

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 3, March 2020

IoT Based Forest Fire and Deforestation Detection System

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ABSTRACT: Forests are an assortment of trees and different plants. The most basic risk in the forests is the forest fire. An enormous number of trees have been lost because of forest fires in different parts around the world. Deforestation is an exceptionally long and remorseful issue. Human is to principally fault for deforestation; however cataclysmic events do play a role. The forest fires and deforestation have wide-extending unfriendly biological, monetary and social effects. This paper shows an IoT based framework structure for identification of temperature and fire for preventing forest fires and for discovery of sound and plot for forestalling the cutting of trees as right on time as possible. In our proposed framework Raspberry pi is interfaced with couple of sensors, buzzer and LCD. In the event that any disastrous occasions emerge, the framework consequently faculties and cautions the client by sending an alarm to an android application introduced on the client's Android versatile.

KEYWORDS: Raspberry Pi, IoT, Forest Fires, Deforestation, Android Application.

I. INTRODUCTION

Forests are an assortment of trees and different plants; they are likewise incorporated biological systems and home to probably the most various lives on Earth They spread 31% of the world's area. They assume a significant job in the carbon and water cycles that make life possible. The most basic risk in the forests is the forest fire. They are a redundant marvel in various bits of the world. They are the fierce blazes which cause significant mischief to natural and Human Resources; Once the fire starts ignited, it rapidly spreads all through the forest and make more transmissions, which dynamically add to all the all the more global warming , which would then have the option to cause more forest fires.

As demonstrated by UCS (Union of Concerned Scientists), seasons with higher quickly spreading fire potential - has all around become longer over the span of the last 40 years. Projections by the UCS prescribe that savage blasts could get four, five and even on different occasions as dreadful as they at present are inside this century. Recent crazy flames have quite recently caused gigantic human prosperity impacts across Southeast Asia. In perspective on the Forest Survey of India's data on woods fire it is communicated that around half of the woodlands districts as fire slanted. Considering the forest stock records, 54.40% of forests in India are exhibited to irregular flares, 7.49% to nicely visit fires and 2.405 to high rate levels while 35.71% of India's forests haven't yet been introduced to flares of any veritable importance.

Deforestation is devastatingly affecting the world's woods. It endangers natural grouped assortment and bothers ecological change. It likewise prompts the loss of biodiversity and fueling environmental change. Deforestation happens in a wide range of backwoods over all landmasses pulverizing nature and untamed life, removing network jobs and mutilating exchange. In timberlands, tree slicing exercises are illicit but due to lack of labor and different assets, governments are not extremely effective in checking this menace. One approach to stop this is to recognize the tree cutting procedure in a beginning time with the goal that opportune measures can be taken to stop the equivalent.

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Deforestation and woods corruption represent about 10% of worldwide CO₂ outflows. Deforestation and backwoods corruption additionally has suggestions for environmental change, as woodlands have a urgent job in both moderating against and adjusting to environmental change. The state wise information accessible with DH shows that the loss of tree spread in north-east India adds up to over 70% of all tree misfortune in India that happened somewhere in the range of 2001 and 2018. Overall deficit of tree spread somewhere in the range of 2000 and 2018 in India is 16,744 sq km. C.Nagarajan et al [4,9] studies shows that in spite of the fact that progress has been made in the field of out of control fire and illicit logging battling in the most recent decades, there is as yet a need to strengthen the debacle reaction limit, including early admonition systems and enhancements continuously trade of information at all stages and levels of a forest monitoring plan. Increment in backwoods fires and illicit signing in woods regions around the globe has brought about an expanded inspiration for creating notice frameworks for the early identification of fierce blazes and tree logging. Technological breakthroughs will be a key power driving change in out of control fire and cutting of trees battling. Ongoing improvements in data and communication technologies are previously having a gigantic impact, especially in forest fire and deforestation recognition frameworks.

II. RELATED WORK

Wireless Sensor Network Based Monitoring System for Forest [10] - This paper presents a system which can prevent the cutting of trees, forest fires, wildlife and also the loss of a significant number of natural resources. The system consists of both transmitter (slave) and receiver (master) unit. The transmitter unit makes use of an ARM micro-controller as a controlling unit which is interfaced with force sensor to sense the vibration, pulse sensor to sense the pulse, and temperature sensor to sense the temperature. All the signals from the sensors and the GPS location information are sent simultaneously over zig-bee networks to forest office. Thus the receiver unit collects all the information. The LCD is interfaced to display whether the trees are cut, fire has occurred, or the animals had been hunt.

An IoT based fire alarming and authentication system for workhouse using raspberry pi3 [13] - In this paper, they have planned and actualized a fire identification framework for factories utilizing Raspberry pi3. They utilized temperature, fire and smoke sensors for detecting fire and PIR sensor and camera for Intruder detection i.e., authentication. They have given an affirmation of the fire presuming framework to keep away from any bogus caution and System will begin terminating concealment framework, such as opening fire extinguishing water valves when fire happens.

Wireless Flame Sensor System Using Arduino and IoT [6] - This paper proposes a framework that recognizes the fire and activates the air pump immediately. The Flame sensor is utilized that should be set at specific separations, so it distinguish the fire (heat). A flame sensor "detects" a feeble DC signal from the AC power sent to the igniter which by means of the phenomenon of fire rectification in which the extremity of power sent through a fire is rectified to DC. This sensor is utilized in the analysis to distinguish the fire. The sensor imparts the signal or the data to the micro-controller.

Automatic detection of tree cutting in forests using acoustic properties [9] - This paper proposes a calculation for programmed recognition of tree cutting in timberland. As tree cutting produces parcel of commotion, it very well may be identified by routinely observing the acoustic signals inside the woods. The proposed calculation is based on difference between parameters, alongside K-implies bunching, GMM and PCA for correlation. The presented methodology is additionally founded on difference between tests. This calculation figures the distinction b/w the stored parameters and new sample. A master database is made which contains the estimations of 10 parameters and afterward a minimal distinction is assessed for coordinating. If the coordinating percentage is more than 80, tree cutting is perceived. Whenever any new sign is shown up, this strategy computes the estimations of those 10 parameters for this sign and afterward it figures the difference b/w the stored values and the new values.

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III. EXISTING SYSTEM

RFID is introduced on trees while the woods officials will have the GPS beacon comprising of RFID reader. This technique isn't excessively ingenious in light of the fact that the woods officials need to physically investigate day and night. Ordinarily, tree logging is accounted for simply after a tree has been chopped down totally. In existing framework, the manual force had been utilized for battling with the fire. So to stay away from the human harm and to downsize the manual force we are right now utilizing the ATV framework. The ATV framework is wasteful ordinarily in light of the fact that it may be hazardous. This system requires manual intermittent checking all through the backwoods zone. Covering the tremendous forest territory could be a test. Recognizing the circumstance of fire with this current framework is frequently a troublesome undertaking [11].

IV. PROPOSED SYSTEM

The proposed framework plans to acknowledge mechanization of a flagging framework, and totally evacuate the manual control of the woods checking. It's given an incorporated framework which is fit for recognizing the fire and cutting of trees. As shown in the block diagram(fig 1), the IoT based framework comprises of four sensors: fire sensor, temperature sensor, an accelerometer and sound sensor which measure physical parameters like temperature, fire, sound, and point. These deliberate data are imparted as inputs to the raspberry pi through the GPIO pins. Information created from these sensors is persistently checked. The Raspberry Pi forms all the got information and reacts dependent on the yield esteems created by the sensor. The values will be viewed as such it fulfills or denies the condition and in this way it pushes the caution to the interface; every one of these alarms are finished by iot module to control the things over web from here. At last the warnings are pushed to a created application. In the event that fire happens or the tree is cut, the buzzer gets activated. The LCD likewise shows the outcome according to the program.

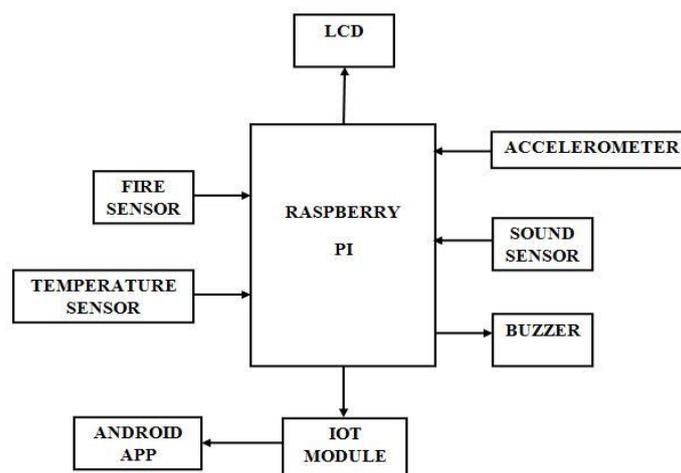


Fig 1. Block diagram of the proposed system

V. WORKING PRINCIPLE

The general working of the framework can be explained as follows:

In the proposed framework, the sensors record the information ceaselessly and impart signals to the Raspberry Pi 3 as inputs through the GPIO pins. The framework is modified with the necessary condition. If fire occurs, the flame sensor

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senses it and sends high value to raspberry pi; when it receives high value it will send alert message and activates the buzzer. If temperature rise occurs, the temperature sensor senses it and sends high value to raspberry pi; when it receives high value it will send alert message. If the sound sensor identifies cutting apparatus commotions and the accelerometer detects the adjustment in tree point, high value is send to raspberry pi; when it receives high value it will send alert message as tree is cut. In the event that the tree edge alone changes, accelerometer detects it and high value is send to raspberry pi; when it receives high value, it will send alert message as tree falling. The LCD also displays the corresponding results.

VI. HARDWARE DESCRIPTION

6.1. Raspberry Pi

The Raspberry Pi 3 Model B is the third era Raspberry Pi and it is an amazing credit card single board PC which comprise of ARM Cortex-A53 1.4GHz,64bit quad-center ARMv8 CPU can be utilized for some applications and supplants the first Raspberry Pi Model B+. The quad-center Raspberry Pi 3 is both quicker and more competent than its ancestor. The Pi 3 likewise supports wireless internet, with built-in Wi-Fi and Bluetooth. Raspberry pi has a 1GB memory and extra memory is given by utilizing a miniaturized scale SD card. It has 4 USB ports, 40 GPIO pins and a Full HDMI port is utilized to interface with a presentation. It was initially sent with 256 megabytes of RAM, later redesigned Model B Model B+ to 512 MB. Apparatuses are accessible for Python as the principle programming language, (by means of the RISC OS picture or the Brandy Basic clone for Linux), C, Java and Perl.

6.2. Fire Sensor

A fire sensor is one sort of indicator which is for the most part intended for distinguishing just as reacting to the event of a fire. The fire recognition reaction can rely upon its fitting. This sensor/indicator can be worked with an electronic circuit utilizing a beneficiary like electromagnetic radiation.

6.3. Sound Sensor

The sound sensor is one kind of module used to sense the sound. this module is utilized to identify the force of sound. The utilization of this module essentially incorporate switch, security, just as observing. The precision of this sensor can be changed for the simplicity of utilization. This sensor employs a microphone to contribute input to buffer, peak detector and an amplifier. This sensor senses a sound, and procedures an o/p voltage signal to a micro controller. From that point forward, it executes required handling.

6.4. Temperature Sensor

A temperature sensor is a gadget, generally a RTD (opposition temperature finder) or a thermo couple, that gathers the information about temperature from a specific source and changes over the information into justifiable structure for a gadget or an onlooker.

6.5. LCD

A liquid crystal display (LCD) is a slender, level electronic visual display that utilizes the light adjusting properties of liquid crystals (LCs). LCD (liquid crystal display) don't produce light straightforwardly. They are utilized in a wide scope of utilizations including: PC screens, TV, instrument boards, airplane cockpit shows, signage, and so forth. They are common in customer gadgets, for example, video players, gaming gadgets, clocks, watches, calculators, and phones. LCDs have dislodged cathode ray tube (CRT) displays in many applications.

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6.6. Buzzer

A buzzer is an electronic device that most ordinarily comprises of various switches or sensors associated with a control unit that decides whether and which button was pushed or a pre-set time has slipped by, and as a rule enlightens a light on the proper button or control panel, and sounds an admonition as a constant or discontinuous buzzing or signaling sound. At first this gadget depended on an electromechanical framework which was indistinguishable from an electric ringer without the metal gong (which makes the ringing commotion).

6.7. Accelerometer

An accelerometer is a gadget that estimates proper acceleration, the acceleration experienced comparative with freefall. Single-and multi-axis models are accessible to identify size and bearing of the increasing speed as a vector quantity, and can be utilized to detect direction, acceleration, vibration stun, and falling. Miniaturized scale machined accelerometers are progressively present in compact electronic gadgets and computer game controllers, to identify the situation of the gadget or accommodate game information.

6.8. IoT Module

An IoT module is a little electronic gadget inserted in items, machines and things that associate with remote systems and sends and gets information. Once in a while alluded to as a "radio chip" or "IoT chip", the IoT module contains a similar innovation and information circuits found in cell phones yet without highlights like a showcase or keypad. Another key differentiator of IoT modules is that they give consistently on availability. This is on the grounds that IoT applications need to send information consequently, progressively without somebody hitting a send button.

VII. SOFTWARE DESCRIPTION

7.1. Android Application

Android is a mobile operating system. It is an open-source system and depends on Linux. The Android structure helps us to create progressed and easy to use applications. The applications can be manufactured by utilizing Java and Kotlin. The Android working framework has then experienced various releases by fixing bugs just as including additional features which make our life progressively agreeable and simple. Android innovation isn't compelled to just cell phones; these days there are numerous gadgets in the market that utilization it as their operating system. Gadgets like TVs, tablets, android auto cars, eBook reader, and wrist watches use Android as the working framework. It is driving the worldwide market. Most of the populace utilizes Android gadgets. The applications we utilize each day have brought a lot of occupations accessible for Android engineers in the market. As android is open source anybody can learn and fabricate Android applications. Likewise, Android applications are perfect with an assortment of gadgets. No question Android improvement is one of the eager and intriguing occupations with regards to this time of innovation.

7.2. PHP

PHP is a server-side scripting language intended for web development yet in addition utilized as a universally useful programming language. It is utilized to make dynamic Web pages, or Web pages that update and show data relying upon the user's action. PHP code is deciphered by a web server with a PHP processor module, which creates the subsequent site page: PHP commands can be implanted straightforwardly into an HTML source archive as opposed to calling an outside record to process information. PHP is intended to function admirably with the web, thus things like getting to the GET and POST what's more, working with HTML (Hypertext Markup Language) and URLs are manufactured ins in the PHP language. This makes it extremely compact and clear to make a site.

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VIII. CONCLUSION

A system has been proposed for forest fire detection and tree cutting detection which overcomes the constraints of the existing technologies. This system is helpful in preventing the after effects by detecting the forest fires as early as possible over a wide area.

IX. FUTURE SCOPE

In future, we will refresh the framework with additional features like interfacing vibration sensor for precise detection of tree cutting, expanding the scope of the detecting of the fire sensor, and scanning of id for the authentication purpose so the illicit lumberjacks can be distinguished.

REFERENCES

- [1] Antonio Molina-Pico, David Cuesta-Frau, Alvaro Araujo, Javier Alejandro and Alba Rozas “Forest Monitoring and Wild land Early Fire Detection by a Hierarchical Wireless Sensor Network” in Hindawi Publishing Corporation Journal of Sensors Volume 2016, Article ID 8325845, Issue No.12, pg no 1-8, 2016.
- [2] Dhruva jyoti Paul, Arnab Ghosh, Soumya Jyoti Banerjee “GSM Based Fire Sensor Alarm Using Arduino” in International Journal of Scientific & Engineering Research, Volume 7, Issue 4, pg no 259-262, 2016.
- [3] Giva Andriana Mutiara, Nanna Suryana, Othman Bin Mohd “Wireless Sensor Network for Illegal Logging Application: A Systematic Literature Review” in Journal of Theoretical and Applied Information Technology, Vol.96No 1,ISSN: 1992- 8645,E-ISSN: 1817-3195, pg no 302-313, 2019.
- [4] E Geetha, C Nagarajan, “Induction Motor Fault Detection and Classification Using Current Signature Analysis Technique”, 2018 Conference on Emerging Devices and Smart Systems (ICEDSS), 2nd and 3rd March 2018, organized by mahendra Engineering College, Mallasamudram, PP. 48-52,2018
- [5] Pandyananian. M, Sai Likhith, Dhananjay. V. Narayan, Ashwini. C “Deforestation Management System Using Force and Sound” in International Journal of Engineering Science and Computing, October Volume 7, Issue No.10, pg no 19156- 19158, 2017.
- [6] Rupanawar Priya. D, Jarande Pramila. M. “Wireless Flame Sensor System Using Arduino and Iot” in International Conference on Smart Systems Isbn: 978-93-88350-20-4, 2018.
- [7] Sathishkumar. R, Vinothkumar. M, Devaraj Varatharaj, Rajesh. S, Gowthaman S. M “Design And Development Of Automatic Fire Detection Using SMS And Voice Alert System” in International Journal of Scientific & Engineering Research, Volume 7, Issue 5, pg no 114-117, 2016.
- [8] Shahrizuan Shafiril, Amri Yusoff, and Norma Che Yusoff (2016) “The Development of an Automated System in Detecting Environmental Data for the Monitoring of Forest Activity” in International Journal of Environmental Science and Development, Vol. 7, Issue No. 7, pg no 532-536.
- [9] C.Nagarajan and M.Madheswaran - ‘Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques’- *Electric Power Components and Systems*, Vol.39 (8), pp.780-793, May 2011
- [10] Snehal. A. Jadhav, Shweta. M. Ingawale, Dhanashree G. Mohite “Wireless Sensor Network Based Monitoring System for Forest” in International Journal on Recent and Innovation Trends in Computing and Communication, Volume: 3, Issue: 3, ISSN: 2321-8169, pg no 1733 –1738, 2015 .
- [11] Sudha B. S, Yogitha H. R, Sushma K. M and Pooja Bhat “Forest Monitoring System Using Wireless Sensor Network” in International Journal of Advances in Scientific Research and Engineering Volume 4, Issue 4, pg no 127-130, 2018.
- [12] Syafruddin Syarif, Nadjamuddin Harun, Tola. M, Wihardi Tjaronge. M “Detection System of Illegal Logging Image Using Matching Process With Discrete Cosine Transform” in International Journal of Computational Engineering Research, Vol, 03, Issue, 6, pg no 57-62, 2013.
- [13] Duraivel, Beniel Wellington, Arul Nayagam and Kijral, “An IOT based fire alarming and authentication system for workhouse using raspberry pi3”, International Journal of Emerging Technology in Computer Science &Electronics (IJETCSE) 2018.