

AN IOT AND WSN BASED SYSTEM FOR FOREST FIRE DETECTION

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Abstract – Enhancement of forest fire prevention and detection system can be considered as a main goal. Implemented to detect the occurrence of fire outbreaks over different forest areas. WSN based on IoT devices and sensors can be used to perform a real time environmental monitoring of the aforementioned forest fire risk factors. Web service and mobile application have been implemented aiming at activating environmental alerts

Keywords: IoT, WSN, Sensors, Zigbee, Embedded c, Relay, Node MCU.

1. INTRODUCTION

Forest fires often cause serious hazard to the environment and produce real emergency situations and natural misfortune. The reaction time of emergency corps greatly affects the reverberation and losses caused by them, so the enhancement of forest fire prevention and detection systems can be considered a main goal for conserving the environment. With respect to this, the real-time monitoring of certain environmental variables may make the forest fire precaution, recognition, and fighting more efficient. The main intention of the proposal here described is to approximation in short-term the existence of forest fire risks and to detect the recent happening of fire outbreaks over different forest areas. A wireless sensor network (WSN) based on Internet of Things (IoT) devices and sensors can be used to carry out a real-time environmental monitoring of the aforementioned forest fire risk factors. A particular model of IoT device provided with environmental sensors has been accomplished. The design and distribution have to be addressed aiming at covering as much forest areas as possible. A mobile application used to alert the forest officers.

based on radio-auditive sounding (RASS) system allowing remote temperature measurements and thermic sensing of a particular forest region.

Radars with fire watchtower, Acoustic sources. While auditive. Sources produce sound waves with a certain frequency and a certain power level, Radar continuously scans for acoustic waves. As is known, resound wave speed is affected by air temperature.

3. PROPOSED SYSTEM:

The proposed system consist of some sensors which is used to detect the analyze some parameters like temperature and smoke are detected by using respective sensors and Interfaced with micro controller to compare the real-time and pre-defined value. After analyzing the environmental condition, if any risk of forest fire is predicted by the system it will instantly start alert the forest officers by Alarm ,water sprinkle on the affected area and updating the details in IOT cloud platform to maintain the monitoring and all other data's.

2. EXISTING SYSTEM:

In this study, a radio-acoustic sounding system with fine space and time resolution potential for continuous monitoring and early noticing of forest fires is proposed. Simulations show that remote thermic plotting of a particular forest region by the suggested system could be a potential solution to the problem of early detection of forest fires.

The earliest possible spotting enables a rapid response to minimize the spread. Moreover, data regarding the seat of the fire is invaluable for the rapid deployment of fire-fighters.

An early noticing system for crown and surface wildfires

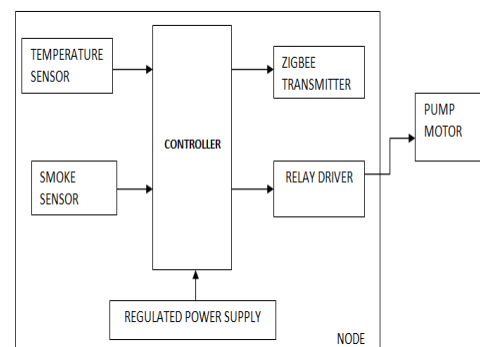


Fig 1: Transmitter block diagram

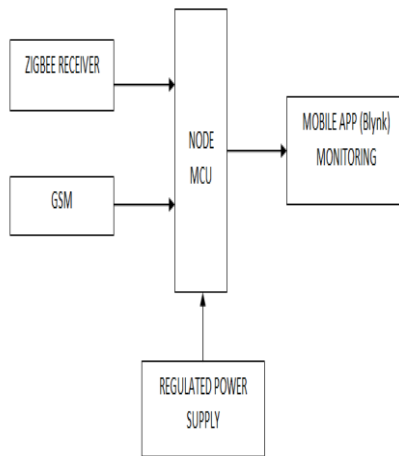


Fig 2: Receiver block diagram

4. HARDWARE COMPONENTS:

4.1 ARDUINO:

Arduino is an open source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs-light on sensor, a finger on a button, or a Twitter message-and turn it into an output-activating a motor, turning on an LED, publishing something online. Arduino consists of both physical programmable circuit board and a piece of software, or IDE that runs on your computer, used to write and upload computer code to the physical board.



Fig 3: Arduino Uno

Arduino Features:

- ATmega328p(datasheet)
- It has 14 digital input/output pins
- 6 Analog inputs 16MHZ ceramic resonator

4.2 SENSOR INTERFACING:



Fig 4 : Sensor interfacing

The sensors implemented in this system are described below:

4.2.1. TEMPERATURE SENSOR:

A temperature sensor is a device, typically, a thermocouple or resistance temperature detector, that provides temperature measurement in a readable form through an electrical signal

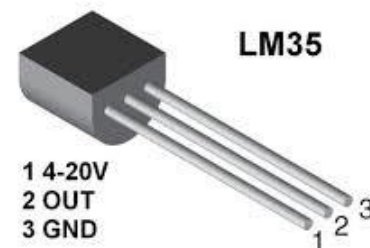


Fig 5: Temperature sensor

- Drain current is less than 60uA

FEATURES:

- Low cost temperature sensor
- Can measure temperature ranging from -55°C to 150°C

4.2.2. SMOKE SENSOR:

A smoke sensor or smoke detector is a device that can detect smoke, which may be an indicator of a fire. There are two basic systems: Simple, standalone sensors usually make a sound or flash a light when they detect smoke.



Fig 6: Smoke sensor



Fig 7: Relay

4.3 PUMP MOTOR:

Motor pump is a mechanical device, used to move the liquids/gases from one place to another by using mechanical action. The working principle of the water pump is, it converts the motor's energy from mechanical to fluid flow.



Fig 7: Pump Motor

Features:

- Belt-driven – The **pump** shaft is driven by a belt.
- Close coupled – The **pump**-end of these **pumps** is mounted directly on the **motor** shaft.
- End / bottom suction – **Pumps** which have centerline suction and discharge.

4.4. RELAY:

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit. The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation.

Features:

- Physical size and pin arrangement.
- Coil voltage.
- Coil resistance.
- Switch ratings (voltage and current)
- Switch contact arrangement (SPDT, DPDT etc)

4.5. ZIGBEE:

ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments and in isolated locations. ZigBee technology builds on IEEE standard 802.15.4 which defines the physical and MAC layers



Fig 8: Zigbee

Features:

- Low duty cycle – provides long **battery life**.
- Low latency.
- Direct Sequence Spread Spectrum (DSSS)
- Up to 65,000 nodes per **network**.

4.6. NODE MCU:

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications.



Fig 9: Node MCU

Features:

2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2)

- General-purpose input/output (16 GPIO)
- Inter-Integrated Circuit (I²C) serial communication protocol
- Analog-to-digital conversion (10-bit ADC)

5. SOFTWARE REQUIREMENTS

5.1. Embedded C

Embedded C has an important role in enabling the microprocessors and microcontrollers for performing preferable actions. It plays a crucial role in monitoring and controlling external devices. It has significant role in any embedded systems similar to hardware devices for desirable outcome.

6. WORKING:

This is a Embedded based system which is having smoke sensor, Heat sensor are connected with the Pic controller. The analog values are used to detect the accurate environment condition. Node MCU is used to upload the data continuously in cloud database for monitoring purpose. It consist of some sensors which is used to detect the analyze some parameters like heat, IR radiation, Air moisture content.

Temperature, infrared radiation and Air moisture values are detected by using respective sensors and Interfaced with micro controller to compare the real-time and pre-defined value. After analyzing the environmental

condition, if any risk of forest fire is predicted by the system it will instantly start alert the forest officers by Alarm.

7. CONCLUSIONS:

- Forest fires are a very serious problem in many countries, and global warming may contribute to make this problem worse.
- Experts agree that, in order to prevent these tragedies from happening, it is necessary to invest in new technologies and equipment that enable a multifaceted approach.
- Our future work will be based on studying and selecting the best classifiers after comparison of various Data aggregation techniques applied to detect fire in terms of precision, response time and energy.

8. REFERENCES

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