SMART CAMPUS BASED ON IOT

An IOT Project Report

Submitted
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INTRODUCTION

A Smart Campus uses advanced network infrastructure and internet-connected devices to provide supportive and engaging experiences. It joins people, devices and applications and allows universities to make insight-driven decisions to improve security and maximize resources.

A. OVERVIEW

A Smart Campus actively learns from and adapts to the needs of its people and place, unlocking the potential of e-technology and enabling world-changing learning and research methodologies. Also to create an environment friendly atmosphere enabled with technology is the main goal of a smart campus. It is a modern application in the standard of the internet of things.

A smart campus is achieved by integrating sustainability to every component of an institute including building structures, renewable resources, digitalization through internet of things (IoT), bringing together the institute, stake holders, faculty and external members to understand the necessity of a sustainable and environment friendly campus.

In this project we mainly focus on making smart notice board and to do power saving by making the process of switch ON and OFF of lights and fans in a room where there is no use.

B. PURPOSE

The idea of building a “smart campus” implies that the institution will adopt advanced ICTs to automatically monitor and control all the facilities on campus.

The students and staff members will benefit from location-aware services for using campus equipment and collaboration services. This will add values for students and increases the attractiveness of the campus. New emerging technologies have changed human lifestyles dramatically. The smart campus implements an IoT-based system to a selected part of campus like the Campus Environment, Campus Security, Campus Parking, Campus Building, Campus offices, and classroom to create smart environment, smart security, smart building, smart parking, smart offices, and smart classrooms.

Our main purpose of doing this project is to reduce the effort of conveying official information from college higher official’s desk and to save power.

LITERATURE SURVEY

A. EXISTING PROBLEM

In today’s busy life every work need to be fast and should get completed within no time. Electricity is a major crisis in today’s world. We need to use it carefully. We need to take proper measures to save electricity. In our day-to-day life we use more electricity for lights and fans. We often forget to switch them OFF when not in use. Due to this a lot of power wastage happens. Also there is another common problem. If we want to send any information to all the students and teachers, a peon goes to every classroom and conveys the information. This process takes a lot of time. Also all the pupil may not get the information conveyed properly. In order to avoid this problem, we have introduced a new system using IOT.

B. PROPOSED SOLUTION

To eradicate the problem of power wastage we’ve introduced a solution namely “smart automation”. Smart Automation consists of controlling when the light and the fans will turn ON or OFF,

here we are using PIR (passive infrared) sensors which are used for motion detection, PIR sensors can detect motion its range of 120 degrees and up to 7 meters. When motion is detected the sensors gives logical high as its output and the fans and lights are turned on, once there is no motion logical zero output is obtained, fans and lights are turned OFF.

Also to eradicate the problem of conveying information, we have used a web application by which a message by a higher official like HOD, Vice Principal or Principal can just give the command in the web application and it is converted into text and all the students and teachers come to get the information within no time due to smart notice boards installation.

THEORETICAL ANALYSIS

A. BLOCK DIAGRAM

B. HARDWARE / SOFTWARE DESIGNING

Software designing:

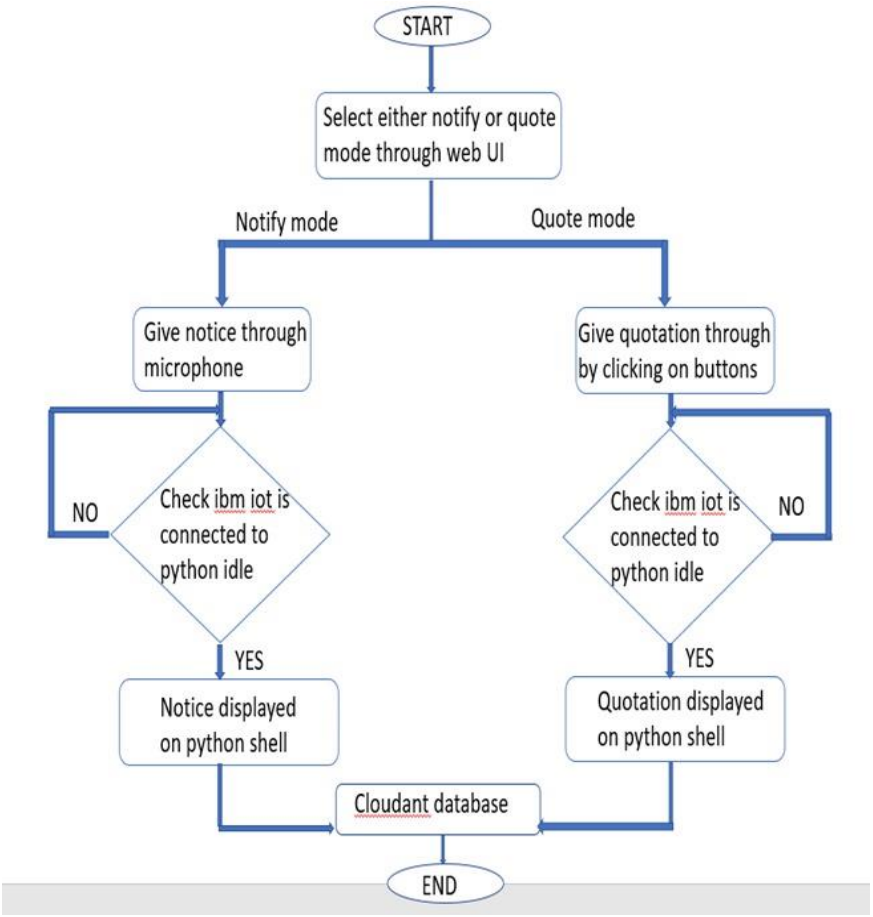
- Code for Text To Speech
- Code for IBM Watson Platform

EXPERIMENTAL INVESTIGATIONS

- The Internet of things (IoT) is a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.
- The IoT can assist in the integration of communications, control, and information processing across various transportation systems. Application of the IoT extends to all aspects of transportation systems (i.e. the vehicle, the infrastructure, and the driver or user). Dynamic interaction between these components of a transport system enables inter- and intra-vehicular communication, smart traffic control, smart parking, electronic toll collection systems, vehicle control, safety, and road assistance. For example, an IoT platform can continuously monitor the location and vacancies of spaces in parking.
- This can only be possible with the IoT and its seamless connectivity among devices. Sensors such as GPS, Humidity, and Temperature send data to the IoT platform and then the data is ANALYSED and then sent to the users. This way, users can track the real-time status of vehicles and can make appropriate decisions. The smart parking system is an IOT based device which is

capable of automatic sensing of vehicles. ALSO, the data of sensors will be displayed in graphical form on.

FLOWCHART



RESULT

Text To Speech code:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import json
from gtts import gTTS
import os

#Provide your IBM Watson Device Credentials
organization = "iwl46m"
deviceType = "iotsensors"
deviceId = "1002"
```

```
authMethod = "token"
authToken = "9?s+!f4O3bo8Ii&sV*"




# Initialize the device client.
notice=" "
def myCommandCallback(cmd):
      print("Command received: %s" % cmd.data['command'])
      notice=cmd.data['command']
      language='en'
      output=gTTS(text=notice,lang=language,slow=False)

      output.save("output.mp3")

      os.system("start output.mp3")




try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method":
authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................

except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting"
10 times
deviceCli.connect()

while True:
      time.sleep(1)
      deviceCli.commandCallback = myCommandCallback
      time.sleep(5)
      p=random.randint(0,1)

      if p==1:
        print("switch on")
      else:
```

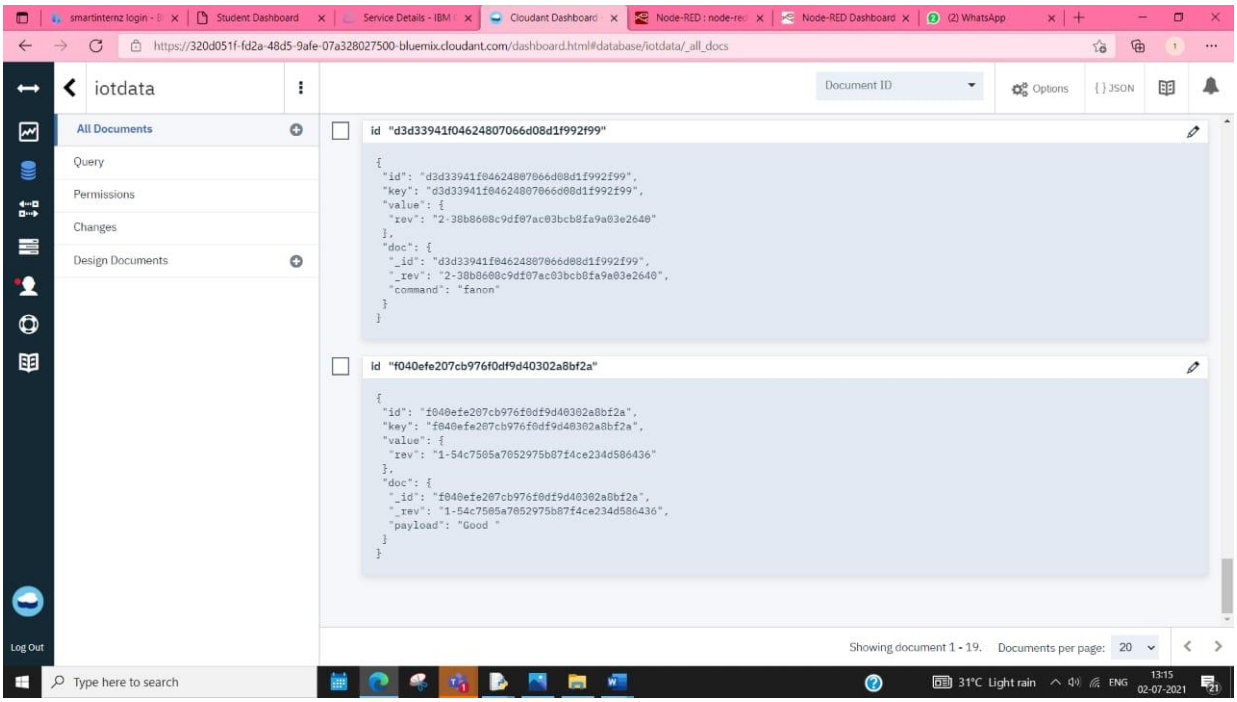
```
        print("switchoff")



# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

IBM Watson Sensor Code:

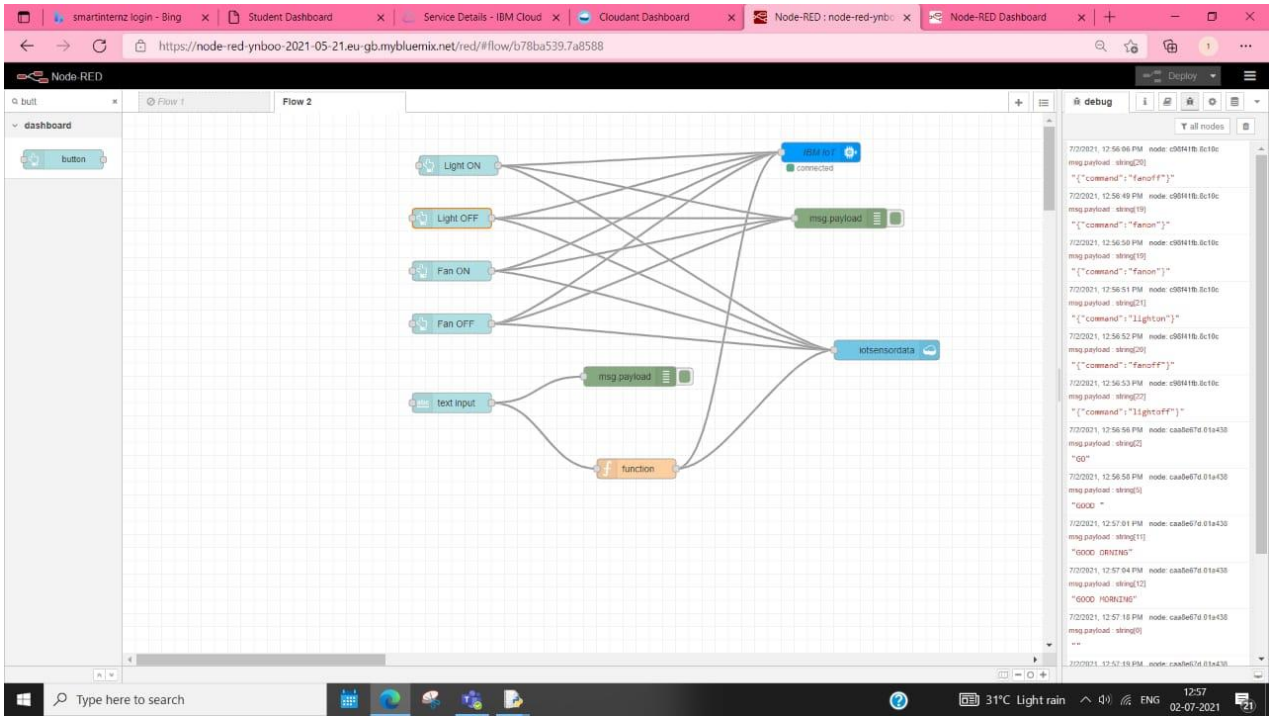
```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import json

#Provide your IBM Watson Device Credentials
organization = "iwl46m"
deviceType = "iotdevice"
deviceId = "1001"
authMethod = "token"
authToken = "1234567890"


# Initialize the device client.
T=0
H=0

def myCommandCallback(cmd):
      print("Command received: %s" % cmd.data['command'])


      if cmd.data['command']=='lighton':
            print("LIGHT ON IS RECEIVED")


      elif cmd.data['command']=='lightoff':
            print("LIGHT OFF IS RECEIVED")

      if cmd.command == "setInterval":
            if 'interval' not in cmd.data:
                  print ("Error - command is missing required information: 'interval'")
            else:
                  interval = cmd.data['interval']
      elif cmd.command == "print":
            if 'message' not in cmd.data:
                  print("Error - command is missing required information: 'message'")
            else:
```

```
            print(cmd.data['message'])

try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................

except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()

while True:
    T=23
    H=45
    #Send Temperature & Humidity to IBM Watson
    data = {"d":{ 'temperature' : T, 'humidity': H }}
    print (data)
    def myOnPublishCallback():
      print ("Published Temperature = %s C" % T, "Humidity = %s %%" % H, "to IBM Watson")

    success = deviceCli.publishEvent("Data", "json", data, qos=0, on_publish=myOnPublishCallback)
    if not success:
      print("Not connected to IoTF")
    time.sleep(1)

    deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

Cloudant Database:



Node-red:



ADVANTAGES & DISADVANTAGES

Advantages

- Reduces operational costs.

- Supports Data-Based Decisions.
- Boosts university reputation.
- Easier accessibility to information.

Disadvantages

- Whenever there are errors, debugging is difficult.
- When we use hardware components to integrate the smart campus, smart notice board doesn't work during power failures.
- Costs are high for technology, as well as the needed maintenance costs.

APPLICATIONS

- Intelligent system using sensor.
- Interoperability and control ability.
- Smart ID cards/ smart payments.
- Building automation.
- Smart lighting.
- Smart transit and parking.
- Location based services.

CONCLUSION

These kinds of systems are required in the university campus as the area is very large and number of rooms is also large. And human can make mistakes and forget to switch off the appliances when in no use and in this case, these systems are useful in order to increase the power efficiency. The system can be viewed as a future of artificial intelligence. This is a powerful and dependable system. It fulfils the goal of energy saving and helps in achieving the efficient use of energy re-sources. Study of various papers gives a better option of Wi-Fi enabled processor instead of Bluetooth and ZigBee for communication and also to process the sensor data. Hence, due to survey it became possible to make power efficient, cost efficient, fully automated system. This system is taking a step forward towards the goal of increasing the technological advancement and Smart City.

FUTURE SCOPE

The future research in IoT may concentrate on the challenges and issues discussed in the paper.

• Security is a major concern in the proposed environment integrating the different business applications. Security architecture for the proposed work may be designed in future to give integrated solutions solving different security issues like key management, intruder's attacks, unauthorized access and network congestion.

• Future research efforts in IoT should also be focused to resolve interoperability as many devices and objects with heterogeneous functionalities are attached to the smart environment. The possible

services with different nature with same data inferred and when required by many may cause poor quality of service.

• Research endeavours in future should also deal with the quality of service

• The proposed system may get slow down later as many applications are connected together. To overcome this issue, high performance microprocessors should be used in the system for better flexibility.

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APPENDIX

A. SOURCE CODE

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
import json
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deviceCli.disconnect()
```

B. UI OUTPUT SCREENSHOT