Chapter 14
An Analysis of Internet-of-Things-Based Fire Detection and Alert Systems

Digvijay Pandey
https://orcid.org/0000-0003-0353-174X
Department of Technical Education, Government of Uttar Pradesh, India

Vinay Kumar Nassa
https://orcid.org/0000-0002-9606-7570
Department of Information Communication Technology, Tecnia Institute of Advanced Studies, India

Binay Kumar Pandey
https://orcid.org/0000-0002-4041-1213
Department of Information Technology, College of Technology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, India

Darshan A. Mahajan
https://orcid.org/0000-0002-1239-6343
NICMAR University, India

Pawan Kumar Patidar
https://orcid.org/0009-0008-8115-9094
Swami Keshvanand Institute of Technology, Management, and Gramothan, India

Pankaj Dadheech
https://orcid.org/0000-0001-5783-1989
Swami Keshvanand Institute of Technology, Management, and Gramothan, India

A. Shaji George
https://orcid.org/0000-0002-8677-3682
Business System Department, Almarai Company, TSM, Riyadh, Saudi Arabia

ABSTRACT

One of the most valuable resources is the forest, home to many animals and plants. Forest fire agencies worldwide have studied forest fire prevention and detection. Worldwide, natural and man-made calamities occur. Forest fires are environmental tragedies. The dense forest fire devours everything in its path. This research examines the forest fire detection and alert system to detect fires early. This research identifies forest fires before they spread to safeguard wildlife and natural resources. An Arduino microcontroller, flame sensor, ultrasonic sensor, thermistor, smoke sensor, buzzer, and GPRS are in every IoT (internet of things) device. Each IoT sensor records sensor values in the thing speak cloud. The cloud storage may pick and map forest fire threats by eliminating features from the input. MLP mapping maps forest fire danger, while AROC maps forest fire hazard. GPRS delivers cloud-based SMS warnings. Finally, forest department officials may interact.

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INTRODUCTION

The forest, which is home to a wide variety of plant and animal species, is one of the most precious resources. Research on forest fire detection and prevention has been conducted by forest fire departments all over the world. Disasters, both natural and those caused by humans, can strike everywhere in the world. Forest fires are a terrible tragedy for the ecology. The raging blaze in the dense forest consumes everything in its path. This research helps to protect wildlife and natural resources by locating forest fires before they spread throughout the surrounding area (Pandey, B. K.,et al.,2023). The research being conducted looks into the forest fire detection and alert system to determine how early fires can be detected. Every device that is part of the Internet of Things (IoT) has the following components: an Arduino microcontroller, flame sensor, ultrasonic sensor, thermistor, smoke sensor, buzzer, and GPRS. Every Internet of Things sensor uploads its readings to the cloud storage service Thing Speak(Raja, D.,et al.,2024). The cloud storage might identify and map potential forest fire hazards by filtering out certain elements of the incoming data. MLP Mapping maps the risk of forest fires, whereas AROC maps the potential for forest fires. SMS alerts can be delivered across the cloud using GPRS. Finally, officials from the forest department may engage with a fire alarm that pinpoints the location of the forest.

The Internet of Things (IoT) refers to a network of sensors and other internet-connected devices that exchange data with one another. In the future, the Internet of Things (IoT) will have the most significant impact on the logic of businesses. The Internet of Things is used in a variety of contexts, including smart homes, agriculture, industries, wearables, cars, forests, and healthcare (Gomez-Chabla, R.,et al.,2019). Both the administration of forests and the Internet of Things are quite interesting to us (Pandey, B. K.,et al.,2011).

The term “forest” refers to a large area that is home to a diverse collection of plant and animal life. Over thirty percent of the globe is covered in forest. Our economy is dependent on a great number of different species, and a large number of people find employment in the forest (Meslie, Y.,et al.,2021). The forest’s most important resource is the air that circulates throughout it. It rids our bodies of harmful substances and shields us from harm (Jaya Lakshmi, G.,et al.,2024). People put themselves in danger when they carelessly set forest fires ablaze. Forest fires that are started by accident might have a negative impact on the food chain (Kumar, M. S.,et al.,2021). Destruction of forest habitat is harmful to both people and wildlife.

There are two primary causes of forest fires: Reasons related to nature: Lightning strikes in locations with low humidity have the potential to start forest fires. Rain is the only thing that can put an end to it and repair the damage done to the ground if it spread across a vast area. 2. Causes that are not natural Accidents caused by carelessness or ignorance, such as fires, cigarette and electrical sparks, can result in extensive property damage (Saxena, A.,et al.,2021).

The density of the forest, the average wind speed, and the temperature all had a high correlation with the daily forest fire rates. Even at low temperature densities, the forest has a substantial impact on the amount of area that has burned (Daoud, M. K.,et al.,2024). According to the National Interagency Centre’s report from 2016, forest fires had an impact on 65,575 different species of animals. In 2017, the fire was responsible for the destruction of about 10 million acres and 71,499 additional structures (Jadon, A.,et al.,2019).

Deforestation in the Amazon rainforest served as the impetus for our idea. The majority of fires in the Amazon were caused by mining, forestry, and agriculture. After cutting down trees, farmers often practise slash-and-burn agriculture in order to help the soil regain its nutrients (Daoud, M. K.,et al.,2023).