SmartInternz

Industry certificate Program

Project By

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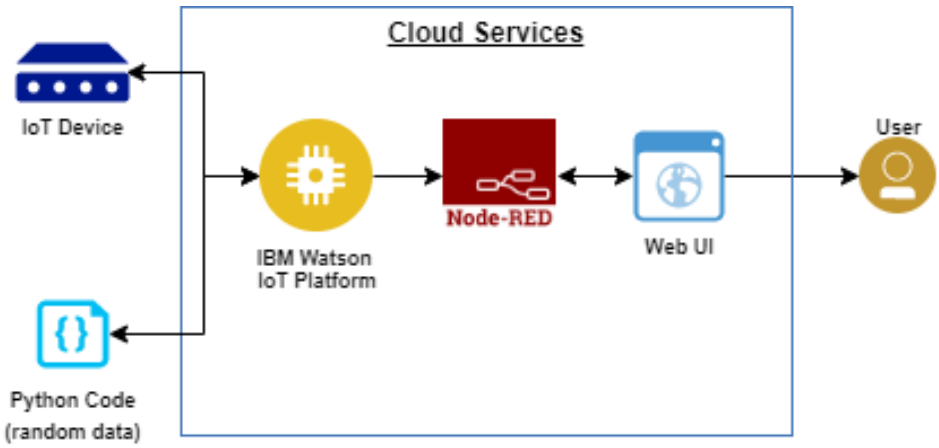
Project Title

Forest Fire Detection Based On IOT

Features:

- Forest fires represent a real threat to human lives, ecological systems, and infrastructure.
- We can develop smart techniques for detecting forest fires to preserve the forest.
- The forest is integrated with the wireless sensor network to detect fire and smoke.
- All the parameters are stored in the cloud platform and the admin will be given a mobile app using which he can monitor all the parameters.
- Emergency alerts are notified to the authorities and Fire station
- If any flame is detected the fire emergency alarm will active.
- We can monitor temperature, humidity, fire, and smoke levels



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1. Introduction

In older days, manually fire detection approach is used. In current days, satellite-based surveillance system is used to detect forest fire but this works when fire is spread in the large area. So these techniques are not efficient and solving this is the main aim of this project. Here I have created an early fire detection model with the help of IBM IOT Platform and required sensors. Centralized server is used for storing the data and analysing that data. Then, an alert message is sent to the admin and to the people within the proximity.

a. Overview:

One of the common hazards that happens in the forest is Forest fire (wildfire). The fire monitoring process inculcates three phases:

1. pre-fire (take appropriate action for fire control),
2. during fire (detection of fire and planning to control fire),
3. post-fire (damage assessment and mitigation planning).

Here the work is done on "during fire" detection using IOT.

b. Purpose

Currently approximately 80% losses are accrued in the forest due to the late detection of fire. So to overcome this problem, we use the Internet of things technology. Early cautioning and quick reaction to a fire breakout are the main approaches and hence connecting technology with data provided by sensors can aid this process.

2. Literature Survey

	Research paper	Overview	Advantages
1	IoT based forest fire detection system M. Trinath Basu1*, Ragipati Karthik2 , J. Mahitha3 , V. Lokesh Reddy4	Node Mcu is interfaced with a temperature sensor, a smoke sensor and signal. Buzzer associated with Arduino gives us an alert sign.	This framework is extremely helpful at whatever point the client isn't in the closeness of control focus.
2	An integrated fire detection system using IoT and image processing technique for smart cities Author links open overlay panelAmitSharmaPradeep KumarSinghYugalKumar	It is a combination of wireless sensor technologies, UAVs, and cloud computing. Some image processing techniques are also integrated into the proposed fire detection system to identify the fire event with better accuracy and used as an integrated solution. To improve the true detection rate, rules are also designed.	It is observed that the proposed system has a higher fire detection rate to improve the true detection of forest fire from 95 to 98 percent.

a. Existing problem

Forest fires are hazardous given that they are the a huge contributing factor of loss of biodiversity and extinction of plants and animals. loss of wildlife habitat and depletion of wildlife. loss of natural regeneration and reduction in forest cover and global warming. Hence detection of forest fires stand as the problem statement of this document.

b. Proposed solution

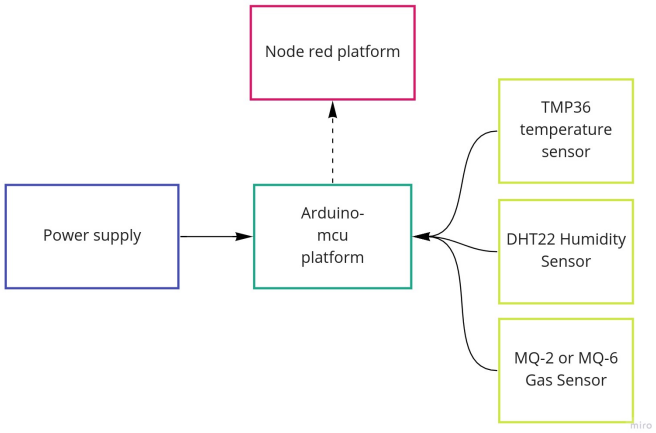
IBM IOT service with Node red to manage the sensor data
IBM Cloudant db to store sensor data
MIT App inventor to develop app for admin side
Node red dashboard to check charts
Sensors

1. The temperature sensor detects the warmth (temperature greater than 800 degrees Celsius)
2. Humidity sensor detects sharp increase in water vapour which increases when water inside the burning object evaporates
3. Smoke sensor detects any smoke produced because of fire or because an object is burning

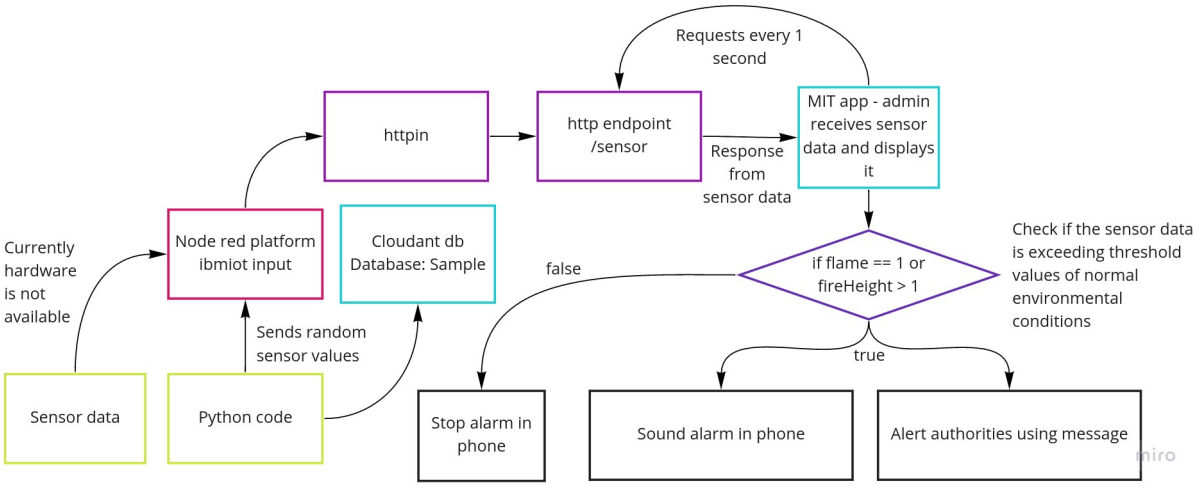
3. Theoretical Analysis

a. Block diagram

1. Hardware



2. Software



b. Hardware / Software designing

Hardware

1. **TMP36** temperature sensor
2. **DHT22** Humidity Sensor
3. MQ-2 or MQ-6 Gas Sensor
4. Node Mcu
5. RF module(receiver and transmitter)

Software

1. Node red IBM platform
2. Cloudant DB
3. MIT App inventor
4. Python code
5. Web app

4. Experimental Investigations

4 cases are handled here:

a. When there is no flame and no fire - alarm off
b. When there is flame and fire - alarm on
c. When there is no flame but fire - alarm on
d. When there is flame and no fire - alarm on

5. Advantages & Disadvantages

a. Advantages:
   i. This framework is extremely helpful at whatever point the client isn't in the closeness of control focus.

ii. 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..
iii. It is a minimal cost framework, the only cost that will be required is that of sensors, rest every software used from IBM cloud platform is free for the first instance.

b. Dis-advantages:
i. Chances of having false positives.
ii. Since the sensors are in the forest, there are chances that we won't be able to place them in the highly unreacheable parts of the forest.
iii. Wildlife present in the forest might tamper with the sensors.
iv. Sensors could stop working in the middle.
v. Battery power to arduino won't be sufficient and will need continuous replacement to ensure the hardware system is working.

6. Future Scope

a. Using satellite detection for confirming the fire
b. To better analyze the flames and fire to prevent false positives, using neural networks and deep learning algorithms to analyze the images taken at random points of the forest would improve the ability of the entire system making it reliable

7. Bibliography

a. https://node-red-wekbz-2021-07-29-pragatidevice.eu-gb.mybluemix.net/
b. https://appinventor.mit.edu/
c. https://www.researchgate.net/profile/Trinath-Miriyala/publication/324054113_IoT_based_forest_fire_detection_system/links/5ce7c459458515712ebdc6fd/IoT-based-forest-fire-detection-system.pdf
d. https://www.researchgate.net/publication/324054113_IoT_based_forest_fire_detection_system
e. https://create.arduino.cc/projecthub/Aritro/smoke-detection-using-mq-2-gas-sensor-79c54a

8. Appendix

a. Source code

Python code (below credentials will be destroyed after some time)

```
import wiotp.sdk.device
import time
import random


from ibmcloudant.cloudant_v1 import CloudantV1
from ibmcloudant import CouchDbSessionAuthenticator
from ibm_cloud_sdk_core.authenticators import BasicAuthenticator


authenticator = BasicAuthenticator('apikey-v2-1nwejm8ytwf942jovbc22ypplmjcgqzxkmk9kzuqb5de',
'3b70fd2e1a2e6331a9807bf4bbd9483f')


service = CloudantV1(authenticator=authenticator)


service.set_service_url('https://apikey-v2-1nwejm8ytwf942jovbc22ypplmjcgqzxkmk9kzuqb5de:3b70fd2e1a2
e6331a9807bf4bbd9483f@d1cf88ff-d098-4502-8be4-2bc64779192b-bluemix.cloudantnosqldb.appdomain.cloud')


myConfig = {
    "identity": {
        "orgId": "fhmboz",
        "typeId": "PragatiDevice",
        "deviceId":"12312"
    },
    "auth": {
        "token": "njwe9hfaidn1"
    }
}


def myCommandCallback(cmd):
    t = cmd.data['text']
    print("printing: - - - ", t)
    print()


client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()


while True:
    temp=random.randint(100,800)
    hum=random.randint(0,100)
    flame=0
    fire=0


    # Scenario when fire is present
    if(temp>400 or hum>80):
        temp=random.randint(400,800)
        hum=random.randint(80,100)
        flame=random.randint(0,1)
        # flame=1
        if(flame):
            fire=random.randint(1,3)
    myData={'temperature':temp, 'humidity':hum, 'flame': flame, 'fireHeight': fire}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
```

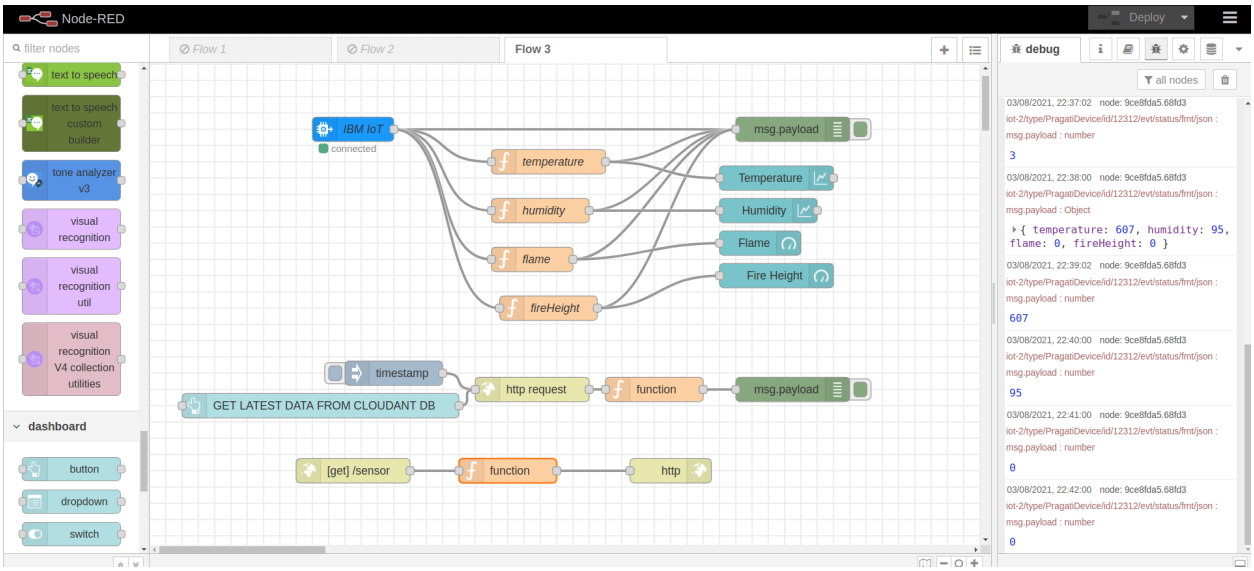
```
        print("Published data Successfully: ", myData)

        response = service.post_document(db='sample', document=myData).get_result()
        print("Data stored in Cloudant __________",response)

        client.commandCallback = myCommandCallback
        time.sleep(1)
client.disconnect()
```

Endpoints

To send sms
https://www.fast2sms.com/dev/bulkV2?authorization=BzIEYaPMrC2fjiJRpkocZqdgXKQ8e7StAyHmsnbOG3W5UD10x9Mxu1yrjfQIpD4EFOGU6YT5nWkH3ieR&route=q&message=Fire%20alert!%20&language=english&flash=0&numbers=9663570543

To connect to Node red platform
https://node-red-wekbz-2021-07-29-pragatidevice.eu-gb.mybluemix.net/sensor

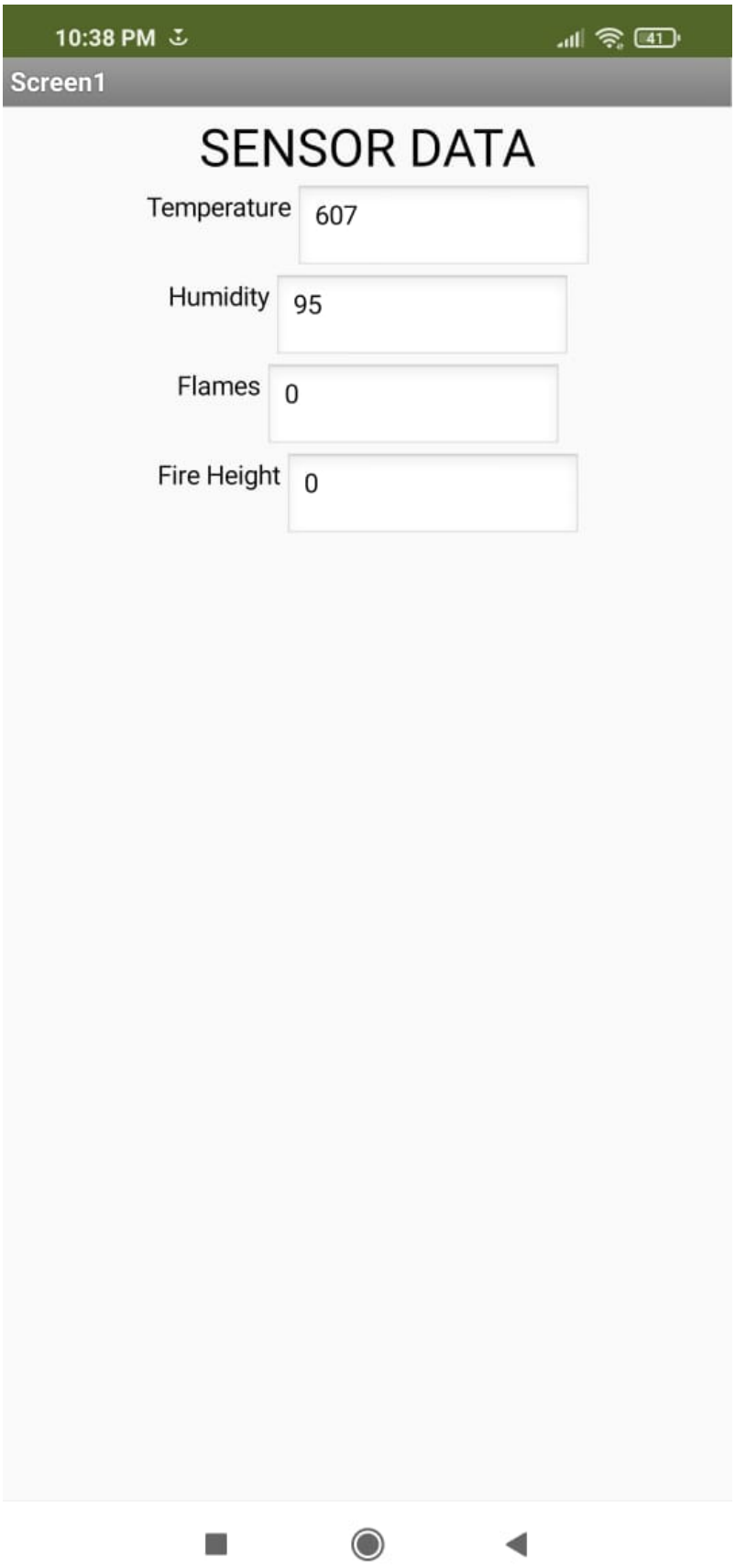
Cloudant DB data
https://d1cf88ff-d098-4502-8be4-2bc64779192b-bluemix.cloudant.com/sample/_all_docs?include_docs=true&descending=true&limit=1



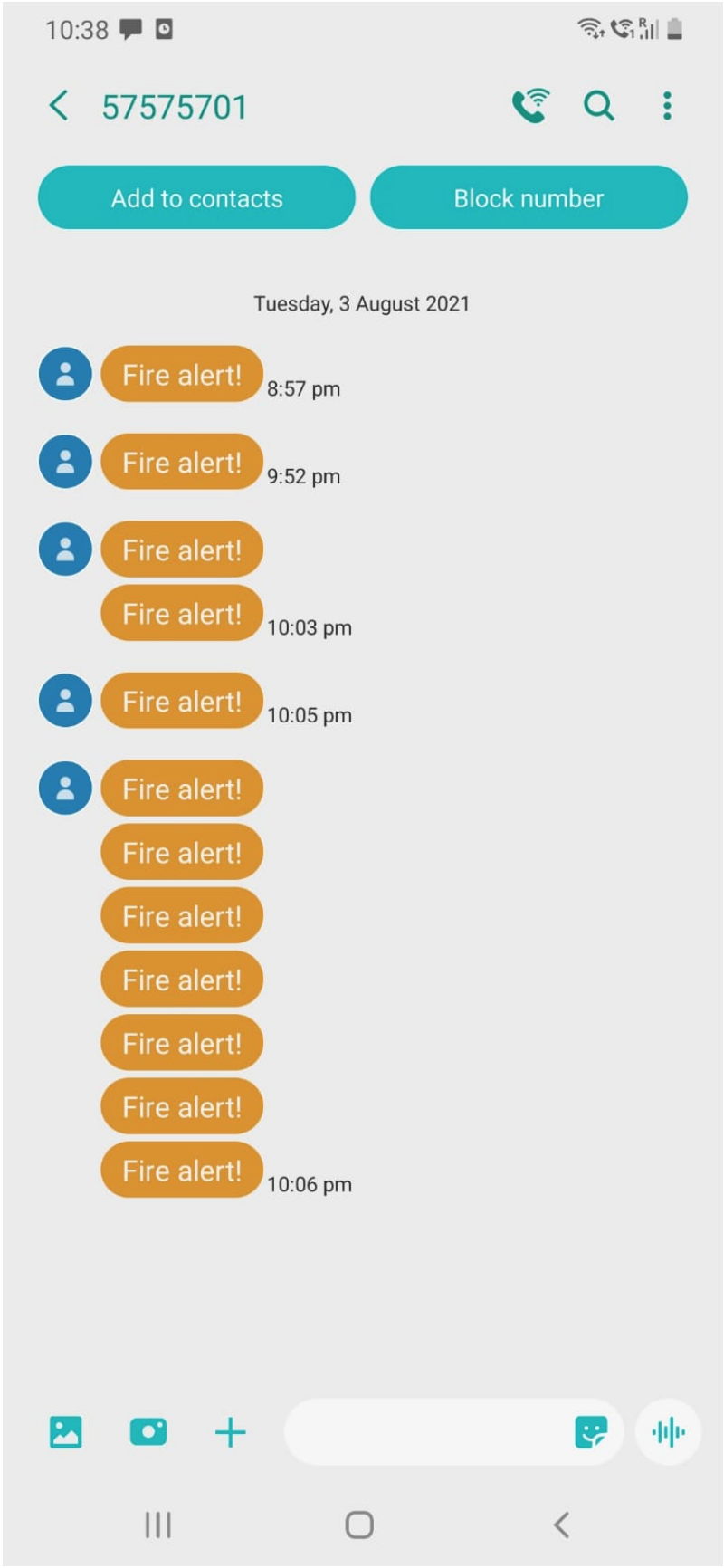
b. UI output Screenshot.

3 types of users UI:

User 1: Admin


10:38 PM
41
Screen1
SENSOR DATA
Temperature
607
Humidity
95
Flames
0
Fire Height
0

User 2: Authorities


10:38
57575701
Add to contacts
Block number
Tuesday, 3 August 2021
Fire alert!
8:57 pm
Fire alert!
9:52 pm
Fire alert!
Fire alert!
10:03 pm
Fire alert!
10:05 pm
Fire alert!
Fire alert!
Fire alert!
Fire alert!
Fire alert!
Fire alert!
Fire alert!
10:06 pm

User3: Real time monitoring stats - web app (Node red dashboard)