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Forest Fire Detection and Location Tracker Using NODE MCU (ESP 8266) and GPS Module

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Abstract: ***Continuous fire has a lot of plant and animal species to extinction, the Gov. has brought about little change apart from introducing a few forest mens and conducting a few surveys. But controls the forest fire is an exceptionally difficult task, but without the help of new technology. To remedy this, we are going to make a replica model of smart forest fire detection system that can help Gov. and Fire Authority in the monitoring and surveillance of forests fires. In our project, we have developed a forest fire detection and alert system. Our flame sensor is to detect the fire . The ESP 8266 is coded in a way that it on the GPS after detection of fire . connected Telegram dashboard will display the fire status on screen and alert the authorities. We have used NODE MCU(ESP 8266), GPS module. The NODE MCU gets fire detection input using the flame sensor, then using the GPS module it sends signal output to Telegram account. Next, using Telegram it processes the signal detection and shows respected output on screen. It then shows the result of the fire status of forest. All this information will saves on Telegram database for further analysis. So, in this way, our smart forest fire detection system keeps track on forest , detect fire and alert authorities on time and creates a database with previous fire statistics of the forest.***
Keywords: NODE MCU (ESP 8266), GPS Module, Flame sensor, Telegram

I. INTRODUCTION

Wildlife A forest fire, also known as a bush fire or a hill fire, is an uncontrolled fire that occurs in the wild or in forests. It is critical to notice these types of fires as soon as possible in order to minimize the damage they cause to the ecological system. Every year, thousands of acres of forest are burned. Unpredictable climate change, a long dry season, and minimal winter rainfall are just a few of the key culprits. Traditional manual systems do not provide fire prevention monitoring 24 hrs a day, 7 days a week. Because the response time of emergency services has such a big impact on the outcomes and losses they cause, improving fire prevention and detection systems is typically seen as a top priority for environmental preservation. The major purpose of the concept detailed here is to estimate the presence of fire threats in the short term and to detect recent fire outbreaks throughout various forest areas. We've been hearing about criminal activities like precious metals smuggling and commercial smuggling for a long time. Teak wood, Sandalwood, and other woods from protected forest regions These trees are extremely pricey and in high demand on the global market. The trees were frequently marked with tags to keep them safe. Because anyone can update it, it will be useless and unreliable. Some trees may also be harmed during natural disasters. As a result, our proposed technology is the ideal answer for both problems. Thus, utilizing modern technologies like as Telegram,we may identify and store fire monitoring data based on their real-time and location. It is also feasible to keep the data in the system. As a result, we designed a Fire forest detecting system in our project... Our technology can detect fires by recording their live positions and storing the information in a database. As far as hardware goes, we're employing a NODE MCU, a GPS modem, and a flame sensor.The goal of this project is to detect fire using sensors/real-time location and save the resulting data to aid in the forest monitoring process. The following are the goals of this project: To detect and save data about a fire. In order to save data from the previous forest temperature in the system. To control the system wireless.

The system is divided into three parts:

1) GPS module interfacing with the Node MCU
2) Save the information and display the output on a computer or smartphone.
3) To gain remote access to the system and obtain information (depends on the network). This type of device is excellent for monitoring animals as well as managing wildlife in zoological parks.

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II. LITERATURE SURVEY

Bu, F. et al.,[1] The Minister for Economic Affairs of the State of California, North Rhine-Westphalia, supported the research project "International Forest Fire Fighting" (iWBB).

Saeed, F. et al., [2] A consortium of firms, research organizations, and universities have collaborated to create a system that is both interconnected and modular.

Saeed, F. et al., [3] An integrated approach to primal forest fire detection and maturation is based on a good mix of diverse detection technologies based on wildfire risk, area size, and human presence, as well as a good logistical infrastructure, simulation training, and novel extinguishing equipment.

Shokouhi, M. et al., [4] When huge areas need to be watched, such as in the event of wildfires, only remote sensing technologies can provide adequate early detection. Satellite controlled unmanned aerial vehicle (UAV) equipped with gas detector and a heat camera space to a suspected fire to pinpoint the source of the reported cloud to reduce fire alarms. The UAV can also be utilized as a fire authority.

Salhi, L et al., [5] An unmanned blimp can be employed as a fireguard after a successful fire Extinguishable to limit the chance of re-ignition. On the blimp are placed a microwave radiometer that detects hot areas even when eyesight is poor (due to Smoky clouds and below the ground level), gas and smoke sensing element, and a heat camera as monitoring instruments.

III. TELEGRAM

Telegram is a open-source cross-platform software, it uses cloud memory instant messaging service.

IV. ARDUINO IDE

Arduino Integrated Development Environment The Arduino Integrated Development Environment (IDE) is a open source software (for Windows, mac-os, Linux) that is coded in functions from C and C++. The open-source Arduino Software (IDE)helps us into write code and uploading it to the board. This software can be used with any Arduino board.

V. FLAME SENSOR

A flame sensor is a detector that is sensitive to fire and heat. This is why flame sensor module here. This flame sensor detects flame if the light source emits a wavelength between 730 nm and 1120 nm. When there is a excess amount of heat sensor can damage. For avoid this sensor can be placed a set distance away from the flame. The flame sensing may be done from a distance of 100cm with a detection angle of 600 degrees. This detector output is either an ac or a dc.

These sensors are utilized as a flame alert in firefighting robots

- Pin 1 (VCC pin) : Voltage ranges from 3.3V to 5.3V
- Pin 2 (GROUND) : This is a ground pin
- Pin3 (AOUT): This is an analog output pin (MCU.IO)
- Pin4 (DOUT): This is a digital output pin (MCU.IO)

Fig.1

VI. NODEMCUESP-8266

The NodeMCU (NodeMicro Controller Unit) is an open source software and hardware development environment programme based on the ESP8266, a low- cost, easy to use SOC. The Systems ESP8266 features all of the necessary components of a computer, including a RAM, CPU, networking (WiFi), and even a current operating system and SDK. As a result, it can be use for variety of Internet of Things (IoT) projects The ESP8266 is difficult to access and use as a chip.

However, To perform the most basic operations, such as turning it on or sending a keystroke to the chip's "computer," you must solder wires with the necessary analogue voltage to its pins. You'll also need to write it in low-level machine instructions that the chip hardware can understand. When used as an embedded controller chip in mass-produced devices, this level of integration is not a problem. Ammature, hackers, and students who wish to try it out in their own IoT projects face a significant challenge.

What about Arduino, though? For their adaptable IoT controller, the Arduino project produced an open-source computer hardware design and software SDK. The Arduino hardware is a microcontroller board with a USB port, LED lights, and standard data pins, similar to NodeMCU. It also establishes common interfaces for interacting with sensors and other circuit boards. The Arduino board, unlike the NodeMCU, can include a number of CPU chips (usually an ARM or Intel x86 processor), memory chips, and programming environments. For the ESP8266 chip, there is also an Arduino reference design. However, because of Arduino's versatility, there are substantial differences between vendors. Most Arduino boards, for example, lack WiFi capability, and some even lack a USB connector in favour of a serial data interface.

Fig.2 Node MCU ESP-8266

VII. GSMGPRS MODULE

On these modules, the NEO-6M GPS type engine is quite good, and it has very high sensitivity for interior applications. There's also a reversible MS6211FE battery for backup and an EEPROM for saving setup settings. A Direct Current input in the 3.2- to 4.9-V range works well with the module (because its has built-in voltage regulator).A NEO-6M GPS chip is at centre of entire system.

It can display up to 20 satellites on 60 channels and reaches the maximal level of sensibility in the industry, 161 dB tracking, while representation only 45 mili amps from the power source. The chip's Power Save Mode is one of its best features (PSM). By selectively switching parts of the receiver ON and OFF, it provides for a reduction in system power usage. This decreases the module's power consumption to just 11mA, making it appropriate for power-constrained application such as GPS wristwatches.

The NEO-6M GPS chip's essential data pins are separated out into 0.1″ pitch. This comprises the pins needed for UART communication with a micro controller. The module supports baud rates ranging from 4800bps to 230400bps, with 9600 being the default

The position fix state is indicated by an LED on the NEO-6M GPS Module. Depending on what condition it's in, it'll flash at different rates:

1) *No Blinking* – System searching for satellites connection.
2) *Blink Every 1s* – Position is found-(The module can communicate with enough satellites)

Fig.3 SIM800L GSM / GRPS module

VIII. METHODOLOGY

The first step in the methodology is to make setup NODEMCU by installing arduino IDE and interfacing of GPS MODU
Following the successful completion of the hardware as shown in the circuit diagram, the IoT platform must be set up to receive real-time data. Telegram is used to save and display the parameters in this case. Follow the steps below to create a

1) *Step 1:* Telegram is free to use. If you don't already have a Mathworks account, go to https://telegram.com/ and sign up for a free account.
2) *Step 2:* Open Telegram and log in. Sign in to Telegram with your credentials and select "New Channel" from the drop-down menu. Fill in the project's details, such as the name, field names, and so on. Then select "Save channel.

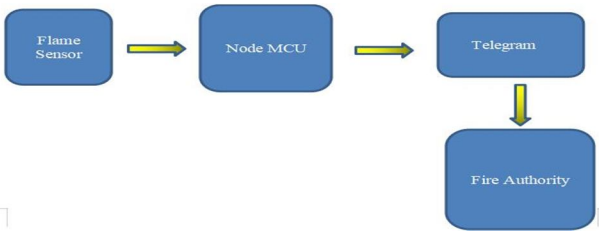

Fig. 2. Block Diagram

A. Algorithm

1) Capturing fire from the sensor.
2) Send data using Node MCU to the telegram cloude
3) Send the data of temperature with its Coordinates using GPS module in a database.
4) Display the output on the monitor/ smartphone (using Telegram)

a) Capturing Readings: Capturing of readings is done using flame sensor. First, we need to set the sensor in the area from where we have to monitor the forest fire for example a big tree in the forest can be best place to observe.
b) Processing the Obtained Records: In the processing of readings to breaks the readings into high low frame and further classification is done by the database system.
c) Comparing Collected Data: Comparison of the readings obtained from the Flame sensor is made with the help of dbms and then the tree is la belled coordinate according to the system.
d) Sending the Collected Data: After processing and comparing the data, the obtained data is then saved in a database with the date and t me and send.
e) Displaying the Data: The obtained results are then can be displayed on a monitor of our pc/laptop or it can be displayed on a smartphone using Telegram application.

IX. RESULTS AND DISCUSSION

The system designed is able to classify the coordinate along with the temperature in the frame.

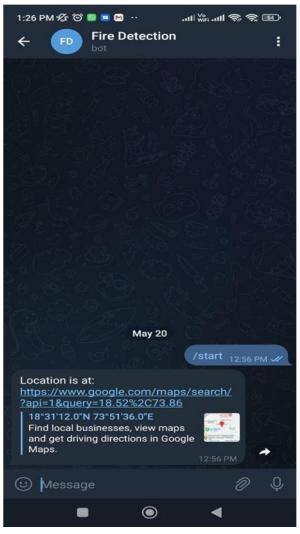

Fig.3. Flame detected and data displayed

X. CONCLUSION

Due to increased temperature change in forest, it has become necessary to keep the record of wildlife temperature and protect environment. Also, its difficult to implement the tadeonal ways of keeping the record. Hence, proposed system works to keep such records with the help of Iot systems.

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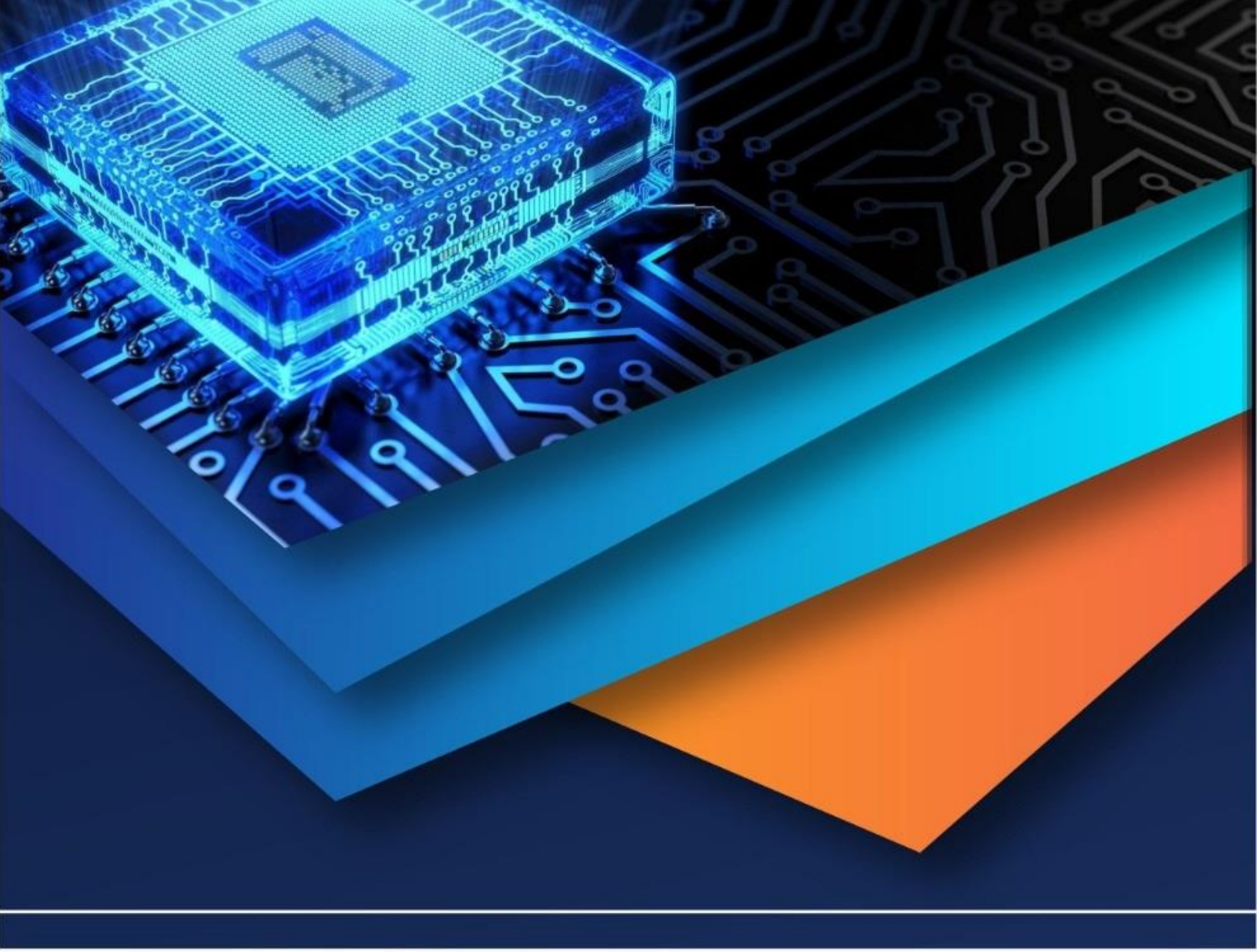

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