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GSM Based Fire Alert System

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Abstract*—The necessity of effective fire detection and alerting systems is highlighted by the prevalence of fire dangers. Despite their efficiency, conventional fire alarm systems sometimes have drawbacks with regard to affordability and installation simplicity. To overcome these shortcomings, this article introduces a unique GSM-based fire alarm system that leverages the capabilities of global system for mobile communication (GSM) technology to deliver an affordable and user-friendly solution.*

The proposed technique makes use of a network of carefully positioned sensors to identify heat and smoke, which are the two main signs of a fire. The sensors send out an alert signal when they identify a possible fire threat, and the signal is sent to a user's mobile over a GSM modem. The modem notifies a pre-selected list of emergency contacts via SMS or phone call as soon as it receives the alarm signal, warning them of the approaching danger.

Relative to conventional systems, this novel method to fire detection and alerting has a number of advantages. First off, because it uses GSM technology, it can be deployed with far less complexity and at a much lower cost than if it used specialized cabling. Second, because of its modular architecture, the system is simple to customize to meet the unique needs of a variety of settings, including public areas, offices, and households. In order to offer an integrated fire and security management solution, the system's scalability also permits smooth interaction with other security systems, such as surveillance cameras.

In terms of fire safety measures, the suggested GSM-based fire alarm system represents a possible paradigm change. Its low cost, simplicity of installation, and inventiveness make it a great solution for a broad range of applications. Furthermore, its integration capabilities open the path for a comprehensive fire and security management platform, boosting overall safety and readiness.

Keywords: *Technology, GSM Module, Sensors, Alert System.*

I. INTRODUCTION

Fires pose a significant threat to life and property, causing extensive damage and potentially fatal injuries. To mitigate these risks, various safety measures, such as fire alarms and water sprinkler systems, have been implemented.

However, these traditional approaches often face limitations in terms of installation costs, maintenance requirements, and fixed coverage areas. To deal with these shortcomings, this paper introduces the implementation and design of a novel GSM based fire alert system.

In order to offer a dependable and affordable fire safety solution, this system takes advantage of the widespread availability of GSM technology. When smoke or heat is detected by a network of carefully positioned sensors, an alert signal is generated and sent using a GSM modem to a user phone. After processing the incoming signals, the control unit quickly notifies the already programmed contacts of the possible fire danger by voice calling or SMS.

Additionally, the system includes a function for manual overriding, enabling users to initiate an alert in case of an emergency. The proposed GSM-based fire alert system offers several advantages over conventional fire safety measures.

Firstly, its ease of installation and operation makes it suitable for a wide range of environments. Secondly, its cost-effectiveness reduces the financial burden connected to conventional fire safety precautions. And lastly, it's adaptable nature enables users to adjust the system to meet their own particular requirements.

This paper describes in detail the hardware and software components of the GSM-based fire alert system, including its design and implementation. The system's performance is measured against conventional fire safety measures and rigorously assessed using multiple metrics, such as accuracy and response time. The outcomes show how well the system works to improve fire safety and lower the probability of fire-related incidents. It is clear that the suggested GSM-based fire alert system is a viable way to increase fire safety and a strong substitute for conventional methods.

II. LITERATURE REVIEW

The proposed fire alert system employs an Arduino Nano and a GSM 800 module to send SMS and call alerts to the user's phone, providing a low-cost and effective solution for fire detection. The system utilizes a temperature sensing sensor to detect potential fire hazards and is able to keep an eye on several rooms simultaneously.

Proposed a wireless sensor network (WSN) for fire sensing and prevention. Their system leverages GSM technology to relay data from the sensors to a central control center, where data analysis is performed to identify potential fires. Additionally, the system incorporates a remotely activated fire extinguishing mechanism.

This paper presents a novel design for a GSM-based fire alarm system that integrates a temperature sensor, a smoke sensor, and a GSM module. The system facilitates message alerts to many users and incorporates a voice module for verbal notifications.

Another cost effective GSM based fire alert system utilizes a LM35 temperature sensor and a GSM800 module to send SMS warnings to the user's phone. This system is built for easy installation in homes and small businesses.

The present paper presents a LM35 temperature sensor, smoke sensor, and GSM800 module-equipped GSM based fire alert system. The system has a voice module for vocal alerts and can send SMS alerts to multiple users.

In this paper, a LM35 temperature sensor, smoke sensor, and GSM800 module are all integrated into a GSM-based fire alert system. Multiple users can receive message alerts from the system, and it has a calling feature for call notifications.

A different GSM based smoke, temperature, and GSM module based fire alert system is demonstrated. The system can send SMS alerts to multiple users and has a voice module for call alerts.

This presented paper presents a GSM based fire alert system specifically designed for small and medium-sized enterprises. The system employs a temperature sensor and a GSM module to transmit alerts for SMS on the user's phone.

A GSM based fire alert system integrating a LM35 temperature sensor, a smoke sensor, and an Arduino Nano is proposed. The system facilitates SMS alerts to users and incorporates a call for calling notifications. The Arduino Nano enhances the accuracy of fire detection.

This presented paper shows a GSM based fire alert system united into a smart home. The system utilizes a LM35 temperature sensor and a GSM800 module to send message alerts to the user's phone. In the event of a fire, the system can automatically turn off electrical appliances thanks to the integration with smart homes.

A wireless fire alert system combining GSM800 module and Sensor technology is proposed. The system comprises a LM35 temperature sensor, a smoke sensor, and the GSM800 module facilitates alerts for messages on the user's phone.

This system combines an automated fire extinguishing system with a GSM-based fire alert system. The system has three sensors: a smoke sensor, a temperature sensor, and a GSM module that allows SMS alerts to be sent to the user's phone. When a fire is detected, the automatic fire extinguishing system is triggered.

Okewale and Oyediran present a GSM based fire alert system utilizing an Arduino. The system integrates a LM35 temperature sensor and a GSM800 module for transmitting alerts for messages on the user's phone. The system is built for cost effective and easy installation.

Another GSM based fire alert system including remote monitoring and control capability is presented. The system includes a smoke sensor, a temperature sensor, and a GSM module that allows the user to send SMS alerts to their phone. Users can access system data and manage the system remotely thanks to the remote monitoring and control feature.

A GSM-based fire alert system is suggested to have a real-time monitoring feature. The system uses a GSM800 module and an LM35 temperature sensor to send SMS alerts to the user's phone. Users can instantly access system data and receive alerts thanks to the real-time monitoring feature. The system is made to be simple to install and reasonably priced.

III. METHODOLOGY

The proposed fire detection system utilizes a flame sensor, an Arduino Nano microcontroller, a GSM module, and a buzzer to effectively detect fire incidents and alert the relevant authorities promptly.

The flame sensor, positioned on the breadboard, serves as the primary fire detection component. Upon detecting the presence of a flame, the flame sensor triggers a signal to the Arduino Nano. The Arduino Nano, acting as the system's control center, processes the received signal and activates the buzzer, emitting a loud alarm to alert users of the potential fire hazard. Simultaneously, the Arduino Nano engages the GSM800 module, responsible for sending alert messages to a designated mobile number. This alert message usually includes crucial information regarding the fire detection event.

The role of arduino nano is to encompass controlling the system's overall functionality. It receives input from the sensors, processes the information, and activates the GSM800 module and buzzer accordingly.

All things considered, the fire detection system, which makes use of an Arduino Nano, GSM800 module, LM35 sensor, and buzzer, provides a reliable method for early fire detection and notification. Because of its simplicity, the system is easy to implement; however, for best results, careful design and installation are essential. By assembling the right sensors, an Arduino Nano, a GSM800 module, a buzzer, and a power supply, this system can effectively guard against the damaging effects of fire.

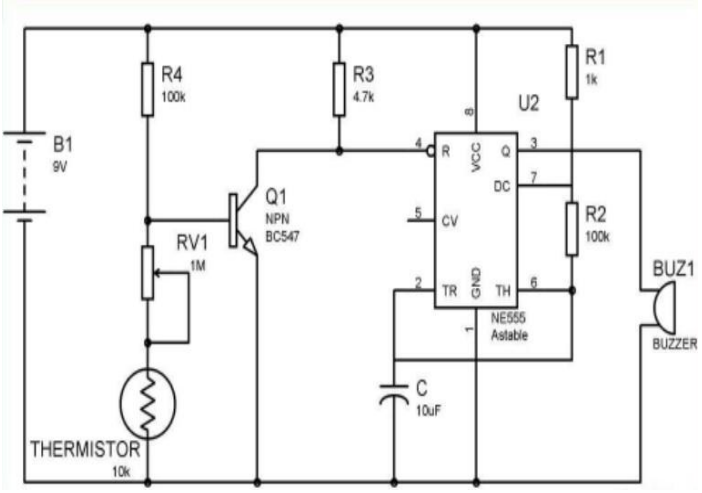

Fig-1: Circuit diagram of Model

IV. RESULTS AND DISCUSSION

Through a series of controlled experiments, the system's performance was thoroughly assessed. To evaluate the LM35 sensor's accuracy and responsiveness, the fire detection system's core component was exposed to simulated heat. The LM35 sensor is positioned to identify a possible fire hazard, and its constant watchfulness shows how prepared it is..

When the system detects fire, it reacts quickly and sets off a series of alarms. The buzzer creates an alerting sound that is meant to wake even the most sound asleep. Its alarm is piercing. Concurrently, an SMS alert is sent to the user's mobile device, transmitting the critical information about an emergency fire. This two-pronged strategy makes sure that, even in the midst of the confusion and chaos of a fire emergency, the warning cannot be overlooked.

The scene following a controlled fire, in which the system's effectiveness is clearly visible. The fire has been put out, its potential for destruction reduced by the alert system's prompt action. This tangible proof of the system's effectiveness acts as a comforting reminder of its capacity to protect people and property.

The user's SMS notice, which serves as concrete proof of the system's alert mechanism. The simple but powerful message highlights the important details of a fire incident and calls for quick action to prevent catastrophe. This digital lifeline serves as an excellent example of how the system can close the communication gap between detection and response, guaranteeing that no fire incident is overlooked.

These meticulously planned tests have solidified the system's unwavering dedication to fire safety. Its capacity to recognise, warn, and safeguard is evidence of its creativity and efficacy, serving as a ray of hope when confronted with possible fire threats.

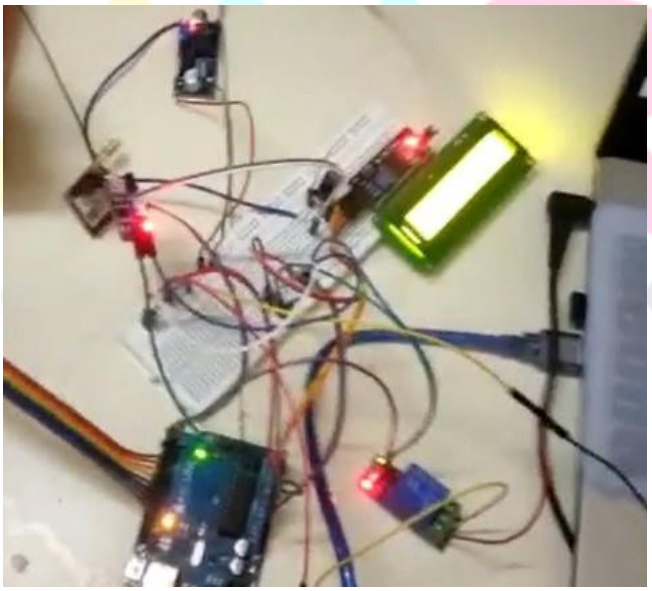

Fig 2: Fire alert System with LCD screen

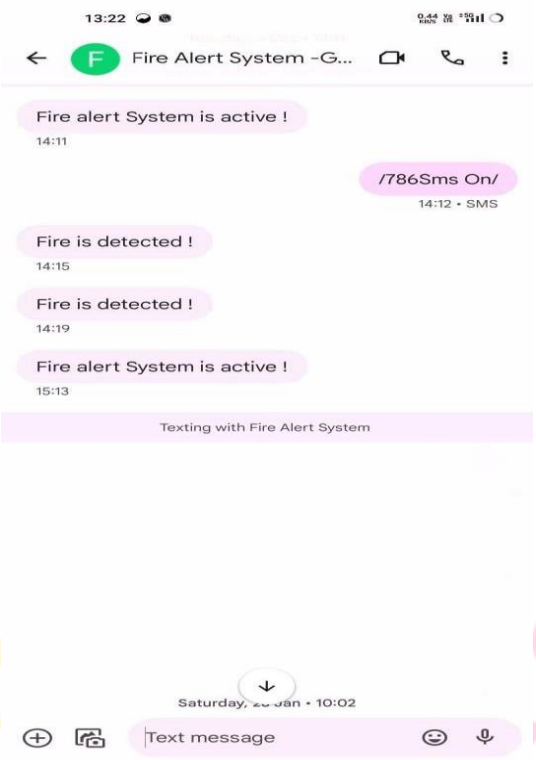

Fig 3: Alert On User's Device

Sr. No	Distance of System from fire (cm)	Response Time (Sec)
1	15.34	0.89
2	30.68	0.74
3	47.23	0.55
4	59.96	0.5
5	71.22	0.59
6	77.5	0.6
7	84.31	0.22
8	88.63	0.48
9	93.17	0.55
10	101.5	0.75

Table 1: Temperature sensor Readings

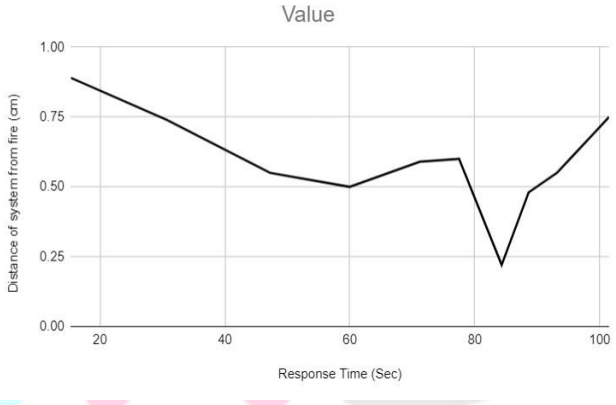

Fig 4: Temperature sensor graph

V. FUTURE SCOPE

There is a large area for progress in the capabilities and efficacy of the suggested GSM-based fire alerting system. Future iterations of the system could incorporate additional sensors, advanced technologies, and real-time monitoring features to provide a more comprehensive and responsive fire detection solution.

1. **Enhanced Sensor Integration:** Adding more temperature sensors, gas sensors, and smoke detectors to the sensor array could greatly increase the accuracy and dependability of the system's detection of a larger variety of fire threats. This multi-sensor approach would provide a more holistic assessment of the fire risk, reducing the likelihood of false alarms and ensuring timely detection of genuine fire incidents.

2. **Integration with AI and ML:** Leveraging Artificial Intelligence and Machine Learning algorithms could revolutionize the fire detection process by enabling pattern analysis and predictive capabilities. AI could analyze sensor data to identify

subtle patterns and correlations that may indicate a potential fire risk, while ML could be employed to develop predictive models that anticipate fire hazards based on historical data and current environmental conditions.

3. **Harnessing the Power of the Internet of Things (IoT):** By connecting the fire detection system to the Internet of Things, users will be able to remotely monitor and control the system, accessing real-time status data and taking control of its functions. IoT would also pave the way for seamless integration with smart home systems, allowing for automated responses to fire alarms, such as activating fire suppression systems or alerting local emergency services.

4. **Real-time Monitoring and Reporting:** Implementing real-time monitoring and reporting features would ensure prompt detection and notification of fire incidents. This might involve sending out automated alerts to building residents and emergency services, giving them vital information for quick and organized action. For determining the severity of the situation and determining the best course of action, real-time updates on the fire's status would be extremely helpful.

VI. FUTURE SCOPE

When building inhabitants are not present, the goal of the home alert system is to address the problem of fire dangers and potential damage. Both residential areas and the structure itself are always vulnerable to unanticipated or serious circumstances that occupants could miss. Residents may feel secure knowing that their homes and possessions are protected even while they are gone thanks to this home alert system.

In contrast to other alarm systems currently available, the proposed system stands out for its affordability and ease of installation, making it accessible to a broader range of homeowners. The efficiency of the system depends on the use of an LM35 sensor, a high-precision temperature sensor that can precisely identify heat or high temperatures. Due to its adaptability and ease of use, this sensor can be used in a broad range of environments, such as factories, residences, hotels, hostels, and transportation facilities.

The system operates with little assistance from the user and is simple to understand. After installation in the designated spot, the system keeps an ongoing eye on the surrounding temperature. The moment the system detects a temperature higher than the predetermined threshold (40 degrees Celsius), an alert mechanism is promptly triggered. The system's designated user or users will receive an SMS notification as part of this alert mechanism. Residents can take quick action to reduce the risk of a fire by using a fire extinguisher or calling the fire department when they receive this alert message in a timely manner.

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