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AN IOT BASED INTELLIGENT SAFETY SYSTEM WITH SENSORS FOR SMART HOMES

[1] Swedha Samson , [2] Dr. G. Manikandan,
[1] PG Scholar , [2] Head Of Department,
[1,2] Computer Science & Engineering,
[1,2] Kings Engineering College, Chennai.
[1] swedhasamson1995@gmail.com.

ABSTRACT

Fires usually occur in homes because of carelessness and changes in environmental conditions. They cause threats to the residential community and may result in human death and property damage. Consequently, house fires must be detected early to prevent these types of threats. The immediate notification of a fire is the most critical issue in domestic fire detection systems.

Fire detection *systems using wireless sensor networks sometimes do not detect a fire as a consequence of sensor failure. Wireless sensor networks (WSN) consist of tiny, cheap, and low-power sensor devices that have the ability to sense the environment and can provide real-time fire detection with high accuracy. In this paper, we designed and evaluated a wireless sensor network using multiple(Voltage , GAS, Current) sensors for early detection of house fires. In addition, we used the Global System for Mobile Communications (GSM) to avoid false alarms.*

To test the results of our fire detection system, we simulated a fire in a smart home using the Fire Dynamics Simulator and a language program. The simulation results showed that our system is able to detect early fire, even when a sensor is not working, while keeping the energy consumption of the sensors at an acceptable level.

Keywords : Smart home, IOT, Gas sensor, SMS.

1. INTRODUCTION

In recent years, fire detection has become a very big issue, as it has caused severe damage including the loss of human lives. Sometimes, these incidents are more destructive when the fire spreads to the surroundings. Early detection of a fire event is an effective way to save lives and reduce property damage. To escape a fiery place and to douse the fire source, the fire must be detected at its initial stage. The installation of a fire alarm system is the most convenient way to detect a fire early and avoid losses.

Fire alarms consist of different devices working together that have the ability to detect fire and alert people through visual and audio appliances.

The detection devices (i.e., heat, smoke, and gas detectors) detect events and activate the alarm automatically, or sometimes the alarms are activated manually. The alarm may consist of bells, mountable sounders, or horns. Most of the fire alarm systems use the technology of a wireless sensor network (WSN). WSNs have gained popularity because they have a variety of uses in different applications, such as target tracking [1,2], localization [3], healthcare [4,5], Smart Transpiration [6], environmental monitoring, and industrial automation [7]. WSN is also used in collecting data and monitoring, both autonomously or with the help of users [8,9]. WSN applications also help human and animals [10,11] and are also used for industrial purposes, for example, underground pipeline monitoring.

In a WSN, sensor devices are often very tiny, battery-powered, and densely populated with the functionality of monitoring several parameters of the environment. The sensed data are sent to the main collecting unit (i.e., the sink, cluster head etc.) for processing [8]. WSNs used for fire detection systems also have the same functional properties. Each sensor detects rising heat, smoke, or gas in some spots in a home and generate san alert in its head node in a network. The head node collects reports from various sensors and identifies the presence of a fire.

Next, different heads coordinate the received inputs and consult with a remote command center to plan a response that may consist in a simple fire alarm generation or in complicated evacuation methods. Numerous technologies based on WSN have already been proposed to detect fire. Some of them are stand-alone with WSN, and some have hybrid technologies. There are many event detection systems, which help to identify heat, gas, and smoke. Today, smart houses and smart cities are equipped with different type of WSNs [12]. In WSNs, more energy may be consumed because of communication overhead.

Thus, most of the time, a sensor's battery is exhausted very fast and it may cause the failure of the sensor or the breakdown of whole network, as houses have different sub-portions and each portion is equipped with one sensor with a single function, which in case of failure causes a system flaw. In this scenario, if an event occurs in a certain portion and the sensor fails to detect the accident, then there is no other way to detect the incident at its initial stage.

As unifunctional sensors are only be able to detect one event, there is another noticeable issue regarding the possibility of false alarms. For example, a heat detector detects

temperature in the environment and produces the alarm if the temperature increases beyond a threshold. However, the increase in heat may be due to environmental changes or human activity in the room. In the case of smoke detectors, the smoke may come from outside or from other sources. The cost of a false alarm is estimated between $30,000 and $50,000 per incident [13].

The main goal of our project is to develop a system such that it will be capable to assure a safety for each and every electric appliance and LPG cylinder in the home and the user will be able to acquire an alert if any problem occurs. Along with this, the SMS will be sent to the nearby rescue center. The user can monitor the electricity level of each individual load and LPG cylinder leakage using a web application which will also work as a data setter to set various user programmable parameters like high/low cut-off voltage, etc.

2. LITERATURE SURVEY

In the last few years, sensors have been widely used for fire detection [14–19]. Silva et al. [14] proposed a work for fire detection in mines by using wireless sensor networks called WMSS. For determining the hazardous factor in the mines, they used gas sensors and designed a wireless sensor network which collects and analyses the gas level in mines. The work proposed in [15] used Zigbee-based wireless sensors for fire detection in forests. They used temperature sensors to establish the intensity of fire in a forest. They used a CC2430 chip in their hardware design for network nodes. Similarly, Buratti et al. [16] also designed a framework for forest fire detection. In their work, they used a model for fire detection using different clustering schemes and communication protocols. They performed the simulation for validation and evaluation of their work.

W. Tan et al. [17] implemented a work for forest fire detection. They used multi-sensor and wireless IP cameras to avoid false alarms. Their system also connected to the internet via gateways for uploading the data to the cloud. A work proposed in [18] for forest fire detection was based on a ZigBee wireless sensor network in China. A work for forest fire detection is proposed in [19]. A. Rehman proposed a work for WSN [20].

South Koreans [21] also designed a system for fire detection in their mountains. They named their system FFSS (Forest fire Surveillance system). They developed their system by using WSN, middleware, and web applications. Network nodes (i.e., temperature sensors and humidity sensors) collect measurements and send them to the sink node. Afterwards, the sink node transmits that data to the cloud via a transceiver (gateway). Later, by using a formula, the fire risk level is determined in the middleware program. After detecting the

fire, FFSS is activated automatically. TinyOS is used as an operating system for network nodes.

Similarly, few other systems utilize the WSN for early fire detection. Few of them use IP-based cameras and mixed multi-sensors [22] on wireless mesh network to detect a fire efficiently. They use these three parameters to make an efficient system to identify and verify fire.

A software application exists, which selects the closest IP base camera. When sensors sense a fire, they send the information to the central server where the software program selects the nearest camera. That camera takes pictures of the location and send them back to the main sink. Alarm decision is made on the basis of the sensor's information and selected images.

Also, a clustering-based forest fire detection system was proposed in [23]. The proposed method uses advanced communication protocols.

The proposed work consists of four major parts: (i) an approach for sensor deployment, (ii) the use of WSN for fire detection, (iii) intra-clustering protocols, and (iv) an inter-clustering communication protocol.

Aother work was proposed by Wenning, Pesch, Giel, and Gorg [24] for disaster detection, including the fire event. This method can quickly adapt the routing work state on the basis of the threat of possible failure.

In [25], researchers proposed a protocol for the adaptation of the Context-Aware Routing Protocol (CAR) to WSN and named it SCAR. Energy, colocation with sink, and their connectivity was evaluated in SCAR. For the delivery of data packets to the sink, delivery probability and forecasted values were combined on the basis of previous knowledge of SCAR parameters. In this system, buffer space and delivery probability are exchanged periodically with neighbor nodes. An order list of neighbors is sorted by delivery probability, which is kept by each node. Garcia et al. [26] proposed a work to create a model for fire detection. They performed a simulation by analyzing sensors data and geographic information. To differentiate from the existing work, they used topography of the environment under study.

3. PROPOSED SYSTEM ANALYSIS

This method properly monitors the LPG and electricity problems. User will intimated with the problem. Voltage and Current sensor is placed for measuring the input voltage and current this will identify the power input in home. So we can avoid the damage to the appliances if any power fluctuations occurs. No man power is needed for checking in homes. A Web server facility is provided for monitoring and control using PC. The system will also provide whenever any fluctuation or leakage

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occurs it Sent alert through via SMS. The system will also send SMS to nearby rescue stations.

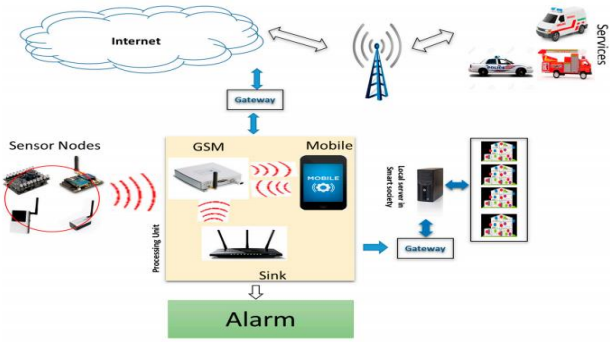

Fig 1: Proposed structure

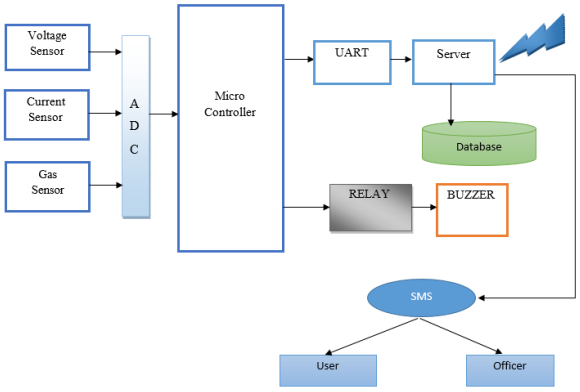

Fig 2: Proposed block diagram

4. RESULTS

Fig 3: Front page

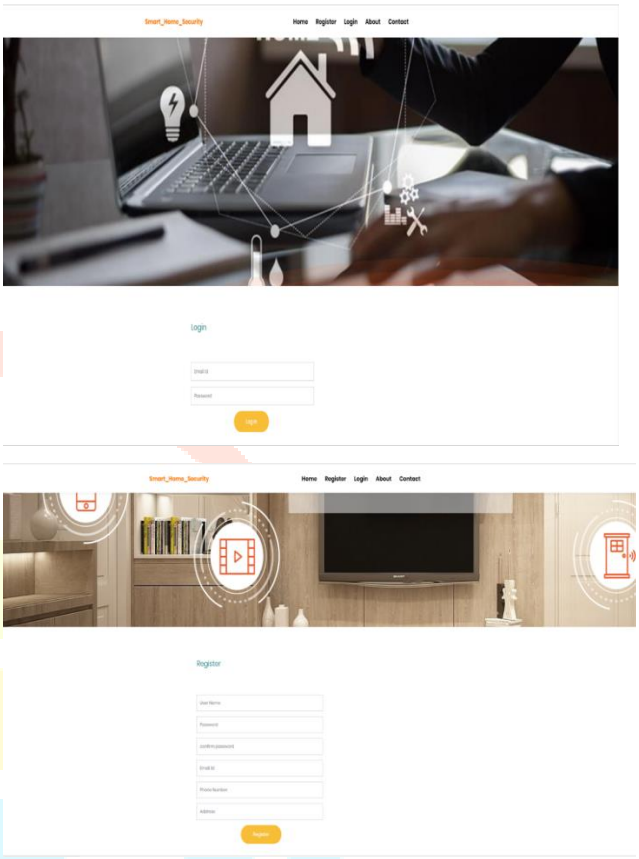

Fig 4: devices registration

5. CONCLUSION

In this project we have completed the user authentication and profile creation modules. User can create an account consists of Following information details like User name, Email id, Password, Confirm Password, Phone Number, Address. The user can login to his/her account with the exact credentials. If any mismatch occurs will not be allowed to login.

6. FURTHER ENHANCEMENT

In future we are planning to do the kit development with sensors and Arduino board. With a help of the kit we can able to monitor

the LPG and power by sensing to avoid the destruction. And we will have a server with application connection to view these details. Along with this user and nearby rescue center will get an alert SMS if any problem occurs.

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