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FIRE DETECTION SYSTEMS IN BUSES

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ABSTRACT- Effective fire detection systems properly installed in bus and coach toilet compartments and driver sleeping compartments may save human lives and property loss. Rapid detection allows for early evacuation and extinguishment of a small fire, while late or no detection may allow the fire to spread. The purpose of the work presented in this paper is to provide recommendations on how to install fire detection systems in toilet compartments and driver sleeping compartments. The recommendations also cover what type of detection system is most suited. As a basis for the recommendations, full scale fire tests were performed with different detection systems. The fire tests were conducted in realistic mockups of a toilet compartment and a sleeping compartment. Different heat and smoke detection systems were analyzed at different positions for different fire scenarios to provide information on how to best install detection systems in these compartments. Five different scenarios were run and the most interesting finding was that two realistic fire scenarios in the toilet compartment did not activate fire detectors in the ceiling at realistic air flow rates. It is very rare that fire detectors are placed anywhere else than on the ceiling in toilet compartments on buses and the fire would then be very large upon detection.

Index Terms—Bluetooth, Display, Buzzer, Fire detection.

1.INTRODUCTION

Fires in buses and coaches are very common and on average several buses1 worldwide are involved in a fire incident each day. For instance, in the US approximately 160 bus fires were reported each year between 2004 and 2008 [1]. In Australia there are about 70 bus fires per year resulting in insurance claims [2] and in Sweden, Norway, and Finland about one percent of all buses in service, will suffer from a fire incident each year [3]. If passengers have reduced mobility the evacuation time may be severely extended. For instance, 20 elderly people died in a bus fire in Hannover 2008 [5]. The fire was caused by a short circuit in an electrical cable near the toilet and spread via the toilet compartment to the passenger compartment. With an effective fire detection system this tragedy might have been prevented. However, not all fire incidents lead to fatalities, but the property loss and the cost due to rescue operation, traffic jam, and clean up can be extensive. The environmental effects of both the fire itself and extinguishing agents may also be severe [6]. All these effects might be mitigated with an effective fire detection system that enables early evacuation and suppression of the fire. Based on reported fire incidents in buses and coaches the fires most frequently originate in the engine compartment or in the wheel well [1]. Several studies of fire protection in the engine compartment have recently been performed [7], and ongoing fire detection projects for these spaces are running e.g., at SP Technical Research Institute of Sweden. However, this paper focus on fire detection in the toilet compartment and driver sleeping compartment and no extensive study on fire detection in these compartments has, to our knowledge, been reported.

In media, recent bus fires have been reported where the fire started in the toilet compartment [8] and in the catastrophic bus fire in Hannover 2008 the fire also started in the interior of the bus [9]. The study reported in this paper was partly triggered by the new UNECE requirement, regarding fire detection in the toilet compartment and driver sleeping compartment of buses, that came into effect in July 2014 [10]. The new requirement states that an excess temperature or smoke shall be detected in these compartments. Reported in this paper is an investigation of what types of detection systems are most suitable in the toilet compartment and driver sleeping compartment of buses and how to best install the systems in these types of compartments.

2.LITERATURE REVIEW

This is a literature review on a research on wireless digital notice board using wi-fi. The author states that as old means of conventional notice boards are outdated as it requires a huge amount of time, resources and manpower. Hence, using digital noticeboard through wireless communication can interconnect the people easily in a less amount of time and using wifi network gives a wide area network that permits to transfer the information into text message through LED display that will act as a notice board[4]. As stated in the research the main propose is to develop a wireless notice board that display message or the information sent from the user through a simple interface and which displays it on LED screen [7]. To originate a Wi-Fi driven automatic display Board which can replace the presently used paper based notice board and conventional notice boards. So this document gives us clear idea of how to change the contents of Digital display using Wi-Fi. So for that we use some Embedded as well as communication idea and using Arduino board we try to implement our system.
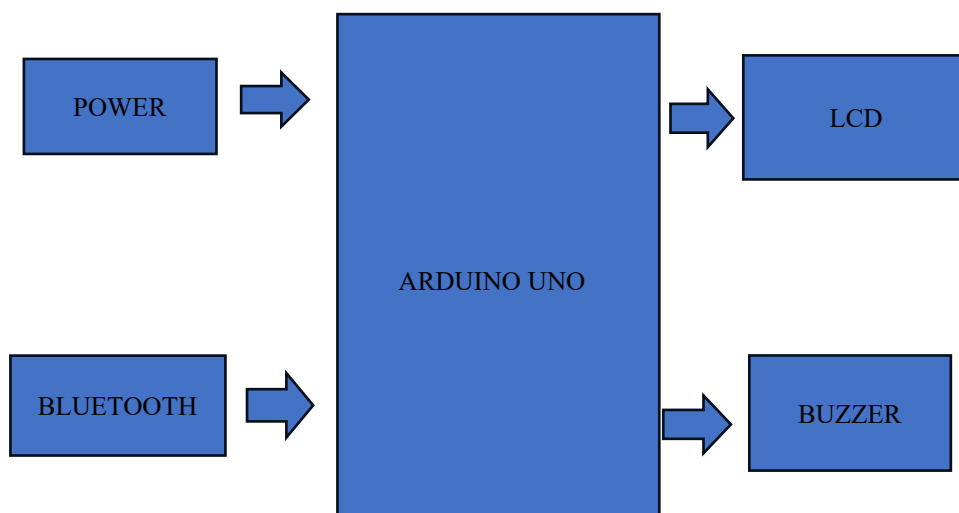
3. Block Diagram

Fig 1. Block Diagram of fire detection System in buses

A. Arduino Uno - The Arduino Uno is a popular open-source microcontroller board based on the ATmega328P microcontroller. It is widely used in DIY electronics, robotics, and prototyping because of its simplicity versatility, and affordability.
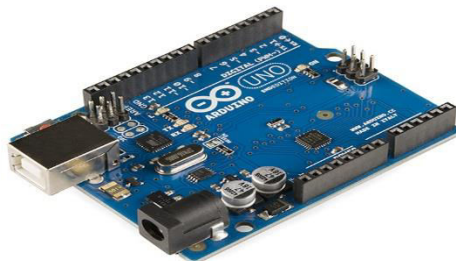

Fig 2: Arduino Uno

B. LCD- LCD stands for Liquid Crystal Display. It is a flat-panel display technology commonly used in screens for devices like televisions, computers, smartphones, and digital watches.

Fig 3: LCD Display

C. Buzzer - A buzzer is an electronic device that produces sound, typically used to generate beeps, tones, or alarms. It is a simple yet effective way to alert or provide feedback in various systems and devices.

Fig 4: Buzzer

D. Flame Sensor - Flame sensors are used to detect flames and trigger a response to mitigate the risk of fire.A flame-sensor is one <u>kind of detector</u> which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The flame detection response can depend on its fitting. It includes an <u>alarm system</u>, a natural gas line, propane & a fire suppression system. This sensor is used in <u>industrial boilers</u>. The main function of this is to give authentication whether the boiler is properly working or not. The response of these sensors is faster as well as more accurate compare with a heat/smoke detector because of its mechanism while detecting the flame.
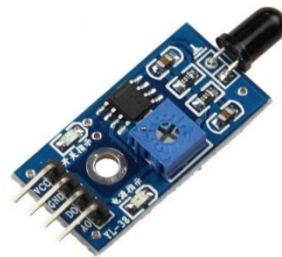

Fig 5: Flame Sensor

E. Node MCU -NodeMCU is an open source IoT platform. It includes rm ware which runs on the ESP8266 Wi-Fi The term & quot; NodeMCU & quot; by default refers to the ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications.
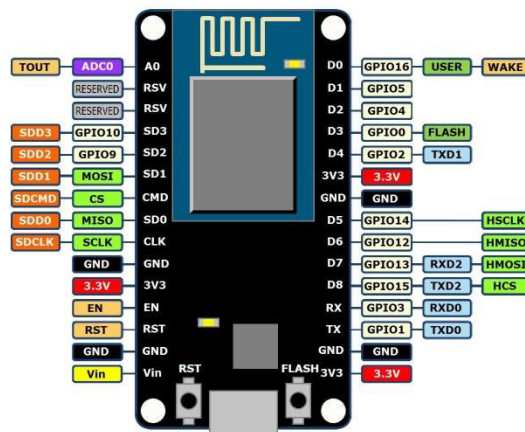

Fig. 6: Node MCU

Temperature Threshold: Set a maximum threshold temperature (e.g., 50°C). If exceeded, it indicates potential fire. Flame Detection: Monitor the flame sensor. If it detects infrared radiation, it identifies fire.Alert Mechanisms: Activate the buzzer., Display the fire alert on

the LCD ,Using the Bluetooth. Fire detection systems are designed to be intuitive and easy to use in an emergency. They can help to prevent fires and minimize damage, which can contribute to a more sustainable future. Early Warning. Early fire detection systems can detect the presence of a fire in its early stages. Property Protection, Life Safety, Legal and Insurance Requirements, Cost Savings.

4. RESULT

The results can be shown in figure 7 below. From the results we can conclude that this paper can be very beneficial for the society and general public benefits because of simple structure strong practicability and wide application hold. By adding wire les technology to this system we have made this systems flexible. Now is easy to change the message from a remote place. Two major thing that are necessary for sending the files are FTP server and internet connection This system is less complex in nature as if wireless. So in short, this system is very beneficial for the public because in today's digital ape people can see any message from a large distance became this LED da play is more cache in nature and to read from it[21].

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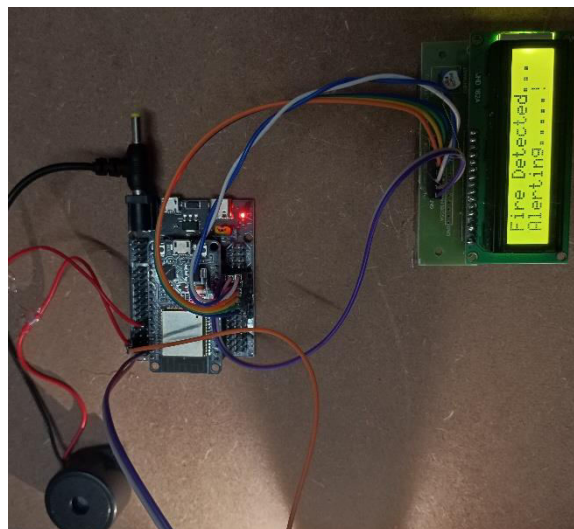

Fig 7. Results of fire detection system in buses

5. CONCLUSION

In conclusion we can say that this display can be easily integrated with all general-purpose display board thus proving its mobility. The message is transferred using wireless technology and is eventually obtained on the LED matrix and it gives a alert with the alarm.fire detection systems in buses are a critical safety feature that help protect passengers, crew, and the vehicle itself from the devastating effects of fire. These systems provide early warning capabilities, allowing for quick responses to potential fire hazards, minimizing the risk of injury or loss of

life. By integrating advanced technologies, such as smoke and heat detectors, automated fire suppression systems, and real-time monitoring, fire detection systems contribute to enhancing overall safety and reducing the likelihood of severe damage in case of an emergency. Furthermore, with the increasing demand for public transportation, the implementation of reliable and efficient fire detection solutions becomes essential in maintaining public trust and ensuring the safe operation of bus fleets. As technology continues to advance, future fire detection systems will likely become even more sophisticated, offering increased reliability and faster response times, further reinforcing safety standards in the transportation industry.

REFERENCE

1. K. Radhakrishna, D. Satyaraj, H. Kantari, V. Srividhya, R. Tharun and S. Srinivasan, "Neural Touch for Enhanced Wearable Haptics with Recurrent Neural Network and IoT-Enabled Tactile Experiences," *2024 3rd International Conference for Innovation in Technology (INOCON)*, Bangalore, India, 2024, pp. 1-6,

2. Karne, R. K., & Sreeja, T. K. (2023, November). Cluster based vanet communication for reliable data transmission. In *AIP Conference Proceedings* (Vol. 2587, No. 1). AIP Publishing.

3. Karne, R., & Sreeja, T. K. (2023). Clustering algorithms and comparisons in vehicular ad hoc networks. *Mesopotamian Journal of Computer Science*, *2023*, 115-123.

4. Karne, R. K., & Sreeja, T. K. (2023). PMLC-Predictions of Mobility and Transmission in a Lane-Based Cluster VANET Validated on Machine Learning. *International Journal on Recent and Innovation Trends in Computing and Communication*, *11*, 477-483.

5. Mohandas, R., Sivapriya, N., Rao, A. S., Radhakrishna, K., & Sahaai, M. B. (2023, February). Development of machine learning framework for the protection of IoT devices. In *2023 7th International Conference on Computing Methodologies and Communication (ICCMC)* (pp. 1394-1398). IEEE.

6. Kumar, A. A., & Karne, R. K. (2022). IIoT-IDS network using inception CNN model. *Journal of Trends in Computer Science and Smart Technology*, *4*(3), 126-138.

7. Karne, R., & Sreeja, T. K. (2022). Routing protocols in vehicular adhoc networks (VANETs). *International Journal of Early Childhood*, *14*(03), 2022.

8. Karne, R. K., & Sreeja, T. K. (2022). A Novel Approach for Dynamic Stable Clustering in VANET Using Deep Learning (LSTM) Model. *IJEER*, *10*(4), 1092-1098.

9. RadhaKrishna Karne, D. T. (2021). COINV-Chances and Obstacles Interpretation to Carry new approaches in the VANET Communications. *Design Engineering*, 10346-10361.

10. RadhaKrishna Karne, D. T. (2021). Review on vanet architecture and applications. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *12*(4), 1745-1749.