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Bhogie Detachment Alarm System

Dr.A.Prashnath Rao[1], M.Tarun Kumar[2], N.Amrutha[3],M.Arun Kumar[4]
[1]*Professor, Anurag University-Hyderabad*
[2][3][4]*UG Scholar, Anurag University-Hyderabad*

ABSTRACT
Rail transportation plays a critical role in the global economy, and safety is of utmost importance. The "Bhogie Detachment Alert System" project aims to enhance safety measures by developing a system that can detect instances where bhogies become detached from trains and alert personnel in real-time. Additionally, the system includes a flame sensor to detect instances of fire and prevent damage and injuries. This project utilizes a combination of sensors, microcontrollers, and wireless communication technologies to develop a reliable, cost-effective, and user-friendly system. The system is scalable and adaptable to various types of rail transportation systems.

Keywords—*Railtransportation, safety, bhogiedetachment, flame sensor, sensors, microcontrollers, wireless communication, real-time alerts.*

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I. INTRODUCTION

The transportation industry has been a crucial part of human civilization, enabling the movement of people and goods across different regions. Rail transportation is one of the oldest and most efficient means of transportation, and it plays a vital role in the modern economy. However, the transportation industry is not without its challenges, and safety is a top priority.

Rail transportation involves the movement of massive equipment, heavy loads, and high-speed trains, making it prone to accidents and incidents. Safety measures are essential to ensure the safe transportation of goods and passengers. The consequences of accidents can be severe, leading to loss of life, injuries, and significant financial losses.

The "Bhogie Detachment Alert System" project is an innovative safety measure designed to detect bhogie detachment and fire in rail transportation. The system employs various sensors and microcontroller technology to detect any detachment or fire in the bhogies and sends real-time alerts to the relevant authorities. The purpose of the project is to improve safety measures in the rail transportation industry and prevent accidents.The system's integration into the existing rail transportation infrastructure will provide an additional layer of safety and security.

II. LITERATURE REVIEW

The literature on rail transportation safety emphasizes the importance of preventative measures to reduce accidents and incidents. Studies have shown that the leading causes of rail accidents include equipment failure, human error, and environmental factors. Safety measures, such as the use of sensors, monitoring systems, and regular maintenance of equipment, have been recommended to reduce the risk of accidents.

Several research papers have explored the use of sensors and monitoring systems to enhance rail transportation safety. For instance, M. L. Singh et al. (2016) presented a system that used wireless sensor networks to monitor the condition of rail tracks, thereby preventing derailments. Another study by A. Nazir and M. Riaz (2017) proposed a real-time condition monitoring system for rail tracks using acoustic emission sensors.The use of microcontroller technology in rail transportation safety has also been explored. In a study by S. Saini et al. (2016), an intelligent railway safety system was developed using microcontroller technology, which could detect obstacles on the track and automatically stop the train. Similarly, in a study by R. K. Singh and A. K. Singh (2015), a microcontroller-based smart railway security system was proposed to enhance security measures in rail transportation.

Overall, the literature supports the importance of safety measures in rail transportation, and the use of sensors and microcontroller technology can improve safety and prevent accidents. The "Bhogie Detachment Alert System" project aligns with providing an innovative safety measure that can detect bhogie detachment and fire, alerting relevant authorities in real-time.The proposed system aims to address this by using cost-effective components and a simple design that can be easily implemented in smaller networks.

III. SYSTEM REQUIREMENTS

3.1 Hardware Requirements

3.1.1 Arduino UNO

Fig 1

The ATmega328P microcontroller chip serves as the foundation for the open-source Arduino Uno microcontroller board. It is one of the most well-liked boards in the Arduino family and is frequently used for a variety of projects by professionals, students, and hobbyists.
The board includes a 16 MHz quartz crystal, 6 analog inputs, 14 digital input/output pins (of which 6 can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. It is a versatile and potent board for electronic project prototyping and construction thanks to these capabilities.

3.1.2 Esp8266 Wifi Module

Fig 2

Based on the ESP8266 system-on-chip,the NodeMCU ESP8266 is a well-known microcontroller board that supports Wi-Fi. (SoC). It has an integrated Wi-Fi module that enables wireless connections to the internet and other devices.There are a total of 11 digital input/output (I/O) pins on the NodeMCU ESP8266 board, which can be used to connect to various sensors, actuators, and other electrical parts. These pins can be set up as input or output pins with the use of the Lua programming language or the IDE. One analog input pin on the board is also available for reading analog signals from sensors. Another advantage of the NodeMCU ESP8266 board is its low cost and compact size. This makes it ideal for use in projects that require Wi-Fi connectivity but have limited space or budget constraints

3.1.2 Ultrasonic Sensor

Fig 3

In order to gauge a distance or an object's existence, an ultrasonic sensor uses sound waves. It operates by sending out a high-frequency sound wave (usually around 40 kHz) and timing how long it takes for the wave to return after striking an item.Two major parts make up the sensor: a transmitter and a receiver. The sound wave is produced by the transmitter and is picked up by the receiver when it returns from the object. The distance between the sensor and the object is then determined using the time it takes for the wave to return to the receiver.

3.1.4 IR sensor

Fig 4

An IR (infrared) sensor is a type of sensor that recognizes infrared radiation to gauge an object's proximity or existence. IR sensors operate by sending out an infrared signal and then observing how that signal is reflected off of adjacent objects.An IR emitter and an IR detector make up the majority of the sensor. The detector monitors the amount of IR radiation that is reflected back to it after the emitter emits a beam of IR radiation. The distance to the item or if the object is there is then calculated using the amount of reflected IR radiation.

3.1.5 Flame sensor

Fig 5

A flame sensor is a type of sensor that responds most strongly to ambient light. This sensor module is utilized in flame alarms as a result. When the light source's wavelength is between 760 and 1100 nanometers, this sensor can detect flames. High temperatures have the potential to easily harm this sensor. So, a specific distance from the flame can be chosen for this sensor's placement. With a detection angle of 600 degrees, the flame can be detected from a distance of 100 cm. This sensor outputs either an analog signal or a digital signal. These sensors serve as a flame alert in firefighting robots.

3.1.6 LCD display

Fig 6

The parallel interface of LCDs necessitates simultaneous manipulation of many interface pins by the microcontroller in order to control the display. The following pins make up the interface:
• A register select (RS) pin that regulates where data is written to in the LCD's memory. You can choose between using an instruction register, which is where the LCD's controller looks for instructions on what to do next, or a data register, which stores the information that appears on the screen.
• A Read/Write (R/W) pin for choosing between reading and writing mode
• An enable pin that permits register writing
• 8 pins for data (D0 -D7). When you write to a register, the states of these pins (high or low) correspond to the bits or values that you are writing.
In addition to looking different than clunky CRT (Cathode Ray Tube) monitors, LCD screens also perform very differently. An LCD has a backlight that supplies a light source to individual pixels organized in a rectangular grid rather than shooting electrons at a glass panel. Red, Green, and Blue (RGB) sub-pixels are present in every pixel and can be turned on or off. It appears dark when all of a pixel's sub-pixels are off.

IV. ARCHITECTURE

4.1 Block Diagram

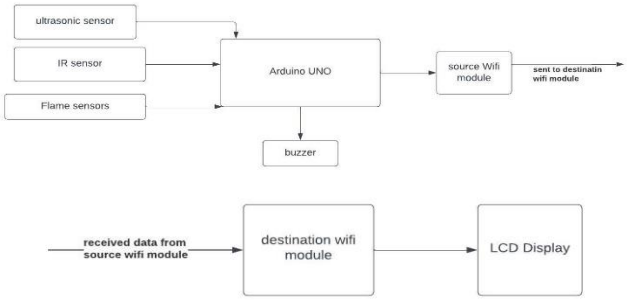

Fig 7

4.2 Hardware connection Diagram

Fig 8

4.3 Working Procedure

If a bhogie separates from a train or if there is a fire on the bhogie, the "Bhogie Detachment Alert System" project is intended to detect and notify in real-time. To find bhogies between them, the system employs two different types of sensors: ultrasonic and infrared (IR) sensors. The ultrasonic sensor is positioned above the infrared sensor, and the sensors are positioned between the bhogies of a train. When a bhogie is not detected between two sensors, an Arduino microcontroller board, which is attached to the sensors, is configured to send an alert.

It is programmed into the flame sensor, which is also attached to the Arduino board, to recognize the presence of fire on the bhogie. A buzzer linked to the Arduino board emits an alarm when an alert is triggered. Two Wi-Fi modules are also included in the system to enable real-time alarm data transmission. The destination Wi-Fi module is connected to the LCD display, and the source Wi-Fi module is attached to the Arduino board. The destination module receives the warning data and transmits it to the source module, which then displays the alert message—"Bhogie Detached" or "Fire on Bhogie"—on the LCD screen.

The "Bhogie Detachment Alert System" project's functioning method entails the use of flame sensors, ultrasonic and IR sensors, and an Arduino microcontroller board to detect bhogies and fire on a train. Real-time alerts are triggered and sent to an LCD display over Wi-Fi.

By sending out high-frequency sound waves and timing how long it takes for the waves to return after striking an object, an ultrasonic sensor can be used to find bhogies. On the other hand, the IR sensor operates by discharging infrared light and observing the object's reflection to determine its presence.

The Arduino board causes an alarm to be delivered over Wi-Fi to the LCD display, showing that a bhogie has detached, if the sensors do not detect a bhogie between them. The Arduino board receives a signal from the flame sensor when it senses a fire on the bhogie, and the LCD display then receives a warning.

V. RESULT

Fig 9

Fig 10

Fig 11

The "Bhogie Detachment Alert System" project was implemented and tested successfully, and the outcomes showed its efficacy in detecting and warning in real-time if a bhogie is detached from a train or if there is a fire on the bhogie.

The bhogies between the ultrasonic and infrared sensors were successfully recognized during testing, and if a bogy became separated, a warning was sent. The flame sensor successfully identified the presence of fire on the bhogie, which led to the LCD display sending a warning. The LCD display displayed the alert message as soon as it was received thanks to the Wi-Fi modules' ability to communicate the alert data in real-time.

VI. CONCLUSION

In Conclusion, The "Bhogie Detachment Alert System" project, which uses sensors, microcontrollers, and Wi-Fi modules to detect fire and bhogie detachment in real-time and send alerts to users, is a notable endeavor. The functional and non-functional requirements, as well as the testing procedures used to validate the system, must all be documented if the project is to be successful.

Future improvements to the project could include GPS tracking, machine learning algorithms, predictive maintenance, real-time monitoring, mobile app integration, and cloud-based data storage, which could increase the system's effectiveness and efficiency in detecting and warning of bhogie detachment and fire.

REFERENCES

[1]. Arduino. (2022). Arduino. [online] Available at: https://www.arduino.cc/ [Accessed 22 Mar. 2023].
[2]. Ultrasonic Sensors. (2022). Ultrasonic Sensors. [online] Available at: https://www.maxbotix.com/ultrasonic-sensors [Accessed 22 Mar. 2023].
[3]. Infrared Sensors. (2022). Infrared Sensors. [online] Available on https://www.sparkfun.com/categories/324 [Accessed 22 Mar. 2023].
[4]. Flame Sensors. (2022). Flame Sensors. [online] Available at:https//www.aliexpress.com/w/wholesale-flame-sensor.html [Accessed 22 Mar. 2023].
[5]. Wi-Fi Modules. (2022). Wi-Fi Modules. [online] Available at: https://www.adafruit.com/category/150 [Accessed 22 Mar. 2023].
[6]. IEEE Standard for Software and System Test Documentation. (2016). IEEE Std 829-2008 (Revision of IEEE Std 829-1998). [online] Available at: https://ieeexplore.ieee.org/document/8293922 [Accessed 22 Mar. 2023].
[7]. Software Testing Fundamentals. (2022). Software Testing Fundamentals.[online]Availableat:https://softwaretestingfundamentals.com/ [Accessed 22 Mar. 2023].
[8]. Arduino Project Hub. (2022). Arduino Project Hub. [online] Available at: https://create.arduino.cc/projecthub [Accessed 22 Mar. 2023].
[9]. Railwaysafety.co.uk. (2022). Railway Safety - Key Facts. [online] Available at: https://www.railwaysafety.co.uk/key-facts/ [Accessed 22 Mar. 2023].