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IOT Platform for Wildfire Detection

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Abstract: As we all know, the forest is considered as one of the most important and essential resources and Forest fires represent a constant warning to ecological systems, infrastructure and environmental features of a community, forest fire detection is an extremely important issue in the pre-suppression process. Unfortunately, the forest fire is commonly observed when it spread over a large area, making its under our control and stoppage arduous, and often even nearly impossible. The issues with forest fires is that the forests are usually remote, abandoned or unmanaged areas full with trees, dry and parching wood, leaves etc, that act as a fuel source and which basically causes wide amount of disaster to nature. So, our idea behind this problem is to get the early detection of fire in the forest before it spreads to the entire forest. This paper highlights the powerful features as a potential solution to the challenge of early detection of forest fires. The device presented makes use of various sensors attached and wireless data transmission, to fulfil the task.

Keywords: forest fire, temperature, humidity, IOT, Raspberry Pi

I. INTRODUCTION

Forests are the protectors of earth's ecological balance. Unfortunately, the forest fire is usually only observed when it has already spread over a large area, making its control and stoppage arduous and even impossible at times. The result is devastating loss and irreparable damage to the environment and atmosphere (30% of carbon dioxide (CO_2) in the atmosphere comes from forest fires). [1] They cause a threat not only to the forest wealth, but also to the entire government of flora and fauna, seriously disturbing the bio-diversity, ecology and the environment of a region.

Forest fire is also called as wild fire or wildland fire is an uncontrolled fire occurring in forest areas It is essential to distinguish these sorts of flames as ahead of schedule as conceivable in order to keep the harm from it to biological framework. [2] Mostly, Forest fires are observed when it's spread over large are and its spread very quickly, which causing millions of dollars in damage and claiming many human lives every year in the many countries. Common causes of forest fires are lightning, extreme hot and dry weather, severe drought, and human unawareness. Forest-fires in South Korea occur frequently in spring and fall seasons because these seasons are drier than summer and winter seasons. [3]

II. BACKGROUND STUDY AND RELATED WORK

The powerful feature of wireless sensor networks as a potential solution to the challenge of early detection of forest fires. The proposed scheme based on wireless sensor networks performs early detection of any fire threat. [4] Each sensor node which has a microcontroller, transmitter/receiver and three sensors. Measurement method is performed by measuring the temperature, flame, the levels of methane, hydrocarbons, and CO2 in some forest area and the combustion of peat in a simulator.[5] It illustrates kind of forest monitoring system solution of wireless sensor networks based on ZigBee in order to improve the insufficiency of the existing monitoring ways and introduces wireless sensor networks technology.[6] The purpose of this system is to avoid the forest fires and also to protect the wildlife by monitoring them using a wireless technology called LoRa(Long Range). This device can also prevent smuggling of trees. On the other hand, the current system is a GSM/GPS based system which requires data connectivity to function. [7] The DHT 11 sensors collect the data and transmit to the central unit as well as alert is send via call or message using GSM.[8]

III. SYSTEM DESIGN

Firstly, we have written code for collecting the data from DHT11 sensor (i.e. parameters like temperature and humidity). We will send this data to the webpage through Raspberry pi or by using Arduino and NodeMCU. The code is written and read data from CSV file and then it can be displayed in a graphical format. The data will be stored in the database. We have set a default threshold value and used if and else condition. If the temperature is greater than the threshold value then, the alarm will ring in the nearest forest station and the mail will also be sent to the nearest forest department and if temperature is less than threshold value, it will take a delay of 15 min and it will start collecting data again from the sensor and the process will continue in the form of loop. Even if fire is detected and mail is being sent ten also it will take a delay of 15min and it will continue in the form of loop. The data which is being collected by the sensor will be displayed

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in the webpage in the numerical as well as graphical form. Finally, webpage hosting is done either by using free software or application software.

IV. FLOWCHART

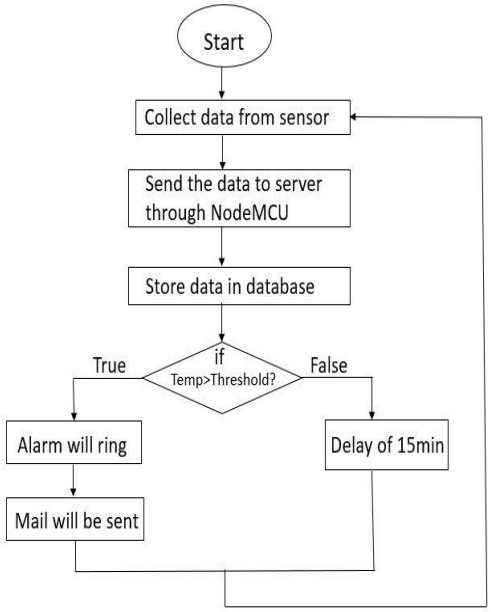

Fig.1 : Shows Flowchart of System Design

V. WORKING

DHT11 Sensor collects the data of temperature and humidity and sends the data to the webpage using Raspberry pi. In case of no fire in the vicinity of the sensor, then the DHT11 sensor installed in the project collects data and keeps updating according to the delay given in the code. If at all fire breaks out in forest region where the sensors are installed, the DHT11 sensor (which senses Humidity and Temperature) collects data and sends it to the webpage through Raspberry pi. A threshold is kept for the temperature. If the obtained value is less than threshold value, then sensor again starts collecting data after the delay. If the obtained value is greater than the threshold value, then an alert and mail is sent to the nearest Forest Station.

VI. HARDWARE COMPONENTS USED

Fig. 2 : Raspberry-Pi

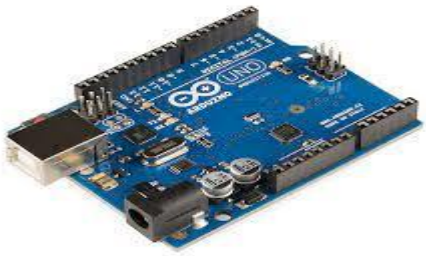

Fig. 3 : Arduino Uno

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Fig. 4 : NodeMCU

Fig. 5 : DHT11 Sensor

VII. RESULTS

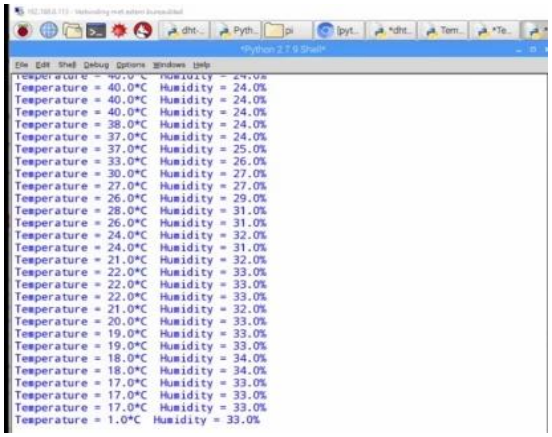

Fig. 6 : Real time values of temperature and humidity using r-pi

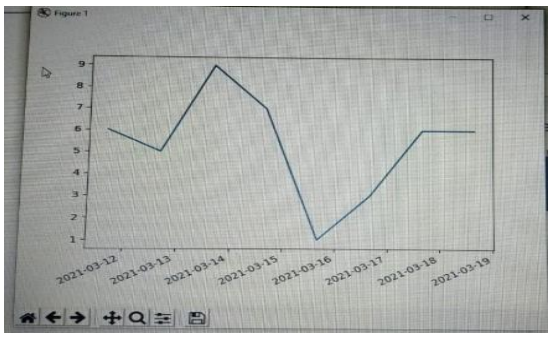

Fig. 7 : Day VS Temperature graph

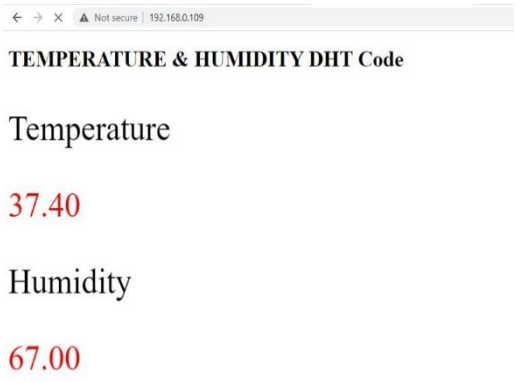

Fig. 8 : Value of temperature and humidity shown in the web server using Arduino

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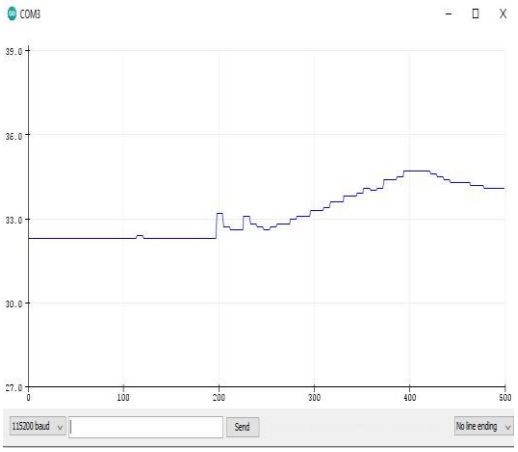

Fig. 9 : Graph of Temperature shown in web server

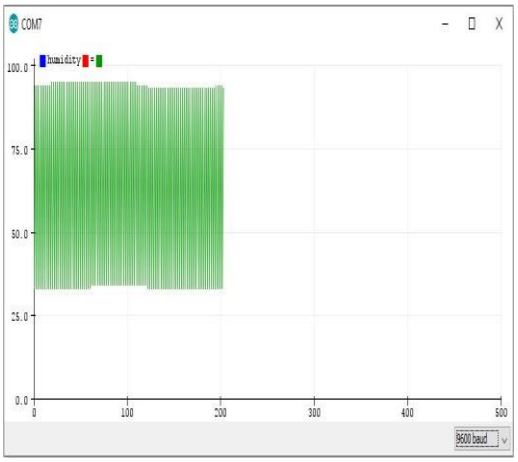

Fig. 10 : Graph of Humidity shown in web server

VIII. CONCLUSION

In this project, Raspberry pi plays a crucial role in forming IOT based forest fire detection. Variations in temperature and humidity are exhibited on the page in the form of graph and readings. Advanced notification is given in the form of warning if forest fire is detected. Fire breakout, at an advanced state can be detected by introducing this IOT platform. Working on this system we came to conclusion that technology can be very effectively used for nature purpose. Our nature can be protected by technology. In real time observation, it provides early extinguishing of a forest fire so that damages and injuries will be reduced.

REFERENCES

[1]. Ahmad A. A. Alkahtib, “A Review on Forest Fire Detection Tecniques”.
[2]. M. Trinath Basu, Ragipati Karthik, J. Mahitha, V. Lokesh Reddy, “IOT Based Forest Fire Detection System”.
[3]. Son B., Her Y., Kim J., “A Design and Implementation of Forest Fire Surveillance System based on Wireless Sensor Network for South Korea”, International Journal of Computer Science and Network Security, Vol 6 No. 9B.
[4]. P.J Vivek , G. Raju , S. Akarsh, “Forest Fire Detection System”, International Journal of Innovative Research in Science, Engi-neering and Technology, ISSN: 2319-8753, Vol 3, Issue 6.
[5]. Hariyawan M.Y., Gunawan A., Putra E.H., “Wireless Sensor Network for Forest Fire Detection”, ISSN:1693-6930,Vol. 11, No. 3, pp. 563~574.
[6]. Tao H., Zhang H., “Forest Monitoring Application Systems Based on Wireless Sensor Networks”, Third International Sym-posium on Intelligent Information Technology Application Workshops, IEEE.
[7]. Losso A., Corgnati L., Perona G., “ Early Forest Fire Detection: Smoke Identification through innovative Image Processing using Commercial Sensors”, Environment Including Global Change, Palermo, Italy.
[8]. Kovacs R., Kiss B., Nagy A., Vamos R., “Early Forest Fire Detection System For Vegetable Fire in the Aggtelek National Park”, Budpest, Hungary.