M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A MINOR PROJECT REPORT
on

TRAIN ACCIDENT PREVENTION SYSTEM
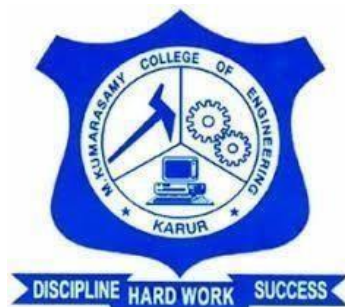
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M .KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113.

MAY 2024

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous Institution, Affiliated to Anna University, Chennai)

BONAFIDE CERTIFICATE

Certified that this Report titled **"TRAIN ACCIDENT PREVENTION SYSTEM"** is the bonafide work of **THARAGESH K R (927622BEE122), VIGNESH P (927622BEE124), SURENDARVASU S (927622BEE308), MANIKANDAN R (927622BEE067)** who carried out the work during the academic year (2023-2024) under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other project report.

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Submitted for Minor Project II (18EEP201L) viva-voce Examination held at M. Kumarasamy College of Engineering, Karur-639113 on………………..

DECLARATION

We affirm that the Minor Project report titled **"TRAIN ACCIDENT PREVENTION SYSTEM"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

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VISION AND MISSION OF THE INSTITUTION

VISION

- ✓ To emerge as a leader among the top institutions in the field of technical education

MISSION

- ✓ Produces mart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create adverse, fully-engaged, learner-eccentric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING VISION

To produces mart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- ✓ **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.
- ✓ **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers
- ✓ **PEO3:** Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.
- ✓ **PEO4:** Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUT COMES (POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions:
Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUT COMES (PSOs)

The following are the Program Specific Outcomes of Engineering Students:

- **PSO1:** Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.

- **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues &challenges.

- **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real world problems.

Abstract(Key Words)	Mapping of POs and PSOs
- IR sensor - IOT - Object Detection	PO1,PO2,PO3,PO4,PO5,PO6,PO7, PO8,PO9,PO10,PO11,PO12,PSO1, PSO2,PSO3

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LIST OF ABBREVIATIONS

S.NO	ABBREVIATIONS	EXPANSION
1	IR Sensor	Infrared Sensor
2	LED	Light Emitting Diode

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ABSTRACT

The increased need and growth in the railway sector has resulted in an increase in the train traffic density across all over India. This is due to increase in travel of people and business. This has resulted in the increase in the number of accidents involving trains especially in town areas where several activities are taking place and lots of traffic happening. In this report, the proposed system includes features which prevent train accidents causes highlighted inside this report. It includes the automatic train slowdown at detection of an obstacle ahead to avoid severe collision using ultrasonic sensing. This system makes use of Infrared sensors and RF transceiver among other components. Governments, the rail industry and road organizations have been implementing a variety of counter measures for many years to improve railway safety. These actions are substantial and have resulted in a continuing decrease in the number and the severity of accidents. This Train accident prevention system existing suitable techniques that are used in the preventative measures targeted to reduce railway accidents.

INTRODUCTION

Railway is the most popular and friendly transportation system in the world. Rail transports are facing major challenges in our day to day life. Rail transport systems first appeared in England in 1820s. From 1820-2016 many evolutions are occurred. At present railways is one of the most widely used transportation system in the world. Approximately 10,000 billion freight tones Kilometres are travelled around the world every year and more than 5 billon passengers travelled per year as per Railway statistic report. Economists have argued that the existence of modern rail infrastructure is a significant indicator of a country's economic advancement. But till now railway transportation system are not safe.

Many countries railway faces many collisions during travelling in every year as a result happened lot of damages and casualties. But if we add Anti Collision Technology (ACT) in railway then we can prevent any types of collision. It is an innovative technology which can be detect collision object from specific distance of train and avoid collision dynamically and efficiently by using ultrasound and embedded system. The train accident is one of the most dangerous accidents ever. The common reason of the train collisions are malfunctioning train signals or lights, failing mechanics, safety gates not in place, crossings that are unprotected, negligence of train conductor and lack of awareness of the people.

Several countries and railway companies have implemented successful train accident prevention systems, showcasing the effectiveness of these technologies. Japan Shinkansen Known for its impeccable safety record, Japan's bullet train system employs advanced earthquake detection systems, automatic train control, and rigorous maintenance schedules. A train accident prevention system is essential for modern railway operations, significantly enhancing safety and reliability

SURVEY PICTURES

Fig:1

Fig:2

Fig:3

Fig:4

CHAPTER 1
SURVEY FORM ANALYSIS

1.1 NAME AND ADDRESS OF THE COMMUNITY:

1   S.Sadhasivam,

Employee in Rasipuram Railway station.

2   S.Ravi,

Employee in Karur Junction.

3   M.P.Manikandan,

Employee in Karur Junction.

4   B.Siva Shankar,

Passenger in Rasipuram.

5   T.Rajendran,

Passenger in Namakkal.

1.2 PROBLEM IDENTIFICATION:

By taking the survey from the Passengers and employees in the railway station. We came to know that the safety of the train journey has been decreased in the recent times. So they feel risk to travel in the train. Detection of Obstacles, track damages, signal failures and other potential hazards along the railway tracks can minimize the accident in railways. Implementing systems to swiftly respond to emergencies or unexpected situations on the tracks.

1.3 SOLUTION:

The solution for the above mentioned problems is to prevent the train accident by using the sensor to detect the obstacles. The Train accident prevention system works as follows, if the obstacle is sensed by the IR sensor then the Arduino will turn ON the LED lights and buzzer sound. After that, the accident is prevented.

CHAPTER 2

LITERATURE REVIEW

Paper 1: Automatic Train Control (ATC) Systems

Reviewing studies on signaling technologies, including positive train control (PTC), automatic train protection (ATP), and train control management systems (TCMS). This system could effect an emergency brake application if the loco pilot does not react to the signal at danger.

Paper 2: Collision Avoidance Systems

Exploring research on radar-based systems, lidar applications, and other sensor-based technologies designed to prevent collisions between trains. This system use variety of technologies and sensors such as laser, cameras, GPS and artificial intelligence.

Paper 3: Human Factors and Safety

Investigating the role of human error in train accidents and how human factors engineering, training programs, and fatigue management contribute to accident prevention. The human reliability is usually characterized by an estimation of a human error probability.

**Paper 4: Infrastructure and Track Maintenance**

Analyzing literature on the impact of track maintenance, condition monitoring, and infrastructure upgrades on preventing derailments and accidents. It aims at guaranteeing safety of operations and availability of railway tracks and related equipment for traffic regulation.
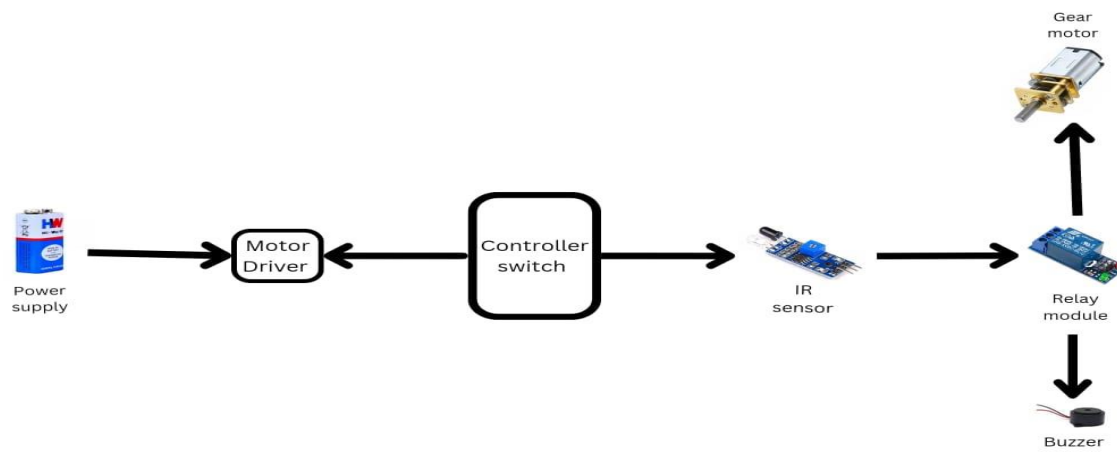
Paper 5: Risk Assessment and Management

Reviewing methodologies used for risk assessment in train operations, including probabilistic safety assessments and risk management strategies.

CHAPTER 3

PROPOSED METHODOLOGY
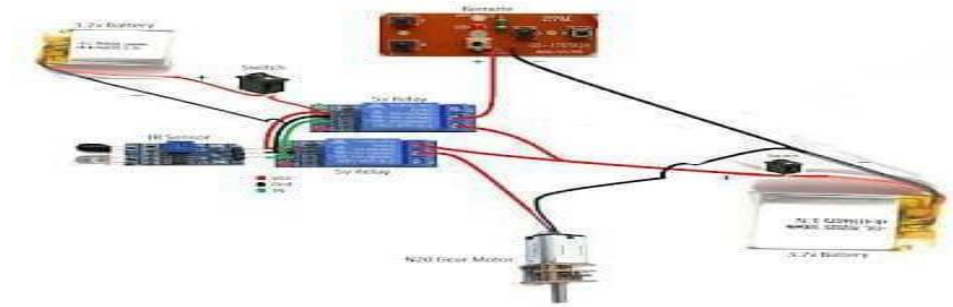
3.1 Fig. Circuit Diagram

3.2 Fig.Block Diagram

3.3 DESCRIPTION

HARDWARE:

Micro controller is a device which combines numerous components of a microprocessor device. The Micro controller used in our project is ATmega8. It has inbuilt ADC which converts analog input to digital value. All the sensors are connected to Atmega8 MCU. The output is given to LCD or Motor or LED for signaling, MCU is given a supply of +5V. A battery of 9 V is used and then regulated to +5V using LM7805 with a capacitor to filter noise.An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

SOFTWARE:

CRAVAT-Code vision AVR is a C cross compiler, integrated development and automatic program generator designed for the Atmel AVR family of micro controllers. The program is designed to run under the windows 98/Me/NT 4/2000/XP/vista 32 bit operating systems. The C cross-compiler implements nearly all the elements of the ANSI C language, as allowed by AVR architecture, with some features added to take advantage of specificity of the AVR architecture and the embedded system's needs. Embedded C compiler based software is used to create a hex file using Code Vision AVR (CVAVR) using C language. Then simulation software (PROTEUS) is used to test the prepared code. Khazama is software used to burn the hex file into the controller. Extreme Burner-It is software used to check the connections of the controller.

WORKING:

From this train accident prevention system we can identify whether there has any obstacle in track like animals, trains or any other obstacles. The main components of this train accident prevention are Infrared sensor, Arduino UNO, Gear motor. The infrared sensor is placed in the front of train engine. This sensor will sense whether there is any obstacle before the train in the track if it has any obstacle it will make a sound with the buzzer and it will make the LED light to ON. After assembling all the components of this project , the code is uploaded to the Arduino board. Now place the Infrared sensor, buzzer, LED in required position. Now there are two engine

are used with two infrared sensors. One engine is placed in the railway station and another engine is running in the same track towards the railway station. The IR sensor will sense that there is another engine in the same track.

After that the transmitter will transmit the information to the receiver. The Receiver will make the buzzer to sound and LED light to ON. In this way train accident prevention system works and alert the train operator to stop the train automatically. If the IR sensor does not identify any obstacle in track it will not make any buzzer sound and allow the train to pass through the track.

3.4 COST ESTIMATION

S. no	COMPONENT NAME	QUANTITY	COST
1	Relay Drive	2	250
2	RC Receiver and Collector	2	250
3	Battery	3	150
4	IR Sensor	2	300
5	Additional components	As required	350
		Total	1300

CHAPTER 4

FUTURE SCOPE & ITS IMPLEMENTATION PLAN

Future scope involves continual advancements in AI, machine learning, and sensor technology to enhance predictive capabilities, minimize false alarms, and increase system reliability. Additionally, implementing predictive maintenance practices to ensure the system's continual effectiveness.

Implementing a train accident prevention system involves multiple facets like:

1. **Sensor Technology:** Implementing advanced sensors along tracks to detect obstacles, track conditions, and potential dangers in real-time.

2. **Data Analysis:** Developing algorithms to process sensor data for immediate risk assessment and prediction of potential hazards.

3. **Automation:** Integrating AI-driven automation to enable trains to react autonomously to identified risks, such as applying brakes or altering speed.

4. **Communication Infrastructure:** Establishing robust communication networks for real-time exchange of data between trains, control centers, and infrastructure.

5. **Regulatory Compliance:** Ensuring the system aligns with existing railway regulations and safety standards.

4.1 RESULT & DISCUSSION

In the proposed system we are using Infrared sensor. The sensor is attached in the Train engine in the receiver side. In the transmitter side the sensor the signals and converts in to electrical energy. And this electrical energy is converted into the mechanical output. The working principle of the IR sensor is that the emitter is an IR LED and the detector is an IR photo diode.

The IR photo diode is sensitive to the IR light emitted by an IR LED. The photodiode's resistance and output voltage change in proportion to the IR light received. This is the underlying working principle of the IR sensor. Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors L293D contains two inbuilt H-bridge driver circuits.

In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. This gives a clear description of the working of the collision avoiding system. All the components of the system are connected with the control unit. The power supply supplies the power to the control unit. In this project we can design an automatic accident preventing system for train.

The IR sensors are used to detect the obstacles in the train path. This IR sensor measures the distance accurately which provides 10 to 80 cm with maximum error of 0.8 cm. Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping. The module can easily be interfaced to micro controllers where the triggering and measurement can be done using two pins.

It saves lot of times as it is automated whereas manual systems take time for the line man to inform the station master to close and open the gate which will consume a considerable amount of time. Also, since it is completely automated there are fewer chances for error to occur. Thus, this design is very useful in railway applications.

CONCLUSION

On this paper, By using Sensor system is done such that all obstacles like flood, animals which are in the right of way of the train will be detected therefore preventing derailment and collision accidents that cost the railway company a lot of money. In this paper, a cost effective, low-power embedded system, was designed which facilitate better safety standards for rail tracks for preventing railway accidents due to obstacles on railway tracks, in the train. The result shows that this new innovative technology will increase the reliability of safety systems of railway. By implementing these features in real time application, we can avoid accidents up to a very significant margin.

In conclusion, the implementation of a train accident prevention system is essential for ensuring the safety and security of railway operations. By investing in advanced technologies, regular maintenance, and continuous training for staff, railway companies can effectively mitigate risks and prevent accidents. Prioritizing safety not only protects passengers and employees but also enhances the overall efficiency and reliability of the railway network. Ultimately, a proactive approach to accident prevention is key to maintaining a safe and sustainable railway system for the future.
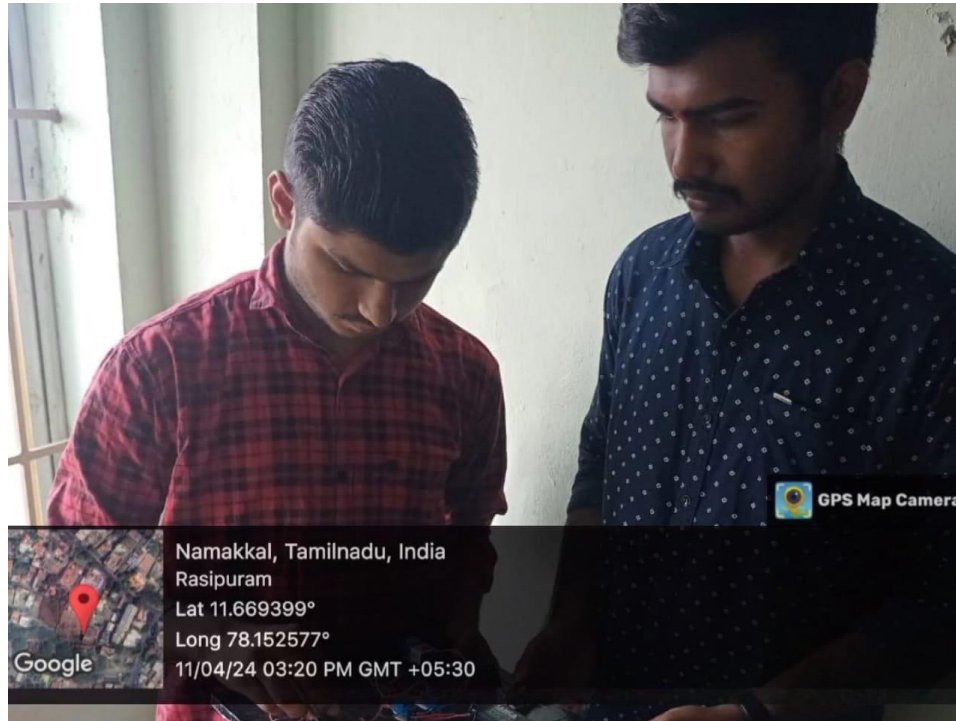
GEOTAG PHOTO

Fig.Implentation Picture

Surveyee Name: S.Nithish Kumar

Surveyee Community: Train Passenger

REFERENCE :

https://drive.google.com/file/d/1aSd7RRW6Mg2Q_bzJfatMMKXaekCD7qdF/view?usp=drivesdk

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