Forest Fire Detection using LoRa technology

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ABSTRACT

In remote forest areas, fire hazards are common. Despite a lot of backing as well as improvisation over firefight facility and tools , forest fires destroy the forest territory and endanger lives and properties due to late detection. Fire detection must be done quickly into avertbruise. In this article we propose a simple fire detection system using long range (LoRa) based technology.

The goal of this initiative is to identify forest fires without any delay using LoRa communication system.

Keywords: Internet-of-Things (IoT), LoRa technology, Arduino, sensors

INTRODUCTION

Forest fire is getting worse for all these days which can be detected and predicted using Arduino Uno based on WSN1. In this project, a temperature sensor, IR sensor is interfaced to Arduino detects the temperature and gas produced from the fire. The values are taken from the Sensor and is transmitted to the LoRa. Using GSM module, messages are limited and it requires network

So to solve this problem we used LCD for displaying the values and also employ nodemcu for better communication.

I. SYSTEM ANALYSIS

EXISTING SYSTEMS

- Fire alarm systems with buzzer
- Highly expensive monitoring systems

DISADVANTAGE

- It requires man power
- Accuracy of output is less

PROPOSED SYSTEM

- Arduino UNO based fire monitoring system
- Lora based alerting system
- Sensor based monitoring
- LoRa can be used for monitoring and alerting

ADVANTAGES

- Both local and global fire alert is provided
- Very low cost implementation
- Also camera based detection can be provided as failsafe in case sensors malfunction

SYSTEM REQUIREMENTS

Arduino IDE

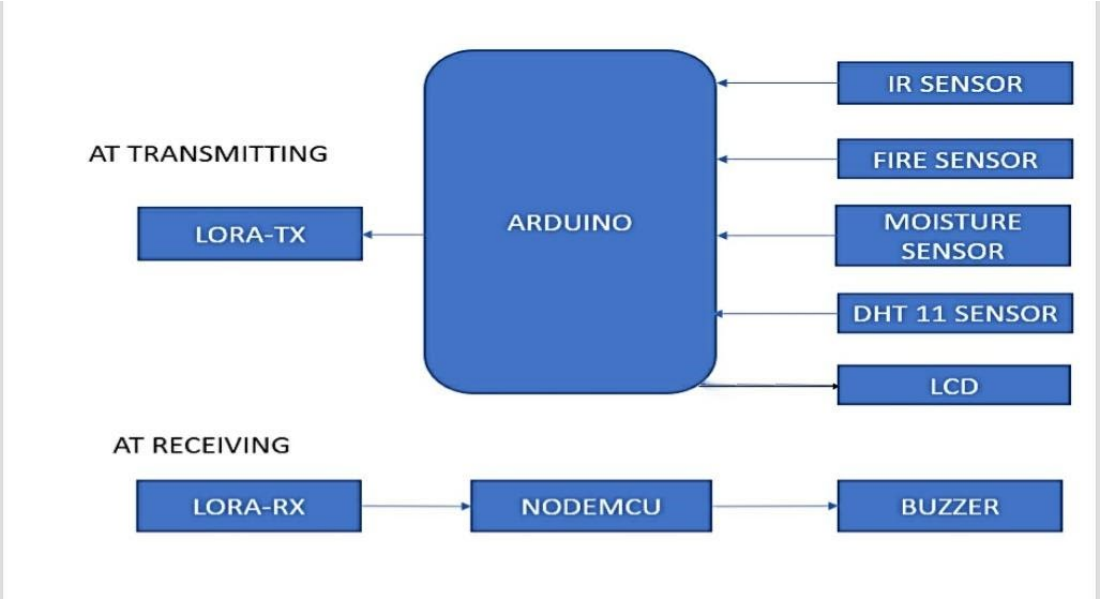


Fig 1. BLOCKDIAGRAM

II. SYSTEM DESIGN AND SOFTWARE

HARDWARE REQUIREMENT

- Arduino Uno
- LoRa Module
- NodeMCU
- Moisture Sensor
- IR Sensor
- Fire Sensor
- Buzzer
- I2C LCD
- DHT 11

HARDWARE DESCRIPTIONS

A. LoRa Module

LoRa devices and networks just like the LoRaWAN alter wise IoT applications in many tough areas such as: energy management, natural resources reduction, pollution management, infrastructure efficiency, and disaster interference. Semtech's LoRa devices have congregate several hundred proverbial use cases for wise cities, homes and buildings, communities, metering, provide chain and provision, agriculture, and more.Semtech corporation is that the leader in LoRa wireless technology and intrinsically have introduced sort of LoRa RF modules for the market. especially, the SX127x family of RF transceivers for the IoT/M2M markets. These RF modules operated between 860-1000 rate and 137- 960MHz. Semtech to boot offers analysis and testing devices at 860MHz band. 865 rate to 867 rate LoRa band with 865.0625 MHz, 865.4025 MHz, 865.985 rate frequency channels ar used in Asian country. LoRa wireless technology plays a key role at intervals the IoT market in interconnecting devices to form wise cities, industrial and industrial solutions, whereas reducing the restrictions from totally different wireless technologies like power and other overheads.

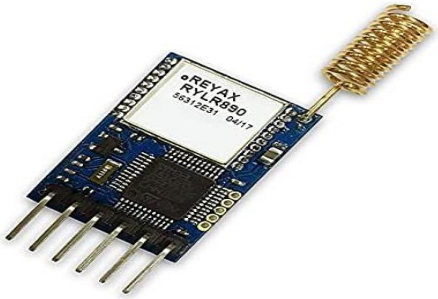


Fig 1: LoRa module

B. Arduino UNO

Fig 2: Arduino Uno

The Arduino Uno is degree American Standard Code for Information Interchange computer file microcontroller board supported the MicrochipATmega328P microcontroller and developed by Arduino.cc. The board is supplied with sets of digital and analoginput/output (I/O) pins which is able to be interfaced to various growth boards (shields) and totally different circuits. The board has fourteen Digital pins, six Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a sort B USB cable. It area unit typically steam-powered by the USB cable or by degree external 9-volt battery, though it accepts voltages between seven and twenty volts. it's to boot just like the Arduino Nano and designer. The board area unit typically programmed for any application through a bunch of directions to the microcontroller, exploitation the Arduino language (based on Wiring), and so the Arduino package (IDE), supported method.

C . DHT11:

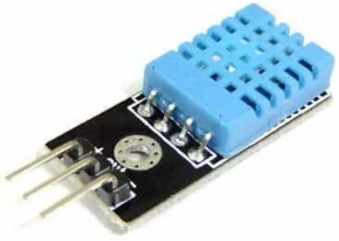


Fig 3:DHT 11 sensor

DHT11 may well be a inexpensive digital detector for sensing temperature and wetness. This detector area unit typically merely interfaced with any micro-controller like Arduino, Raspberry Pi etc… to measure wetness and temperature in a very flash. This detector is utilized here to look at the wetness variation of the environment where the fireplace is detected this can be often a digital detector and measures the wetness price in share format.DHT11 wetness and temperature detector is on the market as a detector andas a module. the excellence between this detector and module is that the pull-up device and a power-on semiconductor device. DHT11 may well be a magnitude relation

detector. To measure the encircling air this detector uses a thermistor and a physical phenomenon wetness detector.

D. NodeMCU

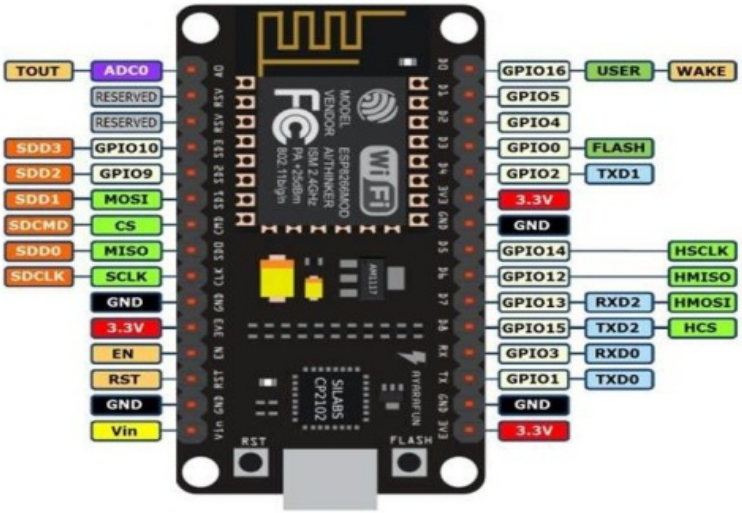
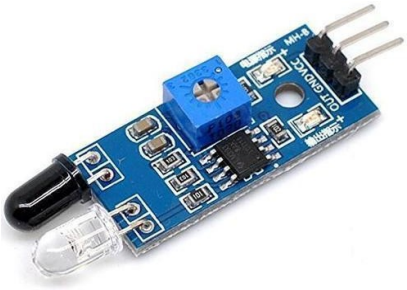


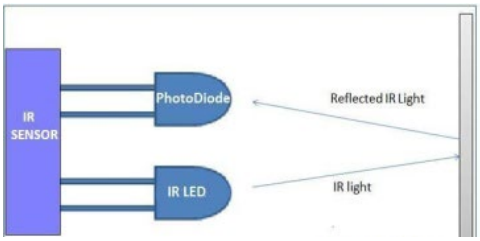
Fig 4:NodeMCU

The NodeMCU (Node MicroController Unit) is degree American Standard Code for Information Interchange computer file package and hardware development surroundings designed around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and created by Espressif Systems, contains the crucial parts of a computer: hardware, RAM, networking (WiFi), and even a up to date software package and SDK. that produces it a beautiful various for internet of Things (IoT) comes of each kind.

E. IR sensor

An infrared detector is degree device that emits therefore on sense some aspects of the atmosphere. degree IR detector can live the heat of degree object nonetheless as detects the motion





SOFTWARE

A. ARDUINO IDE

Download Arduino Integrated vogue surroundings (IDE) from https://www.arduino.cc/en/Main/Software Once the Arduino IDE is place in, opens into a blank sketch where we'll begin programming. First, we tend to should always assemble the board and port settings to allow America to transfer code. Connect your Arduino board to the pc via the USB cable, and next follow the below steps

* Board Setup
* COM Port Setup
* Uploading of sketch

Download and install Arduino IDE(https://www.arduino.cc/en/Main/Software)

1. introduce your Arduino Board
2. select the proper board at intervals the IDE (Tools>Boards>Arduino Uno)
3. select the proper COM port (Tools>Port>COMx (Arduino Uno))
4. Open the “Blink” sketch(File>Examples>Basics>01.Blink)
5. Press the transfer button to transfer the program to the board
6. ensure that your board is functioning as expected by perceptive semiconductor device

B. THINGSPEAK

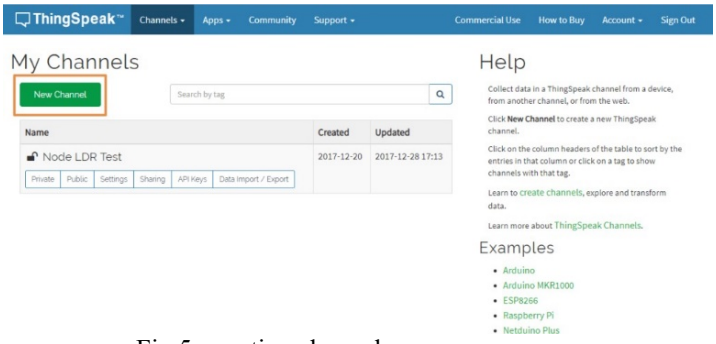


Fig 5 :creating channel

Thing Speak is degree American Standard Code for Information Interchange computer file IoT application and API to store and retrieve info from Hardware devices and Sensors and develop IoT applications.Also, the platform provides apps to analysis and visualize info. It uses protocol Protocol over the online or network for its communication. The MATLAB analytics is encircled to analysis and visualize the data received from Hardware or detector Devices. we'll turn out channels for each and every detector info. These channels area unit typically set as personal channels or share the data in public through Public channels.

How to turn out degree Account

Step 1: attend https://thingspeak.com/and turn out your ThingSpeak Account if you don’t have. Login to Your Account.

Step 2: turn out a Channel by clicking ’New Channel’.

Step 3: Enter the channel details.

Name: Any Name

Description: optional

Field 1: strength LDR – this will be displayed on the analytics graph. If you'd like over one Channels you will be ready to turn out for adscititious detector info..

Step 4: presently you will be ready to see the channels. Click on the ‘API Keys’ tab. Here you'll get the Channel ID and API Keys. Note this down.

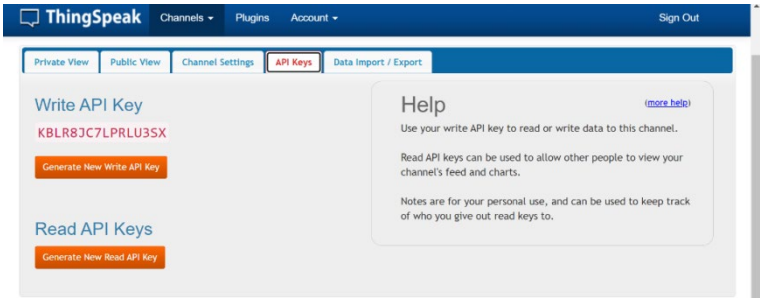


Fig6:API Keys

Step 5: Open the Arduino IDE and Install the Thing Speak Library try and do this visit Sketch>Include Library>Manage Libraries. seek for ThingSpeak and install the library.

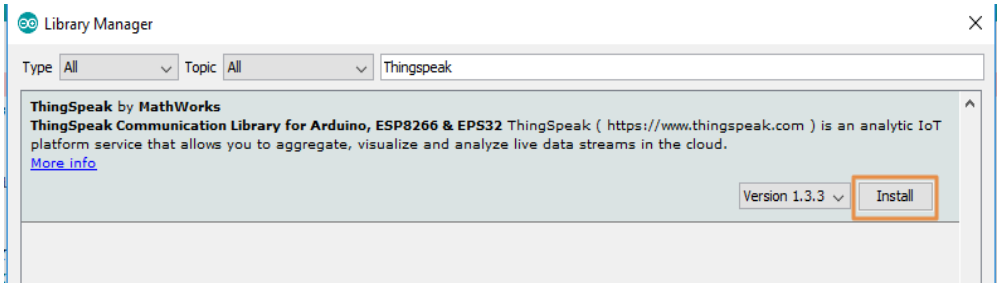


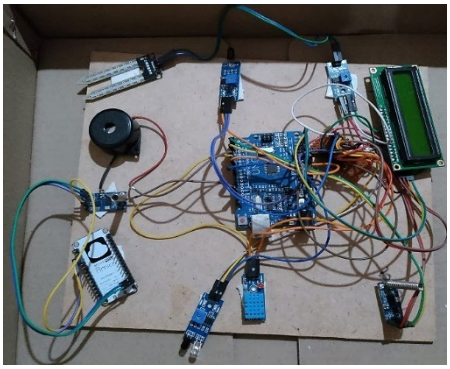
Fig7 : library installing

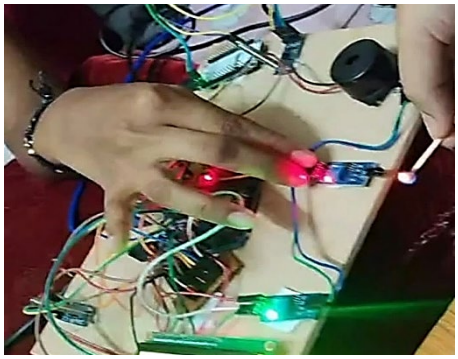
Step 6: Click **Save Channel** at the bottom of the settings.

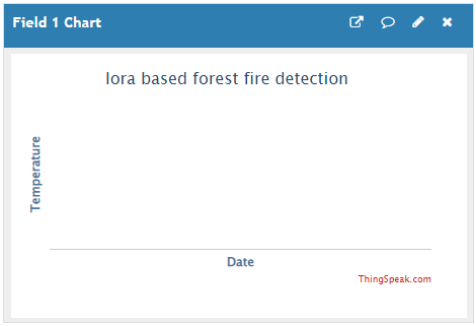
Step 7: Enter the code in Arduino ide (Arduino)

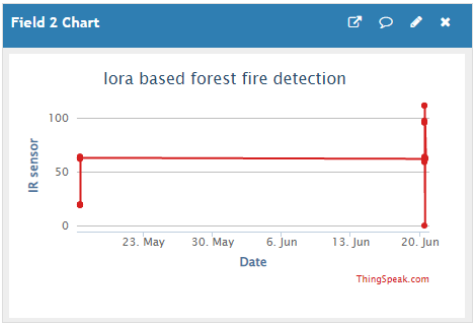
Step 8 : Similarly enter the code for Nodemcu in think speak

III. Results









IV. CONCLUSION & FUTURESCOPE

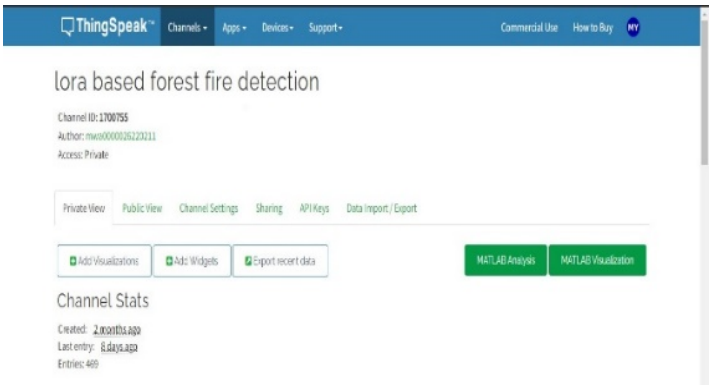
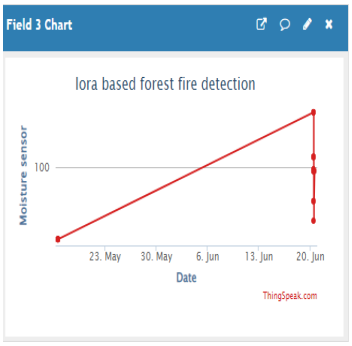


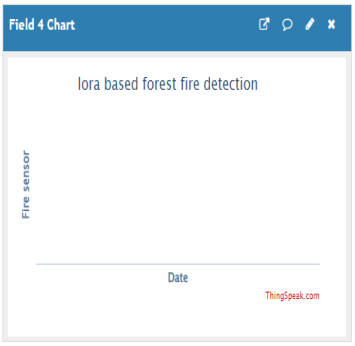
Fig 8

This study described as fire monitoring system uses a wireless sensor network to inform the user remotely. This system was successfully created and implemented. The technology has been tested in a simulated fire disaster environment and has proven to be quite responsive.

Efficiency can be improved by using more accurate sensors and GPS receivers and to predict the disaster .

This system can be used in schools, colleges, offices and industries for any fire, gas leakage.





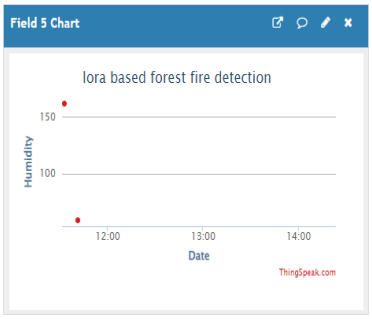


Fig 9 **Fig10**

VI .REFERENCES

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