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DEVELOPING AN INTEGRATED SYSTEM BASED ON INTERNET OF THINGS (IOT) AND WIRELESS SENSING NETWORK (WSN) IN THE EFFICACIOUS EARLY DETECTION AND PREVENTION OF FOREST AND WILD FIRES

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ABSTRACT

Jungles are the reason for supporting the biological system and clears the earth and gives cover nourishment to life reliant on it. People owe an incredible obligation in protecting the rest of the forestlands and make preventive strides towards the demolition of woodland. One of the significant reasons for woodland annihilation is forest fires. So this undertaking manages the improvement of a savvy continuous and programmed early admonition framework for a woods fire. It empowers remote observing of conditions inside the woods locales and makes a ready when a backwoods fire is distinguished by one of a kind mail and Sms, the sensor information is continually checked alongside a GPS area for every sensor hub which is associated together by ZigBee modules able to do long-range transmission, the straightforward battery observing framework permits consistent checking of intensity use of the whole arrangement. As a whole, this model, when executed, will be a financially savvy path for protecting the forest from fires.

INTRODUCTION

As we all know, the jungle is considered as one of the most significant and vital assets. Nowadays across the world the Forest Fire department in widely researching on prevention and detection of the jungle fires. Backwoods are the defenders of earth's environmental equalization. Sadly, the woods fire is typically possibly seen when it has spread over a huge region, making its control and stoppage burdensome and even outlandish now and again. The outcome is destroying misfortune and hopeless harm to the earth and environment (30% of carbon dioxide (CO2) in the air originates from woodland fires), notwithstanding unsalvageable harm to nature (colossal measures of smoke and carbon dioxide (CO2) in the air). Among other horrible results of woods fires are long haul grievous impacts, for example, impacts on neighbourhood climate designs, a dangerous atmospheric deviation, and termination of uncommon types of the vegetation. In view of the insufficiencies of regular woodland fire discovery on constant and checking exactness, the remote sensor organizes a strategy for timberland fire identification is being executed here. The issue with woodland fires is that the forests are generally remote, surrendered/unmanaged regions loaded up with trees, dry and drying wood, leaves, etc that go about as a fuel source. These components structure a profoundly burnable material and speak to the ideal setting for

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introductory fire start and go about as fuel for later phases of the fire. The fire started might be caused through human activities like smoking or grill parties or by normal reasons, for example, high temperature in a sweltering summer day or a messed up glass filling in as an aggregate focal point concentrating the daylight on a little spot for a period of time along these lines prompting fire-start. When start begins, flammable material may handily fuel to take care of the flames focal spot which at that point increases and more extensive. The underlying phase of start is regularly alluded to as "surface fire" arrange. This may then prompt benefiting from bordering trees and the fire gets increasingly elevated, therefore turning out to be "crown fire." Mostly, at this stage, the fire gets wild and harm to the scene may get over the top and could keep going for quite a while relying upon winning climate conditions and the landscape.

PROJECT IDEA

To Develop a wireless device to monitor temperature, humidity, and air quality system using ZigBee and raspberry pi with that we connect the GPS module to get the exact location of the hardware placed and continuously monitoring the above three things. with all this, we also add a video capturing device including SMTP and SMS gateway to get real-time video via SMTP and get an instant alert on phone via SMS. This entire setup is attached with battery and paltrier plates for backup.

Fig. 1: ZigBee module

Fig. 2: RaspberryPi Development Board

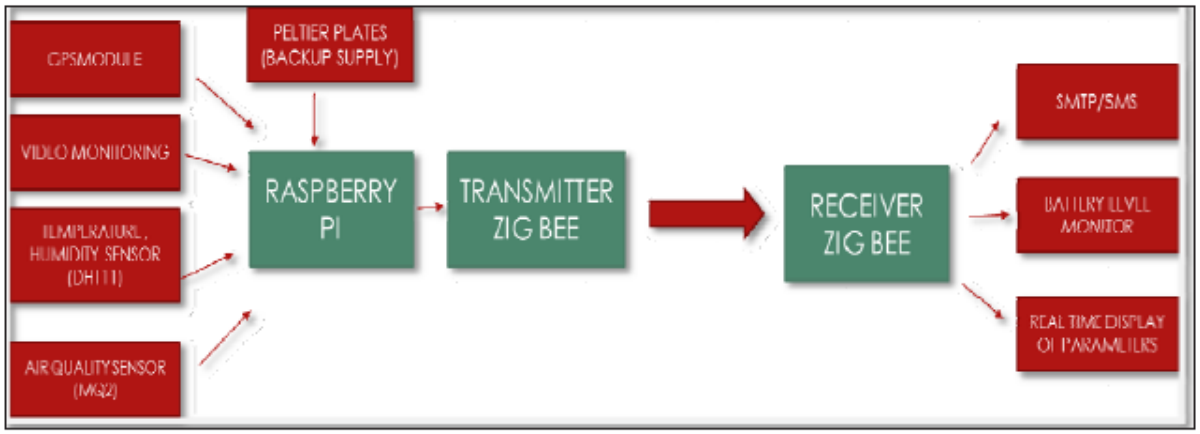

Fig. 3: Block diagram of proposed prototype model

TECHNOLOGY STACK

from Figure 3, the entire hardware is connected with the raspberry pi which includes four sensors and videos surveillance camera which collects real-time data and sends an exact location to the receiver with the help of ZigBee and GPS modules, SMS and email are constantly being sent to the users.

WORK

1. The real time transmission and reception of parameters such as humidity, temperature, air quality, and location are obtained.

2. The Raspberry Pi is more efficient than its other counterparts in multiprocessing of data with minimum expenditure of power.

3. The Wireless sensor node network ensures long distance transmission of data from inside dense forest to the receiver even if it has poor network coverage.

4. The forest is scattered with multiple zig bee node points and they transmit it to a central zig bee system and each central zig bee transmits its data individually to the receiver end which receives all sensor data from each node point in of the forest

5. The live monitoring and condition based picture capturing method ensures an additional warning system that forest fire occurred. And is programmed to be in sleep mode when not triggered to save power.

6. SMTP protocol and SMS are an efficient method to send an early warning whenever a forest fire is detected.

7. Through this way an early warning intimation when a forest fire occurs reaches the monitoring station and immediate actions on extinguishing the fire are taken.

Fig. 4: Battery monitoring display

EFFICIENT POWER SUPPLY TECHNIQUES

The setup requires a 5V power supply. With the help of python programming, we are monitoring the battery charge status and being made available to continuously display. whenever a program detects the battery status as low, thermoelectric Peltier plates act as a backup power source based on the thermoelectric effect, which ensures that the operation of the PI until the battery recharged or replaced with a new one.

NECESSARY CONDITIONS FOR FOREST FIRE DETECTION

The sensors ceaselessly bring and transmit information to the getting station through the remote zig bee organize. Essentially, various zig bee organizes transmit information to the base station simultaneously. The base station comprises a beneficiary zig bee with a presentation associated with it to see the information.

The following are the conditions fixed for the detection and intimation of forest fire in our prototype:

1. High temperature above set value – due to heat from the fire produced.

2. Decrease in humidity below the set value – as the heat from the fire produced decreases the humidity.

3. Increase in CO2 and CO content in air above set value which is monitored by MQ2 air quality sensor.

4. When these conditions are satisfied the web camera for live monitoring captures pictures of its surrounding and through SMTP an alarm message intimating a forest fire and the captured pictures are sent to the users' mail and also SMS is sent and immediate action is taking to extinguish the forest fire.

5. The message will comprise of the temperature, humidity, CO2, CO concentration along with latitude, longitude location of the activated sensor with time and the captured pictures by the web camera.

The great thing is that the entire process is real time.

RESULTS

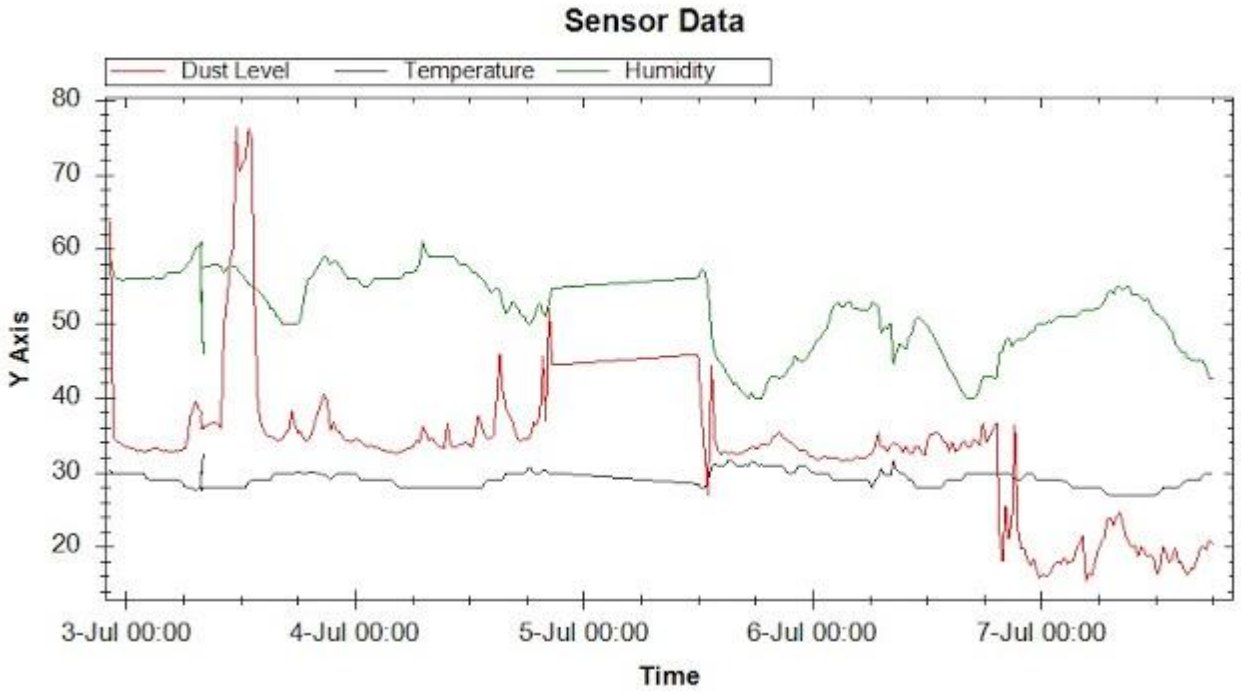

Fig. 5: Graphical representation of the sensor outputs

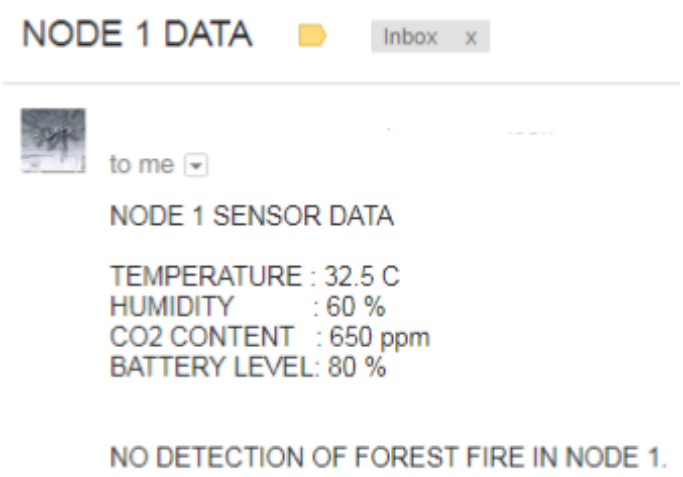

Fig. 6: Real time Mail received through SMTP

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MERITS OF THE PROJECT

1. The various merits from the execution of the project has been listed as follows:

2. The entire setup is cost efficient and small in size.

3. Wireless sensor node system ensures coverage of large area of forests.

4. Instalment is simple and highly accurate in its readings

5. Power consumption is minimal and provided with reliable backup power supply.

6. Can be installed deep inside the forest.

7. Equipped with real time video, image, and various parameter sensing features to monitor occurrence of forest fires.

8. The Zig bee / 802.15.4 2.4GHz RF module has outdoor line-of-sight range of 4km while keeping power consumption at a remarkably low level of only 10 micro amperes in the sleep mode, 23mA in receive mode and 60mA in transmit mode which is a solution to transmission of data from interior of the forest to the receiver.

CONCLUSION

The forest is one of the essential air purifiers and is a fundamental territory of numerous types of plants and creatures. Coordinating the new innovative sensor frameworks and the Internet of things the continuous programmed timberland fire cautioning framework has been proposed with a perspective on forestalling backwoods fire. In a universe of innovative headways incorporating IoT and Wireless sensor systems can end up being an extraordinary resource continuously observing of different conditions. Along these lines, the novel mail conveyance framework through SMTP and SMS gives an early admonition to forestall inescapable timberland fires and through the ZigBee module, the long-ago transmission of information is presently conceivable with insignificant consumption of intensity. The straightforward battery observing activity can demonstrate amazingly helpful in surveying the vitality support and force use of the whole arrangement. Hence, this task when executed in locales of high forestland fire exercises can end up being tremendously valuable.