the control of trains and hence servers a lot of time and money.

VIII. RESULTS



Fig-6: Message received in the system

The SIM provided in the GSM Will sent the message to the user mobile number. That message will contain the distance, temperature level etc. When the red signal occurs the train will be automatically stop., and green signal occurs the train will be automatically start. When any movable or unmovable objects detect in the ultrasonic sensor, the train will be automatically stop. When the temperature increases above the threshold limit, the exhaust fan will automatically start.

IX. REFERENCES

- [1] Georgescu. M . P Driverless CBTC specific requirements for CBTC systems to overcome operation challenges. WIT Transactions on The Built Environment, Vol 88. 2008. pp. 401409.
- [2] Guruprasad Patil, Dr. C. R Rajshekhar, "RFID Based Metro Train System", VOL. 3, NO. 5, May 2014.
- [3] HAN. S,LEE . S, W.KIM. Development of Onboard Train Automatic Control System for Korean Standard EMU. Processing's of the ISIE 2001 conference. 2001. Pusan, KOREA.
- [4] Hedo . E. C, and Vadillo J. V, "Computer simulation of the basic parameters for designing an underground railway line", Computers in railway management, Springer-Verlag New York, 1987, pp. 103–114
- [5] Jonathan Billington and Chris Janczura, "State Space Analysis of a Railway Network," Systems, Man, and Cybernetics, IEEE International Conference on, vol.3 pp.2386-2391, October 1996.
- [6] Jong .J . C and Chang . S, "Algorithms for generating train speed profiles", Journal of the eastern ASIA society for transportation studies, 2005, pp. 356–371
- [7] Jun. H, 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] Michael Meyer zuHörste and EckehardSchnieder, "Modeling and Simulation of Train Control Systems using Petri Nets," Springer-Verlag Heidelberg [J]Vol. 1709, 1999.
- [9] Qutin . F, Blatter . C, S.L. Boare, and M. Malige, "Influence of railway speed increase and cab-signaling system on drivers' activities – Tests on driving simulator for tilting systems applications", Proceedings of the World Congress Railroad Research, 2003, pp. 267–273

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- [10] S. Sivaranjani,V. Ashok and P. Vinoth Kumar,"Data Scheduling for an Enhanced Cognitive Radio System in Healthcare Environment",Bioscience Biotechnology Research Communications, Issue Vol 11 No 2, 2018,pp147-157.
- [11] Sivaranjani S, Kaarthik K ,"IOT based Intelligent parking system at airport, International Journal of Recent Technology and Engineering", Volume-7, Issue-6S4, April 2019,pp-513-516.
- [12] Kaarthik K, Sivaranjani S,"A Novel PDA Technique with Flying Capacitor for Buck Boost Converter",International Journal of Innovative Technology and Exploring Engineering,Volume-8, Issue-5S March, 2019,pp-445-451.
- [13] Vinothkumar. P, Jayanthi.R , Mohankumar. G. B, Rathanasabhpathy. G,"DEFENDED AND EFFECTIVE RELEVANCE PROTOCOL FOR NEAR FIELD COMMUNICATION APPLICATIONS",JOURNAL OF MECHANICS OF CONTINUA AND MATHEMATICAL SCIENCES, Special issue, February 2020,pp-131-138.
- [14] Pradeep.S , Vinoth Kumar.P , Sivaranjani.S," LOW COMPLEXITY EDGE DETECTION AND IMPULSE NOISE REMOVAL IN VARIOUS IMAGES" International Journal of Future Generation Communication and Networking Vol. 12, No. 5, 2019 pp.89-101.