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Emergency Evacuation by Iot in Private Bus

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Abstract

Fires arise increasingly in public transportation systems, resulting in the destruction of the most precious innocent suffering and public property. There are some strategies for preventing fires and reducing the scale of losses in the event of a fire in the public transportation system. However, the harm becomes severe because a fire team will be unable to arrive at the opportune moment due to failure of coordination. As a result, we should continue to control and mitigate the losses incurred by bus fires. The key goal of this project is to identify fire incidents and notify the appropriate authority as soon as possible. If a collision or injury occurs, flame detectors are being used to identify the fire. The sensors are linked to central controller, which controls water sprinklers when a fire is detected. In the proposed scheme, the central controller is a Node MCU. Finally, data is uploaded to the cloud, where it can be accessible to all government agencies.

Keywords: *Fire Accidents, Internet Of Things (Iot), Automatic Glass Breakage System, Node MCU, Blynk app*

1. Introduction

India is the world's second most populous nation, and its population is expected to continue to grow in the coming year. The majority of people in the world use public transit as their primary form of transportation. The nation, as well as guided tour and travel companies, are responsible for the provision of transportation systems. The majority of road transportation is through buses, that require routine servicing. Often bus managers or employees refuse to pay importance to the routine maintenance of the vehicles, which results in injuries in the operating bus or vehicle. The automotive industrial sector adheres to a number of input rules and specifications that help to mitigate accident rates and improve passenger safety. Everyone needs to understand the headlines and what is going on out there the first things each day.Accidents are the main common topic of the press. Making an impartial and empirical investigation of a fire crash and determining the true source of the accident is a significant challenge in the modern research of fire departments and safety manufacturing departments.Fires are some of the many common events that result in the destruction of lives and properties Building emergency measures and training for fire escape skills are becoming highly relevant research subjectsOnly a week earlier, 45 passengers were burnt in sleep on a Bangalore-Hyderabad vehicle.. When a bus is involved in a crash, many passengers and their belongings are lost, as well as the government. And this is especially true in air-conditioned buses, when all window frames are shut, giving passengers more time to get away from an accident.As a result, our plan is to incorporate mitigation measures that would be carried out manually. Also on 05th of June 2017, a propeller of an Uttar Pradesh state transportation company bus exploded after colliding with such a truck while going via New Delhi consisting of two drivers and 38 passengers. Fire engines arrived at scene 90 minutes later.

Fig 1: Fire Accident (Bus with chinese tourists catches fire in taiwan,killing 26-The Blade-www.toledoblade.com)

The Internet of Things (IoT) is a networked system in which material items can send and receive data without the need for human-to-human or human-to-computer interaction. IoT defined as a network of sensors and communication devices that comprehensively connects objects, like connecting between items as well as between people and things. Study focuses on innovations that allow "objects" to connect with one another and for consumers in which to obtain results and/or complete tasks. Any incident is a severe, unpredictable, and sometimes vulnerable position that necessitates immediate action. Early Warning Systems (EWS) are being more widely used to reduce the threats faced by major calamities and include early notice. The much more popular disaster situations that occur also outside and indoors are fire and earthquakes. To keep an eye mostly on place, a monitoring system is required. During any disaster situations the duration it takes to identify, determine, and rescue individuals must remain shorter than crucial venue's functional dissemination timing, making time-critical sensor sharing a necessary component of rescue process The use of IoT should aid with in optimization of the emergency rescue.

Related Work

NodeMCU is suggested in paper [1] to receive messages through sensing devices then monitor to maintain contact only with holder of the premises This is accomplished by delivering an SMS to the holder in the early stages and to the fire department in the late stages to address the fire threat. Fumes, heat, also flame suppressant sensors is among sensors used across the device. For commercial environments, its assists with estimating precise thresholds during unsafe conditions then alerts its buzzer respectively. In the paper [2], the author suggested an equipment package that includes a humidity and temperature sensor that is attached to a computer and is used in a variety of locations throughout the woods. The computer is linked to the Web. The data obtained by the sensor is uploaded at a specified period. The information is then transmitted to a cloud-based system. If the weather in the woods rises unusually, the fire alarm is triggered and a warning will be sent for a forest administrators.

An interface computing-based IoT-based fire alarm system was introduced in this paper [3]. The built technology will be appropriate for smart cities because it addresses problems with current fire detection systems, such as elevated implementation and a loss of digital alert. When a device senses flames, it uses the linked 4G device to send a signal to the centralised node, which then alerts the customer and the fire dept. An SMS will be sent to them, and they are contacted by phone. By incorporating IOT products, such as fire alarm systems (fumes and humidity detection systems), Arduino, as well as other compatible appliances, the paper [4] suggests the “Smart Fire Alarm System Using IOT” in smart buildings. Whenever a fire happens, the alarms will give a warning to the building's guards as well as the administrator, and this notification will contain the place and time of the fire.

The implementation of a fire detection device is presented in this paper [5], the Arduino Nano will be used as the microcontroller, and the wireless nRF24L01 will be used for connectivity. There are two microcontrollers in this machine, each with a variety of purposes. The first microcontroller would act as a worker, detecting fires with the use of heat, smoke, and gas sensors. The second microcontroller would serve as a guide, acting as an entry point and triggering a fire alarm mostly in context of a light and a beep tone. In the early step of the paper [6], a low-cost automatic fire protection device for forestry purposes was developed using GSM methodology for fire detection. A smoke sensor MQ-4 and a temperature sensor LM-35 make up this fire warning system. Likewise, the Arduino board is connected to a buzzer, an LCD monitor, and a GSM module.

Proposed Model

The implemented system is an automatic fire warning system that, when a fire is detected, takes preventive steps such as notifying the appropriate people. It not only notifies but also helps in 'automatic breakage system' wherein as soon as the fire catches and the temperature extends beyond the required room temperature (say 60 degrees) the glass automatically breaks so as many as passengers can escape by the time fire extinguishers reach the spot. The model is built with devices such as the Node MCU, the Fire Sensor ,Buzzer, and the Blynk app (for getting a notification and sending mail). All of the devices are connected to the NodeMCU and operate according to the encoded code. When a fire is identified inside the distributed sector, a message about the fire outbreak will be sent to our cell phone, and a warning email is being sent to the fire department with specifics of the crash site. It will resolve the issue that exists in the present system with this model. The flame devices are deployed in small black boxes throughout the controlled area. When the detector detects a flare, it transfers data to a Nodemcu. The code is written in a manner if the system senses a fire, a text message is sent to the phone and a letter is sent to a fire department. The message and mail are sent using the Blynk software.

Hardware Components Required:

- Node MCU
- Micro USB Cable
- Fire Sensor
- Jumper Wires
- Relay

1).Node MCU : The NodeMCU framework is a free and accessible software IoT platform. It uses protocols that works on Espressif Systems' low-cost Wi-Fi powered Wi-Fi SoC and hardware that is built on the ESP-12 module.

Fig 2: Node MCU

2) Relay : A relay is an electromechanical instrument that makes or breaks an electrical bond. A relay is related to a mechanical switch except that it comprises a flexible spinning components or factors which can be controlled electrically by an electromagnetic; in other words, instead of manually switching it on or off, a message impulses may be used to activate it.

Fig 3: Relay

3) Blynk app: Blynk is an IoT platform featuring white-label mobile apps, cloud services, device administration, database management, and data science that is hardware agnostic. The Blynk app for iOS and Android is the simplest method to create your own mobile app that works with your preferred hardware.. It is extension that runs on top of your hardware application, handles all connection routines and data exchange between your hardware, Blynk Cloud, and your app project.

To avoid fire incidents on moving buses, a model has been introduced. The specification includes a node MCU, a fire sensor, and a DC motor for the sprinklers mechanism.The key element of the architecture is the node MCU, which serves as the central controller, and power is supplied to it through a USB cable via a device. A detector is needed to sense fire, and we had used a Thermistor to

do so. The way a thermistor works is that it detects smoke or flames in the immediate area. We used a relay for the water sprinkler system. It's also in a tank of water. The entire configuration is introduced by coding a specific code in Arduino programme, which is then dumped into the node MCU via USB cable, which also provides power. So, further double the model, a flame sensor is mounted and if it senses a fire, the unit activates, and drivers and travelers in the bus get a warning in a form of an LED wink, as well as an automated sprinklers mechanism that shares place.Link the components as seen in the circuit diagram. Then, using Arduino IDE, transfer the code to the NodeMCU. The fire sensor is attached to the NodeMCU's D0 pin to provide digital data, and the buzzer is attached to the NodeMCU's D1 pin to receive digital output. If the flame system senses fire, it returns "0," and NodeMCU activates the buzzer, sends a message to the phone, and send emails to the associated email account. The message and mail are sent using the Blynk software. The block diagram in the fig.1 represents the Block diagram of the proposed model.

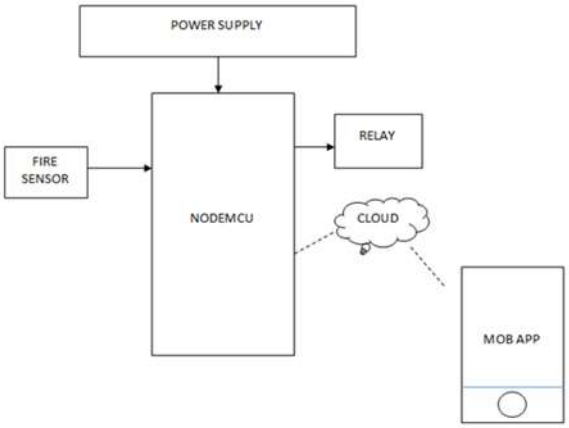

Fig 4: Block Diagram of the Proposed Model

The flame detector and relay are combined with the Node MCU, as seen in the diagram. The Node MCU is fitted with a 5V power source. The data is saved in the cloud (in this case, it is saved in the Blynk app since there is only one user) and as soon as a fire is observed, the relay is enabled to immediately spray water and a message is sent to the mobile app. We are also further working on automatic breakage glass where as soon as the temperature in the bus reaches to a point(say 60 degrees), glass automatically breaks.

Proposed model [Fig. 5] shows the steps to be performed:

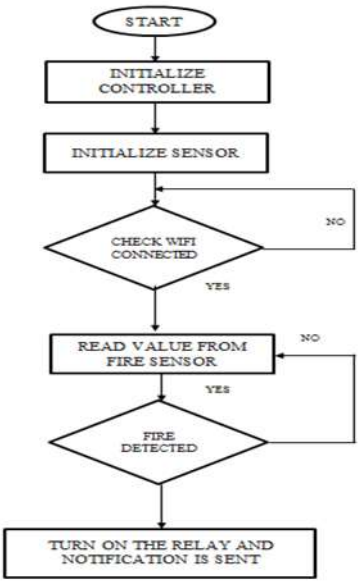

Fig 5: Flowchart of the Proposed Model

In the flowchart shown in the [Fig. 5], it shows flow of the model. firstly, the program has been dumped into the controller then the sensors are initialized and after the sensor detects the fire, the values has been read from the sensor that acts as a input data. After detecting and reading the value, if there's no fire is detected then there's no change seen but if the fire is detected then the relay is turned on and notification is sent to the nearby authorities immediately.

2. Materials And Methods

The model's operation is shown in the diagrams below, Figure 6 depicts the operating, while figures 7,8,9 depict the notification on the Blynk app and by email when a fire is detected. As shown in the figures below, fig.6 shows the working of a proposed model. The connection of hardware components to the device can be seen, showing the results simultaneously. It is also observed that fire has been detected and a mail has been sent to the required authorities like nearby police station,fire stations,hospitals.

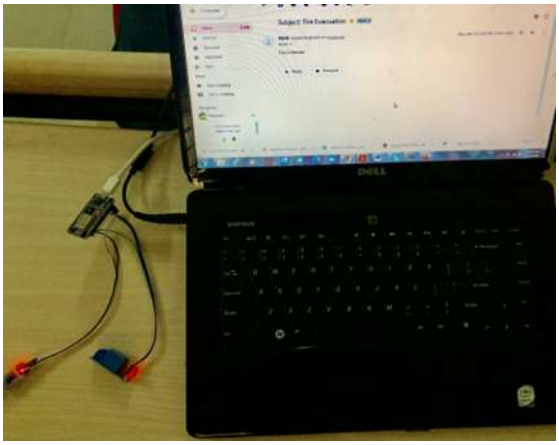

Fig 6: Working of the proposed model

Fig 7: Showing the results of detection of fire

Similarly in the fig.7, a screenshot of the result i.e, after receiving a notification has been shown, stating ‘fire is detected’. Notification from both blynk app and the mail can be seen in the figure.

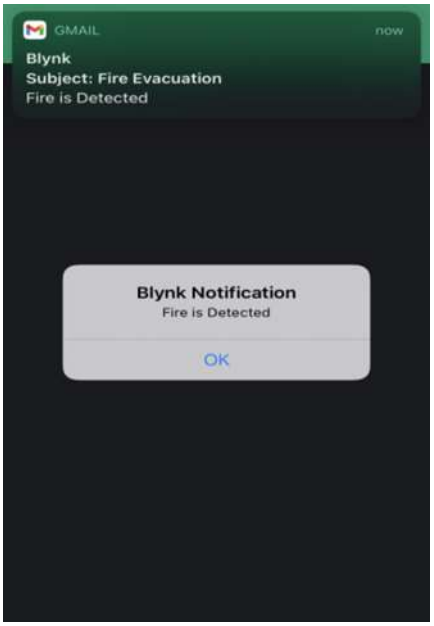

Fig 8: Showing the notification on the Blynk app

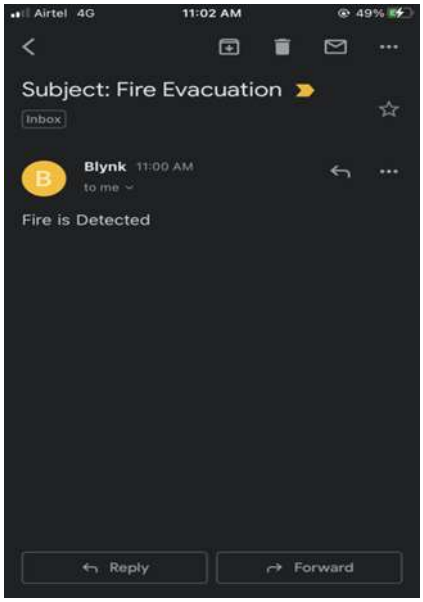

Fig 9: Detection of fire and notification of the same through the mail

The mail that has been received after detecting the fire can be seen in the fig.9

4. Conclusion

The internet of things has a variety of applications, we use it in the areas of fire protection and surveillance, particularly in air-conditioned bus. It has long history of use in the area of real time applications, especially in surveillance system. The paper is primarily concerned with minimizing human and property losses in the event of an accident. The steps in the proposed model are applied immediately which reduces the time it takes to implement them and thereby reduces the loss. This method was designed as a supplement to existing public transit systems. A lot of fire incidents are happening and being recorded these days. Despite the fact that it has been notified to fire safety or emergency help services, the number of lives lost and properties damage is significant. During an event, which is attributed to a loss of coordination or a delay in informing and obtaining the assistance of fire rescue or emergency help staff. As a result, by implementing the proposed scheme, we will be able to notify the local community as well as the fire department of the accident via the mail. It not only notifies but also helps in 'automatic breakage system' wherein as soon as the fire catches and the temperature extends beyond the required room temperature (say 60 degrees) the glass automatically breaks so as many as passengers can escape by the time fire extinguishers reach the spot. As a result,the proposed system is appropriate to ensure everyone's safety.

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