Fire Detection System Using Wireless Sensor Network

Sumit Jha¹, Shubham Narayan²

¹,²Student, Department of Computer Science and Engineering, Galgotias College of Engineering and Technology, Delhi, India

Abstract: This research paper provides the essence of advancements of Sensors, wireless technology, cloud technology and digital technology. How to collect data using wireless sensor network to enhance the life of all living things and How Devices like CPU, Cloud, sensors and IoT can change the way of living and give the immense opportunity for the betterment of human life. IoT and sensors can provide the opportunity to sense and act on the difficult situation like Fire and in this paper we can see that how we can use these devices to collect the data and minimize the monetary loss and sustain the environment for future in case of fire.

Keywords: WSN, IoT, Internet of Things, Fire Sensors, Humidity Sensor, Smoke Sensor.

1. Introduction

Fire Detection using a wireless sensor network has an objective to reduce the fire and minimize the loss to detect the early stage of fire. WSN is using to collect the data from the different sensors like flame sensor, smoke sensor, Humidity sensor and compile the data using ARDUINO and act accordingly to the situation. Each sensor have some characteristics to sense the situation like Flame sensor can use to detect the fire light, Smoke sensor can use to detect the smoke because whenever fire occurred, smoke comes automatically and smoke sensor sense the same. We can install these sensors on prone areas and connect with WIFI Arduino module to collect the data. We will verify further that how these sensors work together to detect the fire and used to control the fire.

2. Types of sensors

Major sensors used in fire detection and prevention of fire:

- Smoke Sensor
- Flame Sensor
- Humidity Sensor

Smoke Sensor: Smoke sensor is device to sense the smoke in environment where these sensors installed. Smoke sensor is capable to understand the difference between normal air and smoke. With smoke sensor we can use more devices to work on and prevent the fire.

Flame Sensor: Flame sensor is a device to detect the fire or flame and act accordingly like to open the fire extinguisher or alarm system etc. Flame sensor response time is high and lot of application. Example: Fire detection, heating system, turbine etc.

Humidity Sensor: Humidity sensor is capable to detect the humidity in air or water vapor available in air. Humidity Sensor has mainly two types namely Relative Humidity Sensor and Absolute Humidity Sensor. Humidity sensor used for many work like Fax machine, Weather department food processing etc.

Wireless Sensor Network: Wireless sensor network is used in a variety of application and the most important work of WSN is to collect the data from different kind of sensors. Lots of nodes is available on network is connected to sense and work together. Nodes are connected with wireless network to transmit the data. The architecture of WSN consists of Sensor Node, User and Gateway. Nodes are connected with gateway
and gateway connected with users. Different nodes are placed in different place and WSN helped to collect the data from that nodes. Protocol stack used in WSN to transmit the data is similar to tcp-ip protocol.

![Fig. 4. Architecture of WSN](image)

**Arduino:** Arduino is a software and Hardware company, which manufactures microcontrollers to build digital products and services. Arduino board equipped with analog and digital input or output pins. Arduino hardware can be written in any programming language. Arduino is an open source company. Arduino is used to control the different kind of sensors and provide the way to act accordingly as per requirement.

![Fig. 5. Protocol stack for WSN](image)

How fire detection system work using wireless sensor network?
We have used different sensors like Flame sensor, Fire sensor, Humidity sensor to detect the fire on the basis of different parameter which these sensors provide and we collect the data using wireless sensor network and we used ESP transceiver module to get the data. We have also used power hub to provide the power to the components and we used toggling system to take the preventive measures and it will start water flow and fire will be reduced. We have used Arduino to connect these components and programmed accordingly to act in case fire. We get all the data in graphical format as well and whenever sensors data point reach on threshold value the preventive measures like water flow will start and system will be taken care the situation and these work will take approximately 2 seconds.

3. Conclusion
We have seen the difficult situation due to fire like in Australia bush fire is the perfect example of loss because of fire and when fire increases then it’s quite difficult to stop so that we have tested this system and we observed that this system can take care the fire in initial stage and we can stop the fire in the infant stage. Sensing and taking the preventive measures using this system is quite easy and cost effective. We can use this system to handle fire and minimize the loss and enhance the living of human.

Acknowledgement
I would like to thanks to Mr. T. Saravanan (Assistant Professor, Galgotias College of Engineering and Technology, Greater Noida) for encouragement that made this paper possible.

References