Internship Title:- IoT based forest fire monitoring system

Student name: Sushil kumar radheshyam kori

Contact details

Email ID : 2019sushilkumar.kori@ves.ac.in

GitHub link:

https://github.com/Tinkerers-Lab-VESIT-ETRX/IoT-based-forest-fire-monitoring-system-12

Index

Introduction

Existing problem

Some of the devastating Effects of Wildfires:-

1. Wildfires take away homes, wildlife, as well as vegetation. All of the inhabitants of the wildlife environment now are found homeless. People often lose their houses as well if the fires are close enough to human housing. Vegetation is now obsolete if this area is near a farm or near the food of other inhabitants. Millions of dollars are spent repairing these damages and re-building homes and areas of vegetation.
2. The soil in the area of the wildfire has been completely destroyed. The soils in the forest are made with decaying nutrients and debris that have a lot of natural ingredients that help make the earth what it is. When a wildfire hits this soil it becomes too hot and all of those nutrients are gone for good.
3. Animals lose their lives. It is a sad but true fact that birds, squirrels, rabbits, and other wildlife animals are no longer a part of this great earth.
4. Trees and plants are gone as well. Trees and plants help to produce oxygen in the world. The fewer trees and plants there is the less clean air we have to breathe. With no plants or trees, the animals that did survive no longer have anything to eat.

Overview

Wildfire, also called forest, bush or vegetation fire, can be described as any uncontrolled and non-prescribed combustion or burning of plants in a natural setting such as a forest, grassland, bush land or tundra, which consumes the natural fuels and spreads based on environmental conditions (e.g., wind, topography).Wildfire can be incited by human actions, such as land clearing, extreme drought or in rare cases by lightning.

There are three conditions that need to be present in order for a wildfire to burn: fuel, oxygen, and a heat source. Fuel is any flammable material surrounding a fire, including trees, grasses, bush, even homes. The greater an area's fuel load, the more intense the fire. Air supplies the oxygen a fire needs to burn. Heat sources help spark the wildfire and bring fuel to temperatures hot enough to ignite. Lightning, burning campfires or cigarettes, hot winds, and even the sun can all provide sufficient heat to spark a wildfire.

Purpose

This system will provide an early warning to the forest department about an ongoing fire and reduce the environmental damage that might be caused if the forest fire were left unchecked.

Literature review

It has been found in a survey that 80% losses caused due to fire would have been kept away from if the fire was identified promptly. Node Mcu based IoT empowered fire indicator and observing framework is the answer for this issue. The temperature sensor detects the warmth and smoke sensor detects any smoke produced because of consumption or fire. The buzzer associated with Arduino gives us an alert sign.

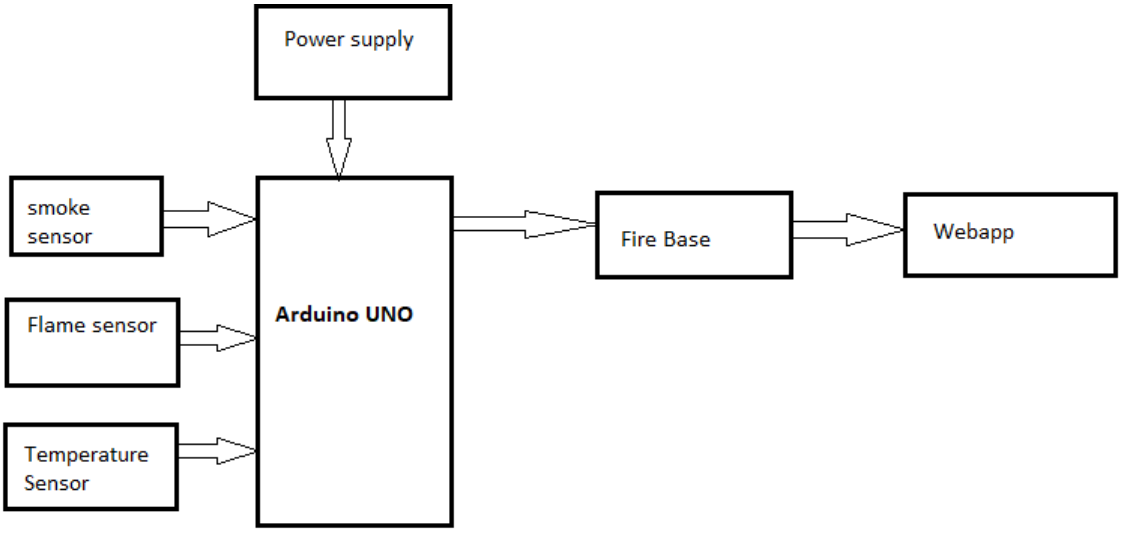
At whatever point the fire activates, it consumes adjacent protests and produces smoke. A fire caution can likewise be activated because of little smoke from candlelight. Likewise, at whatever point the warm force is high then additionally the alert goes on. Bell or alert is killed at whatever point the temperature goes to ordinary room temperature and smoke level decreases. Additionally an LCD is interfaced to the Node Mcu board.With the assistance of IoT innovation.

At whatever point the system recognizes fire or smoke then it immediately alarms the client about the fire through the ethernet module. For this reason, ESP8266 is utilized which is from Arduino IDE. Likewise, the Node Mcu interfacing with LCD show is done to show the status of the framework whether the Smoke and Overheat is identified or not. Node Mcu interfacing with the Ethernet module is done so that clients become more acquainted with the predominant condition message. It insinuates the client about the fire identification.

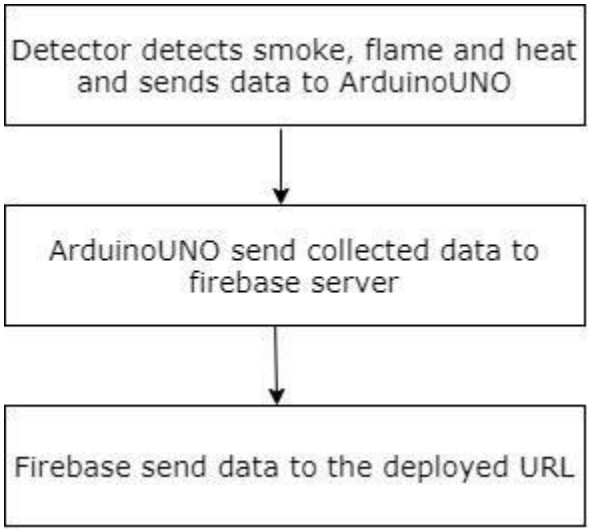
This framework is extremely helpful at whatever point the client isn't in the closeness of control focus. At whatever point a fire happens, the framework naturally faculties and alarms the client by sending an alarm to an application introduced on a user's Android portable or page open through the web.

Proposed solution

Block diagram

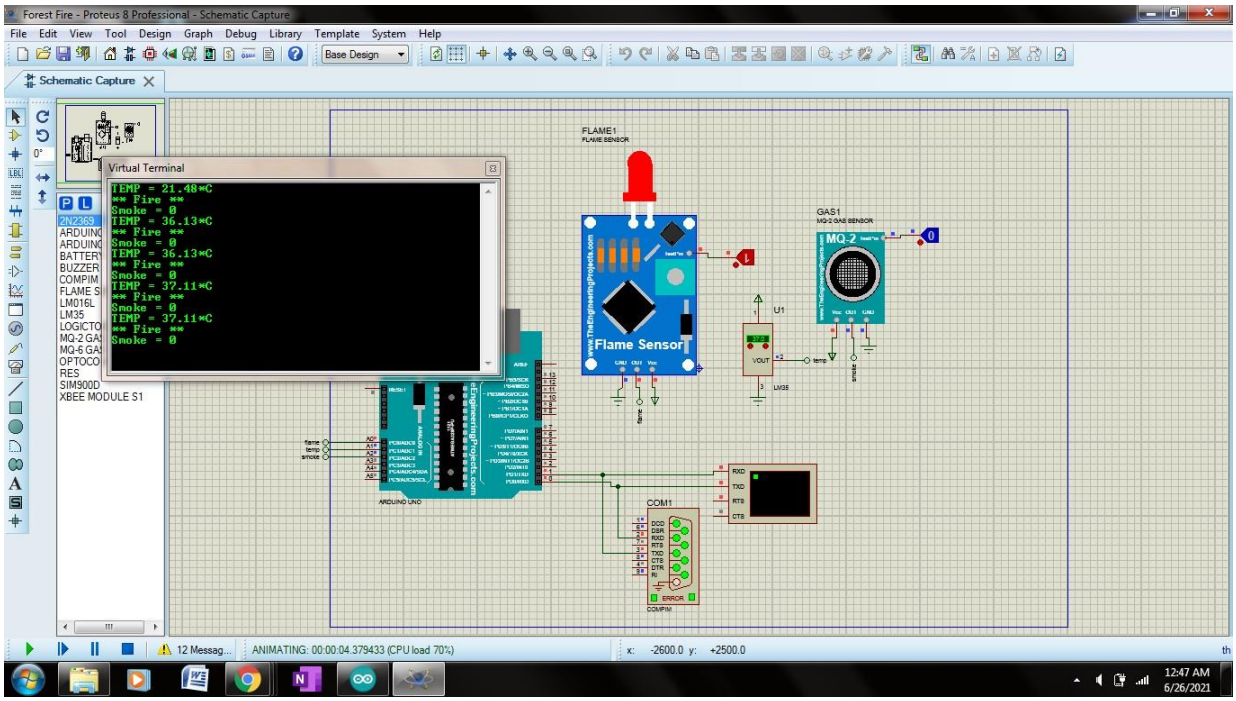


Flowchart

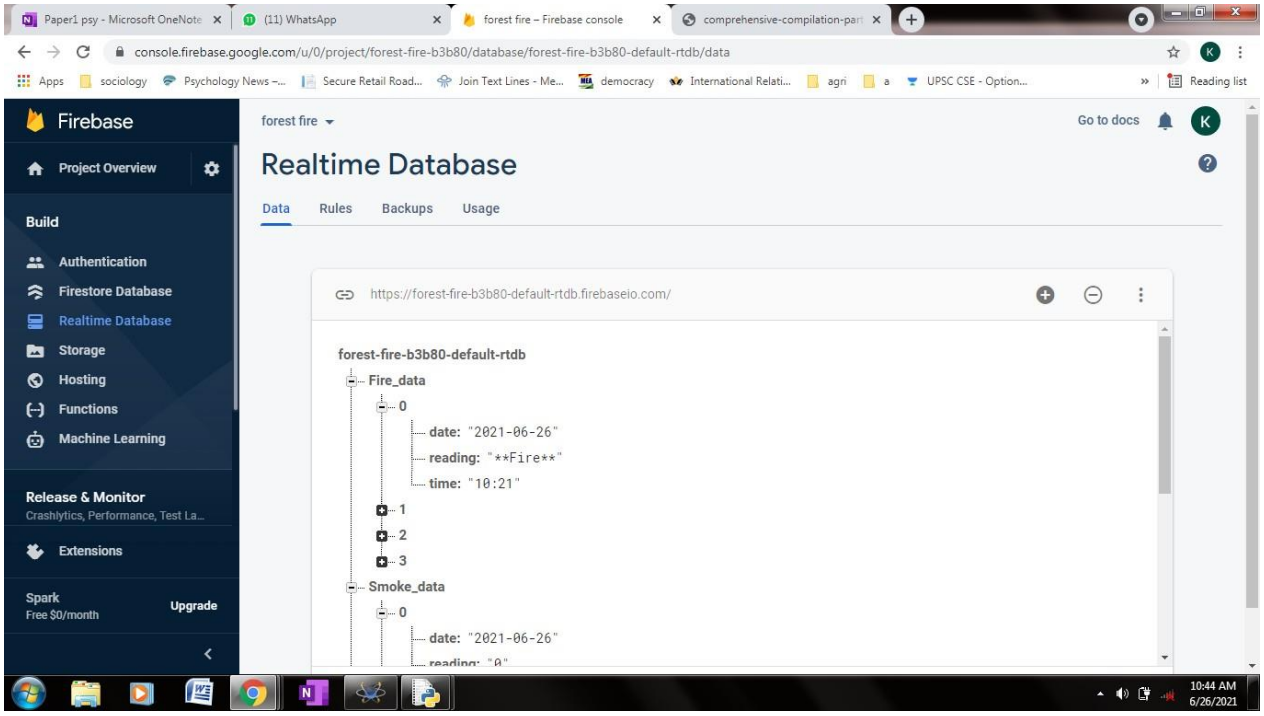


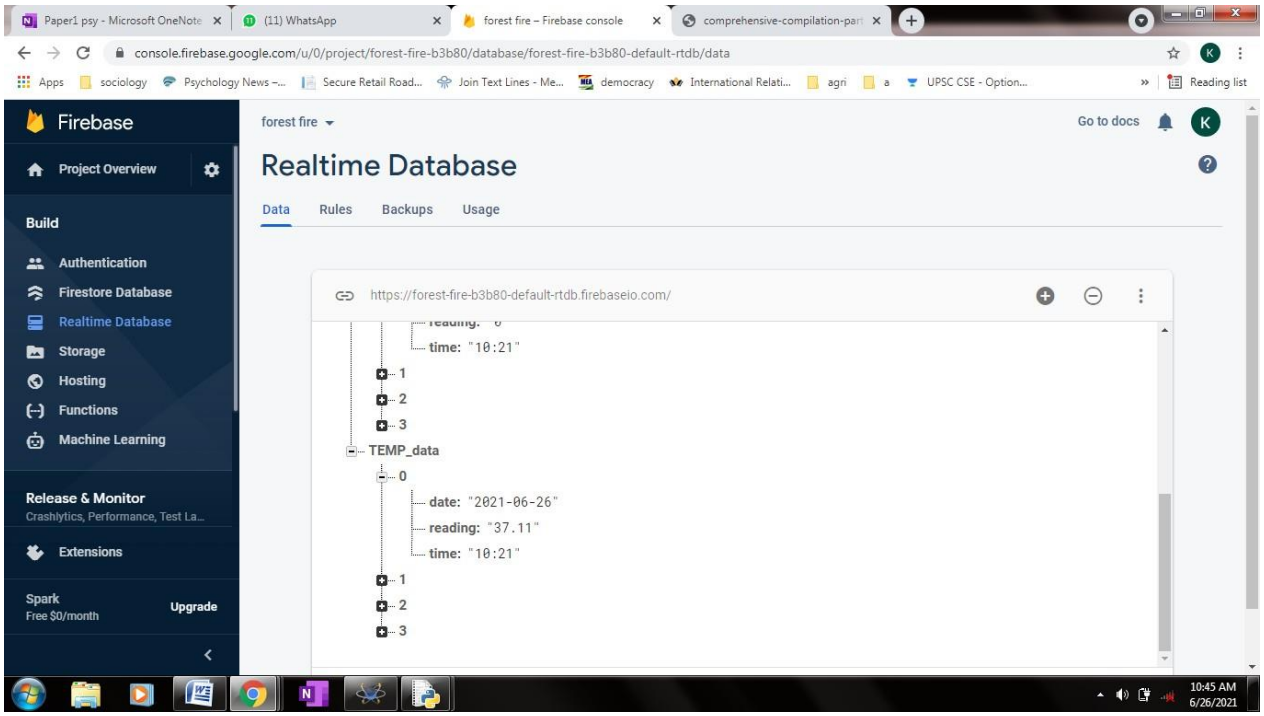
Result

Circuit Simulation running in proteus-



Data uploaded to firebase:-





Link of Deployed WebApp- https://forest-fire-b3b80.web.app

Applications, Advantages and Disadvantages

Applications and Advantages of Forest Fire Detection System-

- It will help in early detection of fire.
- It will help in saving a lot of human and animal life that would have been lost.
- Diversion of manpower to other useful tasks such as forest conservation.

Challenges of Forest Fire Detection System-

- False alarms in case of small intentional campfires
- Timely maintenance is required for proper error free working of this system.

Learning Outcomes

After successful completion of the course we were able to:

1. Design an iot based circuit on Proteus Simulation Software.
2. Creating a C code to run the circuit created on Proteus.
3. Creating a Python code to send the collected sensor data from Proteus to Firebase.
4. Design a web app using HTML and CSS to visualize the sensor data sent to Firebase graphically.

Conclusion

The main aim was to develop an automatic forest fire detection system to safeguard the user and their surroundings so as to provide an early alarm system to avoid serious damages due to such types of incidents.

Our proposed system was capable of achieving its main goals which were mainly building an IoT-based forest fire detection system. It is capable of detecting the presence of fire.

This model constantly monitors the fire signal and sends the corresponding data to the user. It is low cost and installation is also easy. It will be of great use in dealing with forest fires which are hazardous.

This system can also be outfitted with water sprinklers which will be valuable for controlling small amounts of fires. It can also be improved by adding some more sensors such as a GPS module which will give the exact location of the incident.

References

1. C. Gomathi, K. Vennila, M. Sathyananth, B. Shriaarthi, S. Selvarasu, 2015, Forest Fire Detection using Wireless Sensor Network, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) NCICCT – 2015 (Volume 3 – Issue 12),
2. Using Wireless Sensor Networks for Reliable Forest Fires Detection by Kechar Bouabdellah, Houache Noureddine and Sekhri Larbi
3. J. Zhang, W. Li, Z. Yin, S. Liu and X. Guo, "Forest fire detection system based on wireless sensor network," 2009 4th IEEE Conference on Industrial Electronics and Applications, 2009, pp. 520-523, doi: 10.1109/ICIEA.2009.5138260.
4. IoT based forest fire detection system by M. Trinath Basu, Ragipati Karthik, J. Mahitha, V. Lokesh Reddy, International Journal of Engineering & Technology, 2018
5. Miriyala, Trinath & Karthik, Ragipati & Mahitha, J & Reddy, V. (2018). IoT based forest fire detection system. International Journal of Engineering & Technology. 7. 124. 10.14419/ijet.v7i2.7.10277.

Appendix

Source code (web app)

https://github.com/Tinkerers-Lab-VESIT-ETRX/IoT-based-forest-fire-monitoring-system-12/blob/main/index.html

Source code (Arduino code)

https://github.com/Tinkerers-Lab-VESIT-ETRX/IoT-based-forest-fire-monitoring-system-12/blob/main/sensors.ino

Source code (Python data upload)-

https://github.com/Tinkerers-Lab-VESIT-ETRX/IoT-based-forest-fire-monitoring-system-12/blob/main/python%20code.py