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Smart Fire Detection System using IOT

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Abstract: ***Fire is the most boundless reason for the unfortunate death influences for many occupants every year by causing many injuries and also an unprecedented increase in the death toll. Conventional fire detection systems have a tendency of being triggered by false positives. This causes false panic and tension in people head. In this paper, we discuss the design and implementation of a smart fire detection system along with Wireless Sensor Network (WSN) and Global System for Mobile (GSM) communication to detect fires effectively and inform them to the concerned authorities. The proposed system uses smoke, photo infrared and temperature sensors. The system tries to stop the spreading of the fire by using a sprinkler system. We propose to use Arduino and GSM module along with three main sensors that are Smoke sensor, Infrared Sensor and Temperature Sensor. By using GSM module, we will send alert SMS to the owner of the site. The fire will be detected and sent to the owner of the site and this result will be very accurate, thus saving property and life for obvious reasons. It will also try to stop fire in between the response by using the sprinkler system. The main objectives of this work were to design a smart fire detection system that reduces false positives using accurate and speedy sensors and not only detecting but also informing the fire at the site to concerned people. Overall, most of these specifications for the system were met.***

Keywords: Fire detection, Sensors, Smoke, Infrared, Heat, GSM, Surveillance, WSN, IOT, Sprinkler, Alarm

I. INTRODUCTION

Fire detection systems have been promoted immensely in the past few years and have helped in the safety of people and property against fire hazards. The detection of fire hazards on the other hand may, also lead to unnecessary false alarms that can be very expensive if the occurrence happens in a commercial building. As well, false fire alarms have been a nuisance to the fire department and cause tie ups in resources and needless commotion that leads to panic. The problem that was addressed by this work was to detect fires occurring at any site more accurately by reducing the occurrence of false positives in a kitchen like environment where fire is used as a commodity for cooking purpose. Also, this work tends to give the information regarding the fire breakout to the concerned authorities for rapid response to control the fire. The kitchen environment has a very high potential of being a source of fires. Sensors are used to collect monitoring data autonomously. The data from infrared sensor, temperature sensor and smoke sensor is fed into the Arduino. By using a GSM module, the system will inform the owner and authorities by a phone call. The central control of the entire system will manage by Arduino UNO.

II. EXISTING WORK

In the research paper, titled as Energy-Efficient Deep CNN for Smoke Detection in Foggy IoT Environment aims to investigated different CNN architectures and proposed an energy-efficient deep CNN based technique for smoke detection in surveillance videos captured in foggy and normal IoT environment. In the research paper titled as Smart Fire Detection and Surveillance System Using IOT aims to detect the fire at home. The surveillance system by using modern equipment's and the system is economical with affordable cost which is designed to place at fire-sensitive places to warn the user about the incident. An ESP thinker and sensors are used here to distinguish the fire and smoke for monitoring and producing an alarm according to the intensity of the image. So, an IoT based fire detection system is suggested where each activity can continuously monitor to avoid the hazardous incident.

In the research paper titled as Design of a smart fire detection system aims to detect discuss the design and implementation of a smart fire detection system using a Wireless Sensor Network (WSN) and Global System for Mobile (GSM) communication to detect fires effectively and reduce false positives. The proposed system uses smoke and temperature sensors. SMS capability via GSM was implemented so that occupants can interact with the fire detection system and aid in the detection of false positives. The aim of this work was to design and implement a fire detection system that detects fires effectively and reduces false positives. The results show that the system meets the specifications.

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III. LITERATURE SURVEY

Fire detection systems have been promoted immensely in the past few years and have helped in the safety of people and property against fire hazards. The detection of fire hazards on the other hand can lead to unnecessary false alarms that can be very expensive if the occurrence happens in a commercial building. As well, false fire alarms have been a nuisance to the fire department and cause tie ups in resources and needless commotion that leads to panic. In the research paper, titled as Energy- Efficient Deep CNN for Smoke Detection in Foggy IoT Environment [1] aims to investigated different CNN architectures and proposed an energy-efficient deep CNN based technique for smoke detection in surveillance videos captured in foggy and normal IoT.environment. In the research paper titled as Smart Fire Detection and Surveillance System Using IOT [2] aims to detect the fire at home. The surveillance system by using modern equipment's and the system is economical with affordable cost which is designed to place at fire-sensitive places to warn the user about the incident. An ESP thinker and sensors are used here to distinguish the fire and smoke for monitoring and producing an alarm according to the intensity of the image. So, an IoT based fire detection system is suggested where each activity can continuously monitor to avoid the hazardous incident. In the research paper titled as Design of a smart fire detection system [3] aims to detect discuss the design and implementation of a smart fire detection system using a Wireless Sensor Network (WSN) and Global System for Mobile (GSM) communication to detect fires effectively and reduce false positives. The proposed system uses smoke and temperature sensors. SMS capability via GSM was implemented so that occupants can interact with the fire detection system and aid in the detection of false positives. The aim of this work was to design and implement a fire detection system that detects fires effectively and reduces false positives. The results show that the system meets the specifications

IV. FUNCTIONALITY OF PROJECT

The sensors used in the system are Smoke sensor, Temperature sensor and Infrared photo sensor. Firstly, all the sensors are attached to the GSM module and further the module is controlled via Arduino UNO board. Depending upon the input signals of the sensors, it will be decided as to whether there is a fire breakout in the site or not. If the sensors show true value, then a call is made by using GSM module that is controlled by Arduino UNO. The owner of the site will then receive a call and a message from the module and a message will be sent to the concerned authorities. Meanwhile, the sprinkler system will get activated automatically and will try to reduce or even stop the fire. Thus, finally the fire can be controlled and the harm caused by the fire will be reduced. This section contains information on the design and implementation of the complete proposed system. I. Hardware Design: The requirements of hardware for the proposed system are: 1. Arduino UNO 2. GSM Module (900A) 3. Temperature Sensor 4. Smoke Sensor 5. Infrared photo sensor 6. Sprinklers 7. Mobile Sim (5g/6g) The sensor gets activated in such a manner that firstly the infrared photo sensor will detect the heat rays coming from fire. After this the temperature sensor gets activated and sense the heat on the site and then the smoke sensor detects the smoke from then fire. All the data from the three sensors is fed into the GSM Module then the module transfers the data to the Arduino UNO which then further process the data and then triggers the GSM module depending upon the data from the sensors. Then the GSM Module uses 5G/6G technology for rapid response of alarm in the form of call or message to the Owner and Fire Authorities. II. Software Design The sensors work in step wise manner, starting with Infrared photo sensor then Temperature sensor and finally smoke sensor. If the data from all these sensors is high then the code triggers the GSM module to alert the concerned people. The main reason behind using these three sensors is providing more accurate fire detection and reducing false positives. We will use Arduino IDE to program the Arduino, that means the code will be written in the Arduino IDE and will be fed into the Arduino UNO. The call will be made to the OWNER and the message along with the details of the site will be sent to the fire department.

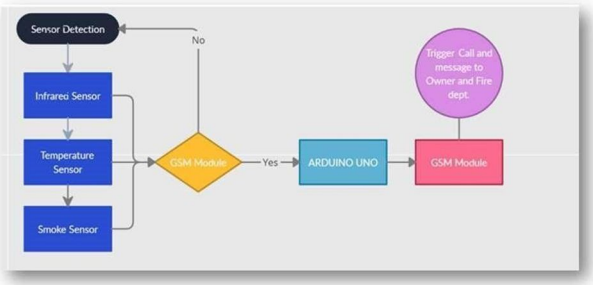


Fig. 1. Flow Chart of FIRE detection system

Below is the algorithm for our fire detection system.

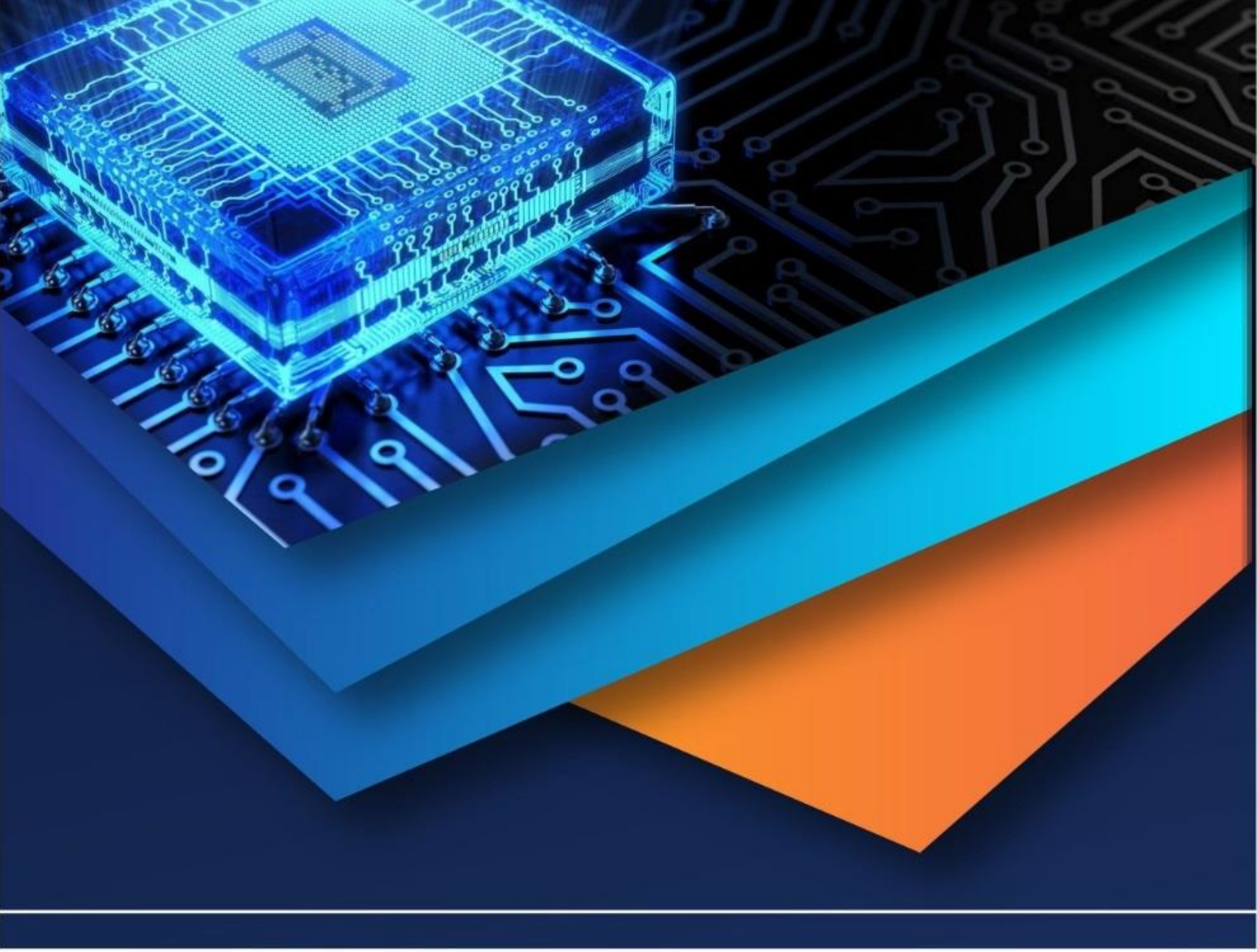
1) START
2) Read data from Infrared photo sensor.
3) If the value is HIGH, trigger Temperature sensor.
4) If the value is HIGH, trigger SMOKE sensor.
5) If the value is HIGH, Arduino UNO should trigger the GSM module.
6) Message will be sent by the GSM module to the owner.
7) Message will be sent by the GSM module to the fire authorities.
8) Sprinkler system will try to control the fire meanwhile.
9) Fire will be finally controlled.
10) STOP

V. RESULT

The system is intended to prevent fire and reduce the loss of life and property. The fire is detected at an early stage and the system generates an alarm and sends SMS or call alerts to
mobile numbers stored inside the Arduino program, via the GSM module. Simultaneously, a water sprayer producing device is switched on for the control of fire. This prototype system can help users to improve their safety standards with immediate response by preventing accidents. This will eventually allow both the lives and the properties from the disaster. The main objectives of this work were to design a smart fire detection system that reduces false positives using
accurate and speedy sensors and not only detecting but also informing the fire at the site to concerned people. Overall, most of these specifications for the system were met. On the other hand, there are some difficulties due to hardware constraints in proving this but again overall the system does what it was designed to do.

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