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Early Warning Alarm System for Detecting Forest Fire Using NODE MCU with IoT

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ABSTRACT- Wildfire causes a severe impact on the ecosystem may. It has occurred naturally or manmade. Nowadays, the construction of buildings takes place everywhere, even in the forest surrounding region also. So the surrounding people have to face a lot of troubles through these forest fires. Sometimes it leads to serious health issues as a natural wildfire cannot be avoided but can be timely detected and dealt with by effectively using the available technologies. The Internet of things comes to mind as a first choice due to its special features. Our project sensor is used to detect the fire by Node MCU information is updated continuously through a cloud, and that information can be checked remotely by an android application. Also, we are using Buzzer so that nearby people can be alerted. Thereby we can take timely action so that many natural resources and human beings will be saved from this threat.

KEYWORDS- Ecosystem, Technologies, Node MCU, Natural Resources, Internet of Things

I. INTRODUCTION

A forest fire can be termed a bushfire, rural fire, or wildfire according to that specific region and type of fire. Terminology will differ. There are many reasons for wildfire depending on the conditions of the forest in which In excessive heat and drought conditions, plants will easily set up the fire by a single light strike, which is a natural process, and some artificial conditions are also there, like burning cigarettes, disposal burning and electrical related things, etc.

II. LITERATURE SURVEY

In this paper [1], the author designed a fire detection system by using proteus software. For detecting the forest, the fire author considered several factors like temperature, humidity, soil moisture, range, and detection of smoke. And also author analysed various aspects that results in occurrence of fire and then illustrated various methodologies followed for fire extinguish ion. Various sensors are deployed for this proposed, and proteus simulation is done.

In the case study [2] of Indonesia in which riau province is taken into account for analysis and detection purpose of fire in the forest. Network topology was implemented by the author using a wireless sensor network, and for deploying the sensor optimized routing algorithm was used.

Various technologies [3] and methods are followed to detect fire, so in this process, the author used image processing and IoT technologies and presented a schematic representation. A forest fire was detected using sensors, and the Django Web application sends real-time pictures.

In this paper [4], the author discussed a detailed meth ology for implementing the fire detection system in the forest. Through this, fire detection is done and updated through the application. For this fire detection, the author used various sensors like DHT11, capacitive soil moisture, methane, fire, etc.

IOT-based system [5] was proposed by the author here also considered some parameters like the intensity of light, a distance of measurement, temperature, and humidity for detection of fire. The reading of the measured parameters is updated and monitored through the mobile application.

The author proposed Arduino-based system for sensor node deployment [6]. This sensor node deployment is within the range of 5 meters, and it is a layered architecture used to detect co-level, humidity, temperature, and intensity of light. For analysis and testing, threshold ratio analysis was opted to get the accurate output.

Author divided the system into sub-blocks according to the type of operation[7]. The first block has transmission of data and its retrieval, processing of data and storage, and representation of the data. So accordingly, for each block, required sensors, controllers, protocols, and storage devices are used for their proper functionality.

In this paper[8], the author designed an automatic fire detection with a water sprinkler system for domestic propose. The developed project uses Arduino having sensors like flame sensor, gas sensor, ultrasonic sensor,

and temperature sensor, and the results are tested in ubidots platform and Arduino

Author partitioned the whole unit into the transmitter, receiver, and final software units to test the results[9]. The transmitter was developed using the Easy bee module with the help of sensors like humidity, temperature, gases, and smoke sensor with a pic as the microcontroller and the receiver module is almost the same, and ZigBee is used as a mode of communication

Authors discussed the details of implementing a fire detection system in the forest and highlighted every module and its usage[10]. So, the author gave an overview of the fire detection system.

In this paper, riau Provence in Indonesia case history was considered[11]. This base station was an arrangement to gather information regarding the changes in the forest area's weather through sensors that spread across that forest area. For sensors deployment and their mathematical analysis model was considered.

The authors proposed an architecture in which the forest area is under surveillance through drone camera and the images are captured and analysed[12]. The image processing module is responsible for identifying smoke or any changes in the weather condition. The experiment is conducted in pano plates, a mountain village area in Cyrus.

III. PROPOSED SYSTEM

The forest fire detection system with its function parts is represented in a block diagram. The block diagram of this is shown in below Fig(i)

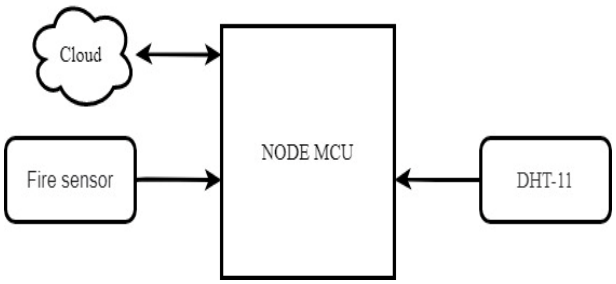

Figure 1: Block diagram of a Fire detection system

The fire detection system has Node MCU as a principal element which offers an environment to interface the hardware components and provides a facility for verifying the experimental setup.

Flame sensor: The purpose of a flame sensor is to know whether fire exists or not, and this flame sensor can find smokeless liquid, and it will also help identify smoke that leads to fire in open areas. See the figure 2.

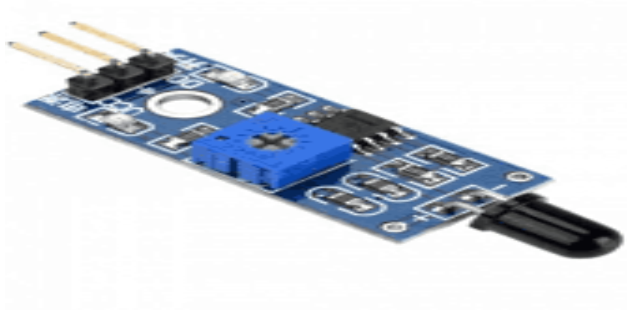

Figure 2: Flame sensor

IV. EXPERIMENTAL SETUP AND RESULTS

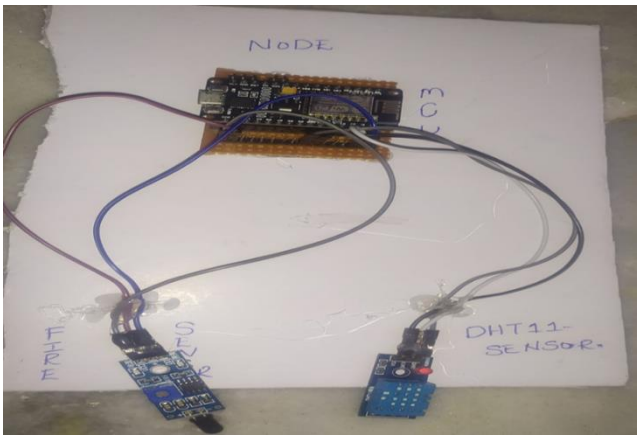

Figure 3: Fire detection system experimental setup

The fire detection system experimental setup is shown in Fig.3. In this figure, we connect the fire sensor and DHT 11 to the node MCU and send this data to the cloud for monitoring purposes. This kit is placed in the forest in various locations, and when the fire is detected, this information is sent to the cloud

The results are simulated using things speak where temperature, humidity, and the existence of fire are shown in the graphical representation. Below Fig.4, temperature values are shown in graphical representation. When the fire occurs in the forest, to identify the range of the fire, we measure the temperature, and based on the temperature in that particular location; we can identify the firing range, and based on that, we can take the measures.

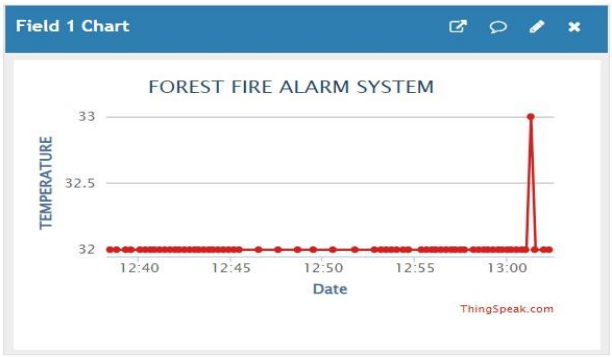

Figure 4: Temperature readings in the fire detection system

Humidity values are shown in Fig.5 graphical representation. We can observe the humidity values in the location where the fire occurs, and we can monitor the values on the cloud.

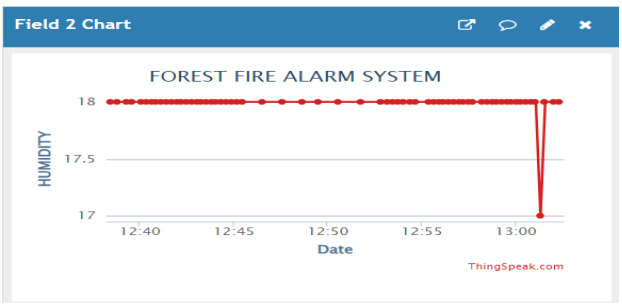

Figure 5: humidity readings in the fire detection system

Fig.6Shows the presence of fire in the system, and we can observe in the below image when the fire occurs in the forest automatically, the value will move to zero. When the fire is not occurring in the forest, the value will be ONE. Based on the graph, we can conclude that the fire is occurring in the forest

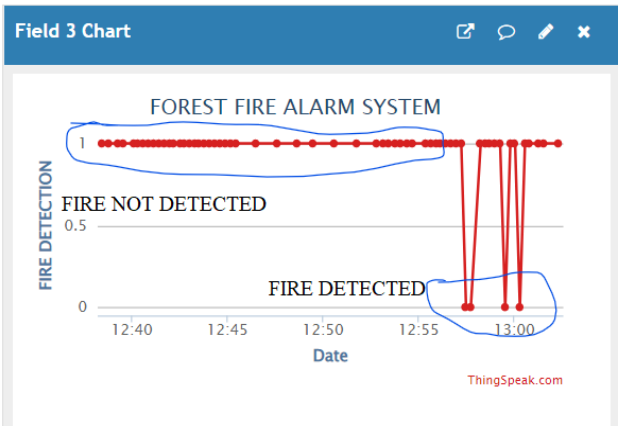

Figure 6: Graphical representation of Fire detection in the system

V. CONCLUSION

Alert systems and rapid reaction to a fire breakout are critical approaches for avoiding extreme disasters and natural and environmental lasting harm. It's much simpler to put out the fire when you recognize where it originated and when it's still small. The response time is also very less. And we use the cloud to monitor the data, so it is very easy to use and less cost-efficient when compared to other equipment, and we can detect the fire at the early stages.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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