

# **IoT BASED FIRE DEDUCTION MANAGEMENT SYSTEM USING RASPBERRY PI**

## **ABSTRACT:**

The main objective of this study was to design and integrate Internet of Things (IoT) to an Arduino-based fire safety system that gives alert to fire-fighting facilities, authorities and building occupants to possibly prevent fire occurrences or reduce the probable damages it may cause. The researchers conducted literature and technology reviews that established a more detailed definition of the topic and gave them ideas about the latest technology to be utilized for a fire safety system. At the same time, qualitative methods such as surveys, focused group discussions and interviews have been used to determine the desired features integrated in the system and determine the level of usability for the quality improvement if any. Because of the increasing number of fire incidents, this study paves way to mitigate some risks on this kind of catastrophic event. Fire safety systems are important means of prevention and are designed primarily to provide building occupants prompt warning and instruction to safely evacuate the premises if a fire occurs. When correctly maintained, operating fire safety systems are proven to be life saving devices that can get you out of a situation that would potentially turn into a tragedy.

## **LITERATURE SURVEY:**

**Ahmed Imteaj**[1], Studied the problems faced by factory workers in times when fire breaks out. They proposed a system using Raspberry Pi 3 which is capable of detecting fire and providing information about area of fire. The Raspberry Pi controls multiple Arduino boards which are connected with several motors and cameras to capture the fire incident. In this, they discussed about the modern technology that can be used to reduce extremely unfortunate accidents

caused by fire. We designed the whole system and calculated its effectiveness. **Ondrej Krejcar**[2], proposed a model for location enhancement and personnel tracking using Wi-Fi networks. In this, he has represented the control system concept that is used in handling information of location and control unit operations. The location of the user present in the building, is obtained through Wi-Fi access points. **Azka Ihsan Nurrahman, Kusprasapta Mutijarsa**[3], have proposed a prototype for a centralized management system for homes or offices which helps better in managing the safety features. In this, home management system is required. This system controls the room lights by turning on and off automatically, it keeps the record of use of electronic device status, turning on and off the ac regulator automatically, it displays the room temperature in home. If fire is detected in the house, it turn on sprinkler at home, it supervises at home via surveillance cameras, take photos and store them including recordings of surveillance at home, it detects the movements of people at home, and provide notification when someone enters the house **authorSudhirG.Nikhade**[4],discusses wireless sensor network system that has been developed using open source hardware platforms, Raspberry pi and Zigbee. **Sowah**[5], proposed designed and implemented a fire detection system for vehicle using fuzzy logic. They used temperature, flame and smoke sensors for sensing fire. The system also can extinguish fire in 20 seconds and they used the air-conditioning system for extinguishing fire. **Fuzi**[6],proposed designed a fire alert detection system with ZigBee wireless module. The system consists of Arduino Uno Microcontroller, temperature sensor, buzzer alarm and operating software. The system used only temperature sensor for detecting fire and the receiver could receive signal from a distance of 10 meter. **Kwon**[7],proposed designed and implemented a system to detect fire outbreak using camera image processing. Although this is a novel approach, it is not as efficient and accurate in detecting fire as sensor based

system.**Pandey, Kazmi, Hayat, & Ahmed**[8],proposed The traditional fire alarm system contains several types of devices each has a specific role in system operation to detect people and warn them through visual and audible devices if there is a fire, smoke, carbon monoxide or any other emergencies. This type of alarm can automatically have activated from heat and smoke detector and it could be activated by manual fire alarms such as manual focal point or intake station. Alarms can come as a motorized bell; horns or wall-mounted speaker they can also be luminous sound for speakers that actually sound an alarm, and add an audio evacuation message that for example will warn people against using elevator. Fire alarm speakers are always being sit up at a certain frequency with low, medium or high tones and that is being defined according to country and device manufacturer**Pandey**[9],proposed The fire alarm system by using Arduino on IOT with temperature and smoke sensor as can be used in order to send direct information such as smoke or temperature detected value using a specific device wright strait to the fire department**Al Mamari, Kazmi, Pandey, & Al Hinai**[10],proposed The Arduino will start on transmitting data to the Wi-Fi module ESP8266. This module is a small chip used for making connection between microcontroller and Wi-Fi Network. ESP8266 is then sending the collected data to the website, where authorized persons can take an action and take appropriate measures to reduce the fire.**Kang**[11],proposed, There are only traditional fire alarms located in some pints inside the building which can be very useful to keep the students' lives but still not enough because it is now have become an old system and can made mistakes sometimes and that can be not save or will make bushing for nothing and it may cause study lateness.**Hassan Zaki, Syed Sajjad Imam zaidi**[12],proposed Few years back the fire is detected through sensors or any other method or by smoke. But these methods are now old and are not effective because in these methods the fire detects when it reaches maximum level and it was sometimes too late because the damage was already done. To prevent from this and

to stop fire when it starts researchers have explored the idea to replace the sensors and to detect fire through internet or by another means that was cheap and useful and beneficial for others. **Fernandino S. Perilla, Thelma D. Palaoag** [13] proposed, Integrating IoT on a fire safety system greatly increases its effectiveness and efficiency. With the use of sensors, fire indications like increase of temperature, presence of flames, gases and smoke are detected effectively. Building occupants and firefighting authorities are notified in real-time through distress sound and light alarms, and SMS messages sent by the modules integrated in this system. Critical situations are solved and addressed quickly over the traditional systems which requires large amount of time and effort. In 60 A.D., **emperor Nero** [14] established a Corps of Vigils (Vigils) to protect Rome after a disastrous fire. It consisted of 7,000 people equipped with buckets and axes, and they fought fires and served as police. In the 4th century B.C., an **Alexandrian Greek** [15] named Ctesibius made a double force pump called a siphon. As water rose in the chamber, it compressed the air inside, which forced the water to eject in a steady stream through a pipe and nozzle. **Poonam** [16], Designed an Intelligent Fire Extinguisher System. the features are intelligent fire detection and suppression, locate the position of fire origin, effective power control of electricity, reporting through an SMS or email and effective usage of water supply, among the sensors used is a gas sensor which detect any type of smoke, this can send a false alarm and hence not reliable. **Poonam** [17], proposed an Designed an Intelligent Fire Extinguisher System. the features are intelligent fire detection and suppression, locate the position of fire origin, effective power control of electricity, reporting through an SMS or email and effective usage of water supply, among the sensors used is a gas sensor which detect any type of smoke, this can send a false alarm and hence not reliable. **Burchan** [18] proposed, The paper examines the potential use of fire extinguishing balls as part of a proposed system, where drone and remote-sensing technologies are utilized cooperatively as

a supplement to traditional firefighting methods. The system consists of a scout unmanned aircraft system (UAS) to detect spot fires and monitor the risk of wildfire approaching a building via remote sensing, communication UAS to establish and extend the communication channel between scouting UAS and firefighting UAS, and a fire-fighting UAS. One has to be very skillful in controlling drones and also the system is very complex which makes the system unreliable.

**Qin**[19] Designed an intelligent smoke alarm system with wireless sensor network using ZigBee. The system consists of a smoke detection module, a wireless communication module, and intelligent identification and data visualization module. The disadvantage of his system is that it is very expensive and complex to design.

**Izang**[20] Designed An SMS Based Fire Alarm and Detection System. The system works when fire or gas is detected by the sensors, the Arduino will trigger the GSM module to send SMS, sound the alarm system and trigger the servo motor. The disadvantage of this system is that the servo motor works at an angle of 170 degrees and hence cannot reduce fire outbreak as compared to using a pump motor.

**Jinan**[21] Designed and Implemented a Factory Security System that consist of a smoke sensor, a GSM (Global) System for Mobile communication) module and a sound module. When the gas leakage is detected, an SMS will be sent to a number. The disadvantage of the system is that there is no device that can stop the gas leakage and hence, when there is fire outbreak the necessary device to extinguish the fire is not included in the system which may cost loss of properties. **Sailaja Vungarala,**

**Ammaji Kasi**[22], proposed It is an algorithm which is used for fire detection. The technique which uses this algorithm is known as Safe From Fire technique. In this technique three sensors are used which are flame sensors, gas sensors and temperature sensors. Arduino is a microcontroller which is used for collecting data from the sensors. The technique consists of two parts that are software module and hardware module. The software part consists of webpage through which user will

login in the system and the sensors along with Arduino will start working. The reading of sensors is passed to the Arduino to through which it is stored in the database. Database maintains record of all the readings of sensor whenever fluctuation occurs in the reading at least any two sensors then automatically alarm rings. Which detect that fire has been **occurred**. **Cao Shunxia[23]** designed a wireless intelligent home alarm system consisting on anti-theft feature, anti-fire feature, and anti-harmful gas leak feature using Single Chip Microcomputer (SCM) AT89C51 and voice chip ISD1420. Two SCMs were used to display the gas concentration and alarm host as the alarm signals were sent by using wireless transmission. When the sensor detects smoke, a voice message will be sent to the relevant department. However, if an error occurs during the detection, a false alarm will be submitted because this system did not include any user confirmation. **Jun Hou [24]** proposed an intelligent home security system using Zigbee to monitor important locations inside a home through a surveillance camera. When the system was triggered by any penetration, the user will be notified through SMS and Multimedia Message Service (MMS). The temperature and gas sensor were connected to the system motherboard using Zigbee modules and forming a Wireless Sensor Network (WSN). Even though it can be included as one of the most advanced system, the system motherboard used to manage the WSN was too expensive. **Rakesh V[25]** improved real-time surveillance system for home security system using Beagleboard SBC, Zigbee and FTP Webserver which monitor important locations inside a house using camera and detecting smoke. When smoke or intruder movement is detected, the system sends warning messages through SMS to cell phones, starts capturing realtime video for fixed duration and makes the alarm on. But this system only sends SMS to warn the user and cannot broadcast the live streaming video as the system record the video only. Moreover, the single board

computer used is expensive and has lower technical specifications compare to the Raspberry Pi.