

DETECTING AND BUILDING AN ALTERNATIVE MEASURE AGAINST FIRE USING LORA

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Abstract - This project aims at detecting fire using sensors and LORA. Through this system we can achieve 24*7 surveillance. Here temperature and gas (carbon monoxide) level are detected and if it increases beyond a particular pre

-defined threshold value the buzzer will ring alerting that fire has occurred in a particular place or in a near by location. The temperature sensor used is LM35 and the gas sensor is MQ7. Here the sensors take data in the form of analog signals and converts it to digital signal using analogue to digital converter, it also uses relay system and displays the values on the LCD continuously.

1. INTRODUCTION

Fire accidents are common incidents all around the world most of the time this ends up in human life loss. This accidents can happen in any environment such as home, industries, cinemas etc. If accident occurs in an industrial environment the fatality of the situation is very high. Recently there was a case in Delhi, On 8 December 2019, a fire occurred at a factory building in a place called Anaj Mandi area of Delhi, India. The fire started in a workshop that produced school bags and shoes. The Delhi fire service department (DFS) received a call for help around 5:22 a.m. IST and reached the location within five minutes, but their entry to the building was prevented by the intensity of the fire and blockages to the entry points, and another case is about On 21 February 2019, wildfire broke out in the Bandipur tiger Reserve. Unlike in previous years, this is the first time the wildfire in Bandipur flared up earlier due to the sudden climatic change and rapid growth of dry grass and Lantana. Over 10,000 acres of forest in Bandipur area was destroyed. With the fire spreading rapidly due to sudden changes in climate,

2. EXISTING SYSTEM

In the existing paper[1] a fire and a smoke sensor is used to detect the presence of fire in the forest. A gps module is used to find the location of the fire.

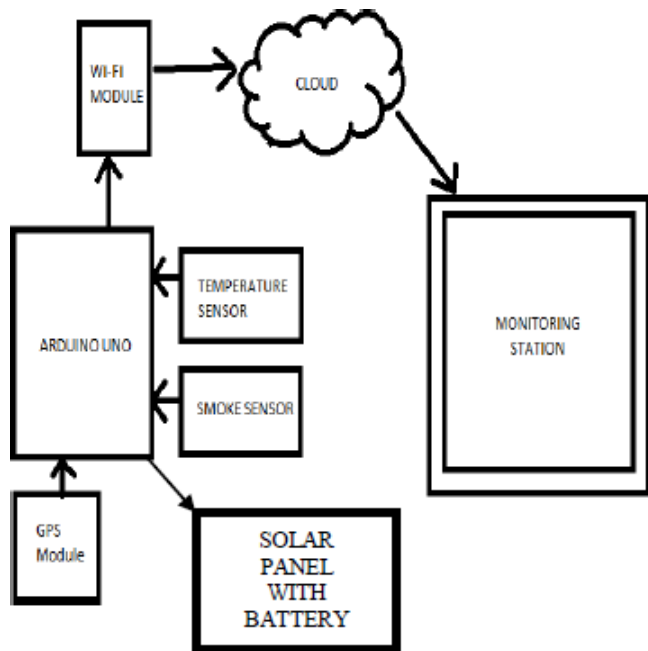
Power is obtained from an external source such as a solar battery which obtains energy from the sun. A Wi-Fi module is used to transfer the data via a cloud to the monitoring station. All of the modules are connected to the Arduino UNO. The drawback of this system is that, This system uses the Wi-Fi and the cloud with may not be feasible to use in all forest conditions. On the other hand there is no continuous monitoring and this system does not have an alarm or an alerting system.

the authorities closed the Gundlupet-Ooty National highway and safaris in Bandipur National Park were also canceled. Strong winds were making the job of fire fighters, forest staff and volunteers more difficult. Two Mi-17 Indian Air Force helicopters were deployed on 25 February 2019 afternoon to douse the fire, which had been raging for three days in the Bandipur Tiger Reserve. This can be solved by designing a general system to monitor any type of environment remotely or locally. This system is realized in this paper.

1.1 Related Works

The paper[1] on Forest Fire Alerting System With GPS Coordinates Using IoT written by Jayaram K, Janani K, Jeyaguru R, Kumaresh R, Muralidharan N, here the system uses alerting mechanism, a micro-controller is used to control the activities of the system.

Sensors are used to detect the fire in the forest, after detecting the fire the location of the fire is also been detected and the located is sent to a nearby forest officer. This is an IOT based system where the data is been continuously printed on the online page. On the other hand the paper[2] on Forest Fire Detection System Reliability Test Using Wireless Sensor Network and OpenMTC Communication Platform written by Anton Herutomo, Maman Abdurohman, Novian Anggis Suwastika, Sidik Prabowo are other such related papers.

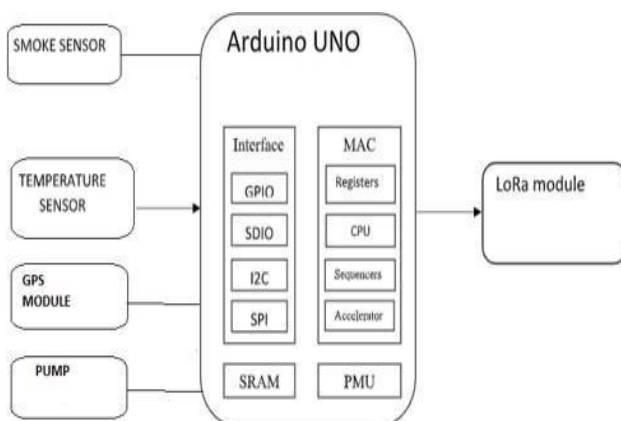


3. PROPOSED SYSTEM

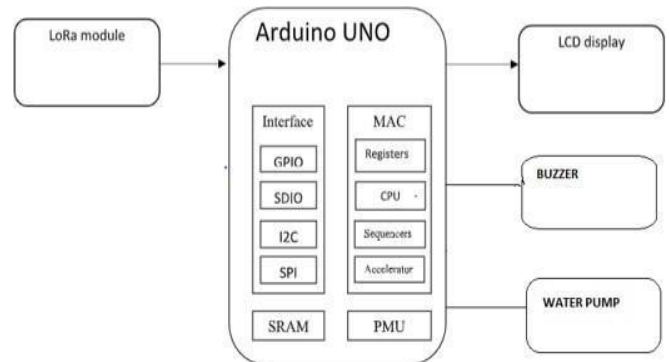
The proposed system aims at developing an efficient forest fire detecting system. Here the concept of LORA is used to develop our project. The idea of this project is to develop an efficient means of transporting data or readings without using internet or any form of cellular devices. Here LORA aims to achieve our idea to transport data on a long range, efficiently and in a secure manner.

There are six major components in this IOT system and they are sensor nodes such as temperature sensor and gas sensor. The other modules used here are arduino, GPS module, LORA device, buzzer, water pump and the LCD display. Two LORA devices are used here one for transferring data and the other for receiving data. So it makes the system sensor based detection and since it uses alarm it become an alerting system also.

Sensor node



Master node



4. HARDWARE SPECIFICATION

4.1 Arduino

The Arduino Uno is an open source microcontroller board, developed by Arduino.cc. The board consists of a sets of digital and analog input/output (I/O) pins which converts analogue signals to digital signals and in turn they are connect to other devices.

4.2 Gas Sensor

It is used to detect the presence of LPG. Also, it has quick sensitivity combined with a fast response time.

4.3 Temperature sensor

LM35 - Precision Centigrade Temperature Sensor. Resistance temperature detector otherwise called as thermocouple collects data about the temperature in the form of analogue signals in a continuous manner. This temperature sensor is used in a number of electronic devices and house hold applications. Here we use temperature sensor which is used to get continuous temperature from the surrounding.

4.4 GPS module

GPS is also called as Global positioning System is a navigation system used to find the location of a particular object. It was first used in the military but now it is used in smart phone, smart watches and so on. But in this project it is used to find the location of the device if there are a number of devices placed, here the output location is in terms of latitude and longitude.

4.5 Buzzer

Otherwise called as a beeper is a signal ling device where the signals are in the form of audio. This device has a alarm device, a timer and once the particular criteria is satisfied the buzzer starts to ring. Here, the buzzer is an output device which is used to alert the person who is monitoring

that there is a fire and it requires assistance.

4.6 LCD

Liquid crystal display screen is an output device which displays data in a 16*2 display screen. Once programmed, the values can be printed easily on the display and it is very easy to use and economical. The cursor position is set to print the particular value on the screen. The data obtained is converted into ASCII value which can be displayed on the LCD screen.

4.7 LORA

LORA is nothing but a long range transmission device which has revolutionized the field of IOT. Now a days LORA is becoming popular because of its efficiency to transmit data over a range of 20km and even more. Another advantage of LORA is that it uses wireless transmission and does not require WIFI or internet for transmission. So because of this it can be used in a number of rural areas. This device consumes very less electricity in comparison to other data transmission devices. The data transmitted from the device is highly secure and it can be easily programmed. Here LORA is used to transmit continuous data over a long range in the most efficient way possible.

5. SOFTWARE SPECIFICATION

5.1 Arduino Software (IDE)

The arduino integrated development environment contain a text editor and a number of sketches such as file, edit, tools, and help apart from this it contains a number of libraries language support board third party hardware multiple files preferences and so on. Here embedded c programming is used. In arduino two important functions are done, that is setup() and loop(). Here input and output are used to receive and send information respectively.

7. RESULT AND DISCUSSION

- ☑ This system is used for both local and global fire alert.
- ☑ Very low cost implementation.
- ☑ Consumption of very less electricity.
- ☑ Transmission of data is very long.
- ☑ Multiple devices can be connected to LORA.
- ☑ Continuous monitoring service is provided.
- ☑ The programming done in Lora is less complex.
- ☑ The transmission of data can be done in a secure manner.
- ☑ Future upgrades can be done due to its scalability.
- ☑ Lora has a highly intelligent architecture.

6. WORKFLOW

In this there are two Arduino devices which is connected to its corresponding LORA device. Where one is the LORA transmitter and the other is the LORA receiver device. The transmitter is connected to a number of sensors like the temperature sensor(LM35), gas sensor(MQ6) and the GPS module. In the beginning the LM35 takes in the temperature data from the surroundings in the form of analogue data and the analogue signals are then converted into digital signals by the arduino. Further more the data are then sent to the transmitter LORA (tx) this LORA then sends the signals to the receiver LORA (rx) which is placed in a different location with a maximum range of 20km where the signals are received and the arduino processes it further. The threshold values are set where, if the temperature value received crosses the threshold value the value will print on the screen and the buzzer will ring as an alert, if it does not exceeds it will continuously print the values on the LCD screen. The same happens with the gas sensor, if it surrounding carbon monoxide value increases beyond the pre set threshold value the alarm will ring and the values will print on the screen. If not it will continuously print the values on the screen. A water pump is also attached to the transmitter end and will spray water when all the required condition is satisfied.



7.1 Advantages

- It can be used to detect forest fire.
- Fire can be prevented remotely.
- Man less fire fighting.
- Fire can be prevented in the earlier stage.
- Fire is automatically alerted to department.

8. CONCLUSION

This paper presented, a fire monitoring system that can alert the user remotely using IOT. This paper has been designed and implemented successfully.

The system has been tested in deliberately created fire accident situation and response is very fast. In future we would like to expand the project by adding a number of LORA transmitter and connecting it as a network using a LORA gateway and the receiver would receive signals at which point fire as occurred.

9. REFERENCES

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