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Research Paper



IoT based forest fire detection system

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Abstract

It has been found in a survey that 80% losses caused due to fire would have been kept away from if the fire was identified promptly. Node Mcu based IoT empowered fire indicator and observing framework is the answer for this issue.In this task, we have assembled fire finder utilizing Node Mcu which is interfaced with a temperature sensor, a smoke sensor and signal. The temperature sensor detects the warmth and smoke senssor detects any smoke produced because of consuming or fire. buzzer associated with Arduino gives us an alert sign. At whatever point fire activated, it consumes protests adjacent and produces smoke. A fire caution can likewise be activated because of little smoke from candlelight or oil lights utilized as a part of a family. Likewise, at whatever point warm force is high then additionally the alert goes on. Bell or alert is killed at whatever point the temperature goes to ordinary room temperature and smoke level decreases. We have additionally interfaced LCD show to the Node Mcu board.With the assistance of IoT innovation.Node MCU fire checking serves for mechanical need and also for family unit reason. At whatever point it recognizes fire or smoke then it immediately alarms the client about the fire through the ethernet module. For this reason, we are utilizing ESP8266 which is from Arduino IDE. Likewise, the Node Mcu interfacing with LCD show is done to show the status of the framework whether the Smoke and Overheat is identified or not. What's more, Node Mcu interfacing with Ethernet module is done as such that client become more acquainted with about the predominant condition message. It insinuate the client about the fire identification. This framework is extremely helpful at whatever point the client isn't in the closeness of control focus. At whatever point a fire happens, the framework naturally faculties and alarms the client by sending an alarm to an application introduced on user's Android portable or page open through web.

Keywords: *GPS, LCD Display, GSM, Smoke Sensor, Ethernet, Radio Frequency..*

1. Introduction

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. Consistently a large number of sections of land of timberland are burned to the ground. The land were woods is singed it winds up plainly difficult to develop vegetation over yonder. This is on account of soil moves toward becoming water repellent and acknowledges no more water, prompting lessening in ground water level. The Global Warming Report 2008 says rapidly spreading fire as one of the real reason behind increment in an Earth-wide temperature boost. In late year 2016 more than 4000 hectares of timberland were singed in the slopes of Uttarakhand. Common causes of wild fire are lightning, extreme hot and arid weather and human carelessness. The utilization of wireless sensor in this paper presents one of the methods for early wild fire identification

2. Literature survey

Numerous answers for identification of out of control fire are displayed and executed in recent years. Video Surveillance System is most generally utilized for identification of wild fire[1]. It is isolated into four classifications : Video Cameras delicate in unmistakable range in light of acknowledgment of smoke amid sunlight and fire blazes at night, Infrared(IR) Thermal Imaging cameras in view of discovery of warmth transition from the fire, IR Spectrometer which distinguish unearthly attributes of smoke gases and Light Detection and Ranging (LIDAR) system which measures the laser light back scattered by smoke particles. The limitation of these systems was high false alert rate as a result of climatic conditions, for instance, proximity of fog, shadows, clean particles etc. Another strategy is the utilization of Visual Cameras that take depictions of the forest to identify the fire. These cameras were mounted on the highest point of correspondence towers[2,3]. A turning engine is introduced to give a full round perspective of the forest. The pictures got from the camera are prepared utilizing project or MATLAB code and are contrasted and the reference pictures taken at introductory stage. This framework additionally had impediment of high false caution rate. Additionally the cost of establishment of visual cameras on correspondence towers was high

Another technique is the utilization of satellite framework to distinguish the wild fire. The primary segments of the framework are satellite(s) and the base station that gathers the information send by the satellite(s) and runs the dissecting calculation. The crude information from the satellite(s) is handled and after that Best in class High Determination Radiometer (AVHRR) instrument is

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utilized to recognize nearness of Problem areas. However the mists enormously influence the framework [4,5].
Wild Fire Reconnaissance Framework which comprises of WSN was likewise proposed for identification of wild fires in South Korea. The WSN decides the temperature and dampness after which middleware program and web application examines the gathered information .However in this approach of discovery of wild fire there was some loss of information amid correspondence [6].
WSN comprising three various types of sensors which can distinguish temperature, fire and smoke levels of methane, carbon monoxide and carbon dioxide was additionally proposed for wild fire recognition .The information gained by sensors is transmitted utilizing radio recurrence module. The radio recurrence module used has limited bandwidth and also picks up noise easily [7].
WSN comprising of temperature sensor setup and GPS module was likewise proposed for recognition of backwoods fire .In this temperature information was transmitted to base station through essential and principle receiving wire utilizing satellite. A portion of the impediment of framework was establishment of an excessive number of reception apparatuses; consistent power was required to both temperature sensor setup and recieving wires. Notwithstanding this climatic/regular changes can influence the framework [8].

3. System Architecture

To detect the forest fire as early as possible by measuring the level of temperature and CO2 level.

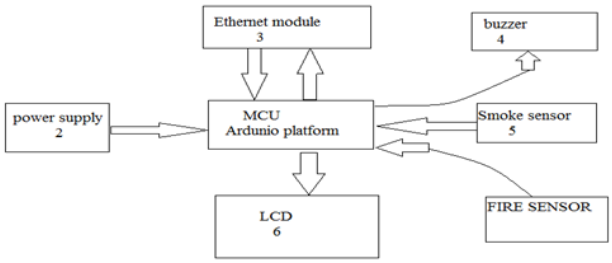


Fig 1. Block Diagram

3.1. Hardware

- Node Mcu
- RF MODULE(RECEIVER AND TRANSMITTER)
- GAS SENSOR(MQ6)
- TEMPERATURESENSOR(NTC)
- ETHERNET SHIELD
- LCD(16*2)
- ROUTER
- PCB(PRINTED CIRCUIT BOARD)
- TRANSFORMER
- VOLTAGE REGULATOR
- BUZZER.

3.2. Flowchart

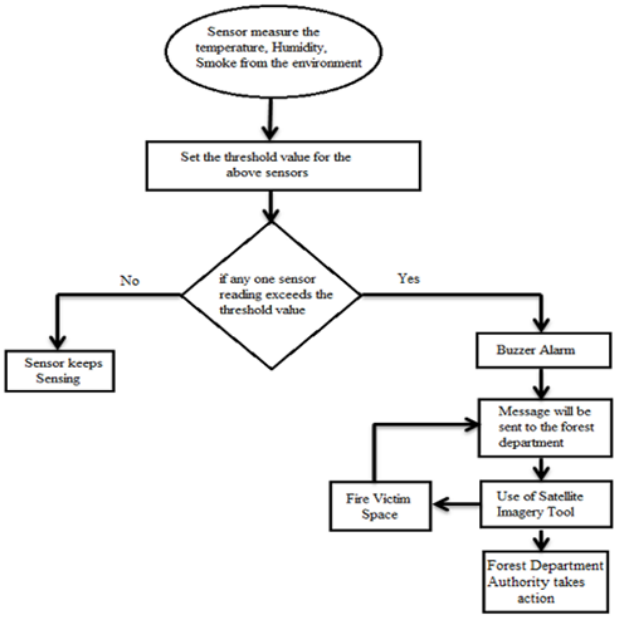


Fig 2. Operational Flow Chart

Working of it can be explained in 5 steps. They are:-

- Employing Sensors serving as Data acquisition centre-

Temperature sensor and smoke sensor are utilized that should be set at specific separations with the goal that a look can be kept on the whole forest territory keeping in mind the end goal to distinguish the start disturbing temperature and the level of carbondioxide gas(CO2). These sensors will send the flag or the data to the microcontroller. These will all detect changes in the earth and respond naturally in case of a crisis. New advancements in programmed starting gadgets utilize cameras and PC calculations to examine obvious impacts of flame and development in ways that other discovery gadgets can,,t. Number of terminate sensors are to be utilized in handy circumstance that are should have been set at specific separations with the goal that a look can be kept on the whole forest region.

- Gathering of information by the IC installed in the arduino of the Transmitter circuit :-

The IC ATMega 328-p (microcontroller) inserted in arduino stage display in the transmitter circuit get the information detected and gathered by the temperature sensor and gas sensor. At that point, the controller plays out the customized activity to it and pass them to the transmitter for transmitting the information to the accepting station.

- Transmission of the information by the transmitter :-

On getting the information from the controller, transmitter transmits the information to a specific range where the beneficiary station is enhanced to be utilized . Microcontroller is the focal piece of the equipment circuit; it controls and empowers the working of the whole circuit, here transmitter circuit for this situation.

- Accepting of the information by the Getting station:-

On accepting the information from the transmitter circuit , the recipient sends the information to the controller IC of the appended arduino uno installed in the beneficiary circuit in computerized frame making the controller conceivable to do the modified activities for the checking of temperature level and CO2 level for flame identification.

- Show of the levels of temperature and CO2 level in site page available through privately made system:-

At the point when the information in regards to the temperature and the CO2 level are prepared in the IC of the recipient circuits Node Mcu which is modified with various library elements of the Ethernet shield interfacing making it conceivable to make a page in the privately made system naming ―Fire Security System‖ by the assistance of switch . The Node Mcu ethernet shield R3 (collected) permits an NodeMcu board to interface with the web. It

depends on the Wiznet W5100 ethernet chip (datasheet). The Wiznet W5100 gives a system (IP) stack equipped for both TCP and UDP . Arduino Ethernet Shield 2 interfaces your Node Mcu to the web in negligible minutes. Simply plug this module onto your nodemcu Board, interface it to your system with a RJ45 link with highlights like:-

- Working voltage 5V (provided from the NodeMcu Board)
- Ethernet Controller: W5500 with interior 32K support
- Association speed: 10/100Mb
- Association with esp8266 on SPI port

Aside from the over, a caution circuit has been made just to encourage the Fire security group to find the defenseless part at the earliest opportunity. This fire caution circuit will give alert just when the levels of the temperature will cross the preset esteem.

3.3. Stages of Design

The entire outlining of this IoT empowered woodland fire location and observing framework has been for the most part classified into 4 sections :-

- Interfacing and programming of LCD with Arduino
- Interfacing and programming of Collector and transmitter with Arduino
- Interfacing of Ethernet Shield with Arduino and making Taste condition by programming.
- Interfacing of sensors with transmitter

4. Conclusion

Early cautioning and quick reaction to a fire breakout are the main approaches to dodge incredible misfortunes and natural and social legacy harms. Hence, the most critical objectives in flame observation are fast and solid identification and restriction ofthe fire. It is substantially less demanding to stifle a fire when the beginning area is known, and keeping in mind that it is in its beginning periods. Data about the advance of flame is likewise profoundly profitable for dealing with the fire amid every one of its stages. In light of this data, the fire battling staff can be guided on focus to hinder the fire before it achieves social legacy destinations and to smother it rapidly by using the required putting out fires hardware and vehicles..

References

[1] Stipanicev D., Vuko T., Krstinic D., Stula M., Bodrozic L., " Forest Fire Protection by Advanced Video Detection System-Croatian Experiences", Split, Croatia, 2006

[2] 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, 2009

[3] Kovacs R., Kiss B., Nagy A., Vamos R., "Early Forest Fire Detection System For Vegetable Fire in the Aggtelek National Park", Budpest, Hungary,2004

[4] Kelha V., Rauste Y., Buongiorno A., "Forest Fire Detection by Satellites for Fire Control", European Space Agency, Finland, 2000

[5] Manyangadze T., "Forest Fire Detection for Near Real Time Monitoring using Geostationary Satellite", International Institute for Geo-information Science and Earth Observation, Enschede, Netherland, 2009

[6] 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, September 2006

[7] 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, September 2013

[8] P.J Vivek , G. Raju , S. Akarsh, "Forest Fire Detection System", International Journal of Innovative Research in Science, Engineering and Technology, ISSN: 2319-8753, Vol 3, Issue 6, June 2014

[9] Tao H., Zhang H., "Forest Monitoring Application Systems Based on Wireless Sensor Networks", Third International Symposium on Intelligent Information Technology Application Workshops, IEEE, 2009