PREDICTIVE MAINTENANCE OF INDUSTRIAL MOTORS

DATE : 20.08.2020

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1) INTRODUCTION:

1.1 OVERVIEW :

The objective of this kind of motor maintenance is to ensure that the right kind of maintenance is carried out at the right time. In order to define these two parameters, it is necessary to monitor the motor operation regularly and thereby detect problems before they actually occur.

1.2 PURPOSE :

To prevent critical breakdowns rather than repairing them. In plant operations, unscheduled stoppage of production or long repair shutdowns are intolerable. The resultant downtime eats deeply into production times. Periodic inspections of motors are necessary to ensure best operating results.

2) LITERATURE SURVEY :

2.1 EXISTING PROBLEM:

When an electric motor needs repairs, it is usually for one of the following reasons.

- Winding failures: Stressful mechanical, environmental, and electrical operating conditions can all cause electric motor failure
- Contamination: Grease, oil, and dirt are common contaminants that can make their way into electric motors. Moisture, which is a damaging contaminant, can also negatively affect ac motors and dc motors.
- Electrical and mechanical issues: Electrical and mechanical problems are other significant electric motor repair causes. Ranging from electrical overload to broken and worn parts, electrical and mechanical issues can severely impact a motor's ability to work correctly. These issues usually affect the electric motor winding.

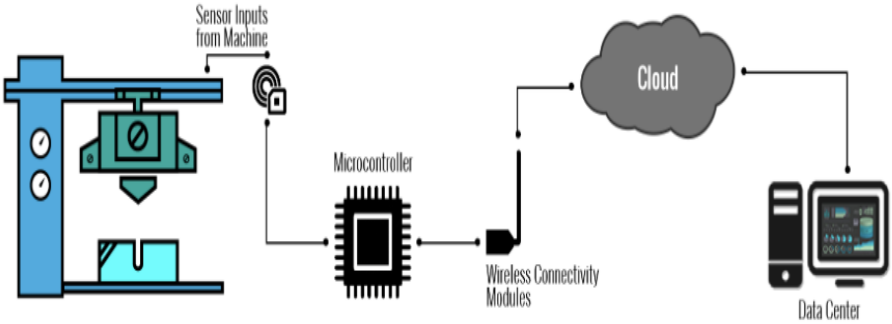
2.2 PROPOSED SOLUTION:

- Winding failures: To avoid conditions that cause stress to the electrical appliances.
- Contamination: To make sure that the motor doesn't get in contact with external dust , grease , oil and dirt and kept in a dry place and make sure its not moist.

- Electrical and mechanical issues: To make sure that the motors are serviced properly in equal intervals of time and make sure they don't get electrical damage .

3) THEORITICAL ANALYSIS:

3.1 Block diagram :



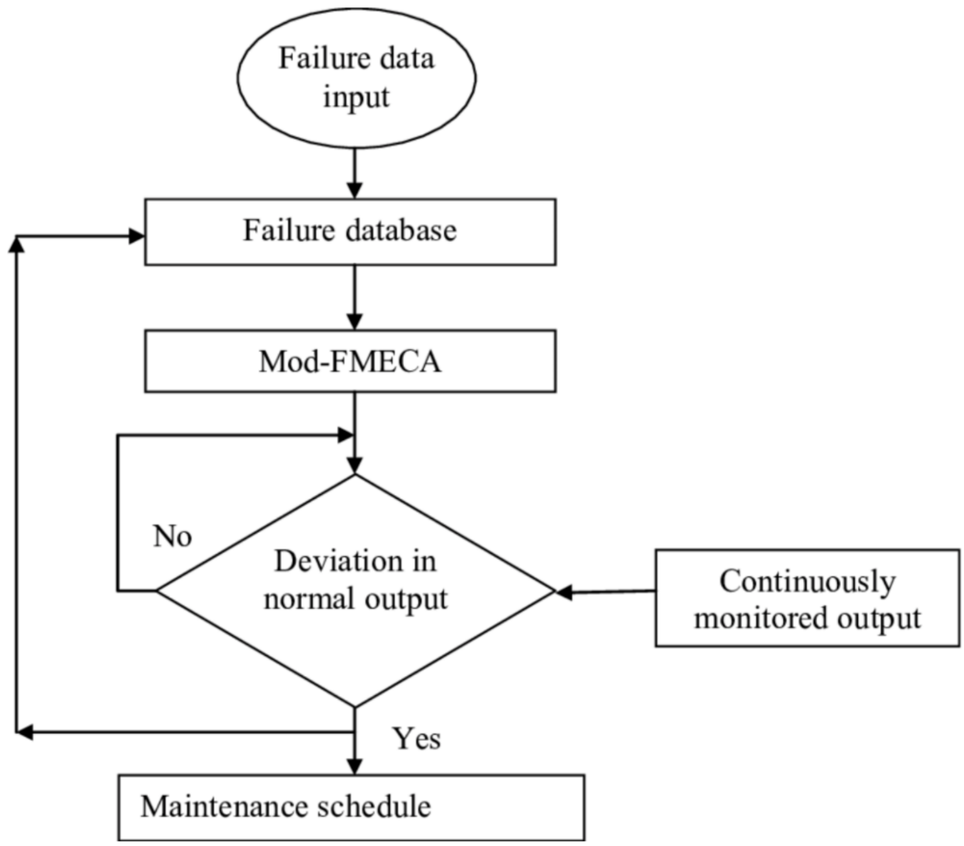
3.2 Software designing:

Software components used are : 1.IBM cloud 2.IBM IOT platform 3.IBM Watson 4.node-red 5.Python IDLE 6.MIT app inventor

4) EXPERIMENTAL INVESTIGATIONS :

MCCB traditional maintenance process is done by removing dust and internal soil by cleaning the external body only. Therefore, carbon atoms are formed at the contact points. In this work, a new maintenance technique is proposed to enhance the maintenance process, adding the titanium oxide (TiO_2) into the insulating oil to prevent contamination .

5) FLOWCHART:



6) RESULT:

This was built using IBM watson assistant, IOT sensor simulator to check the maintenance of motors in industries.

7) ADVANTAGES & DISADVANTAGES

ADVANTAGE:

- Electric supply to the motor is proper .
- Bearings and shafts are fixed properly with no contamination .

DISADVANTAGE:

- More money upfront
- Over maintenance
- More workers

8) APPLICATIONS :

- Allows exchanging data from one end to other .
- Improves the usage quality of motor .
- Saves money .

- Better adherence to the maintenance of the motors .
- Reduction in investing money to get new motors .

9) CONCLUSION

The predictive maintenance app is available on your phones. Any time, any place it can be accessible. It is very feasible and eco-friendly. This helps to detect any problem in the motors and can be rectified when necessary .

10) FUTURE SCOPE

- With more High-end hardware and software, the Predictive maintenance can be customized and can be upgraded and improved for more efficiency and success rate in future .

- **11) BIBILOGRAPHY**

- Github
- youtube
- smart internz

12) APPENDIX

A. SOUURCE CODE :

1. <u>DHT11 SENSOR TO MEASURE HUMIDITY AND TEMPERATURE:</u>

```
#include <dht.h>

#define dht_apin A0

dht DHT;

void setup(){

Serial.begin(9600); delay(500);

Serial.println("DHT11 Humidity & temperature Sensor\n\n"); delay(1000);

}

void loop(){
 DHT.read11(dht_apin);

Serial.print("Current humidity = ");

 Serial.print(DHT.humidity);

Serial.print("% ");
```

```
Serial.print("temperature = ");
Serial.print(DHT.temperature);
Serial.println("C ");
 delay(5000);
}
```

2.<u>VIBRATION SENSOR :</u>

```
int vib_pin=7;
int led_pin=13;
void setup() {
  pinMode(vib_pin,INPUT);
  pinMode(led_pin,OUTPUT);
}
void loop() {
  int val;
  val=digitalRead(vib_pin);
  if(val==1)
{
    digitalWrite(led_pin,HIGH);
    delay(1000);
digitalWrite(led_pin,LOW);
    delay(1000);
   }
else
digitalWrite(led_pin,LOW);
}
```

<u>3.CURRENT SENSOR :</u>

```
void setup() {
Serial.begin(9600);
}
void loop() {
unsigned int x=0;
```

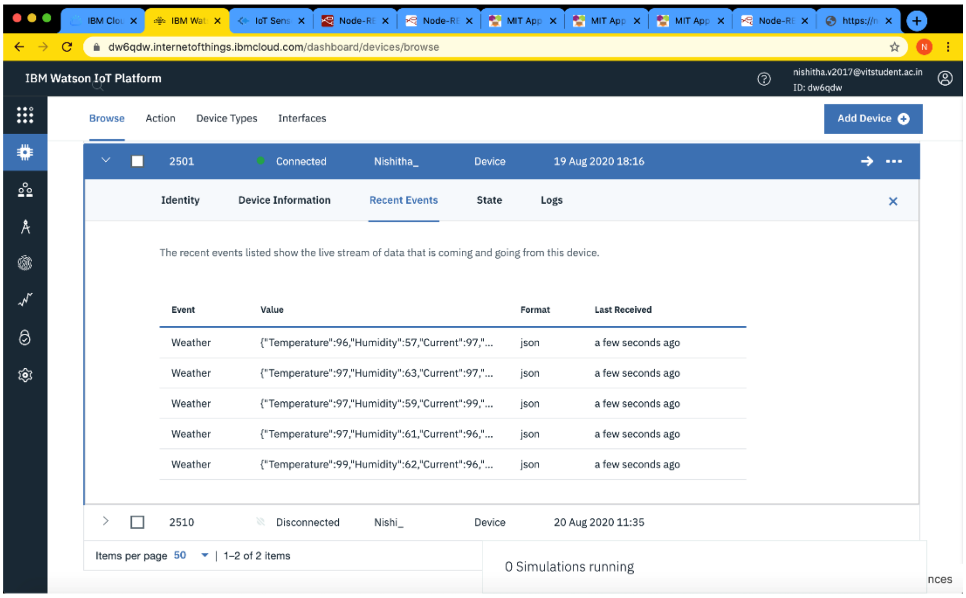
```
float AcsValue=0.0,Samples=0.0,AvgAcs=0.0,AcsValueF=0.0;
for (int x = 0; x < 150; x++){
AcsValue = analogRead(A0);
Samples = Samples + AcsValue;
delay (3);
}
AvgAcs=Samples/150.0;
AcsValueF = (2.5 - (AvgAcs * (5.0 / 1024.0)) )/0.185;
Serial.print(AcsValueF);
delay(50);
}
```

4.SWITCH AND LED INDICATION:

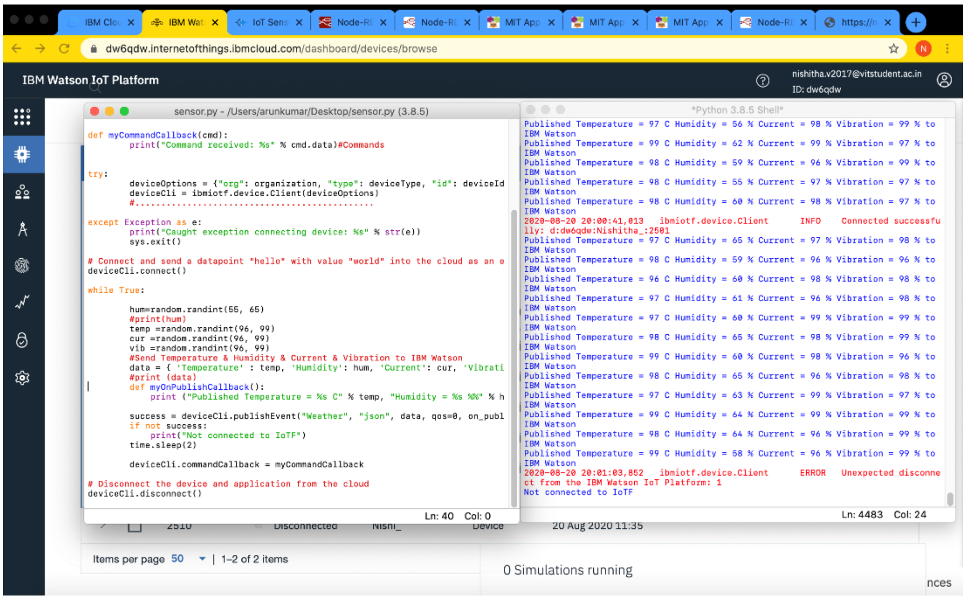
```
void setup() {
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
}
```

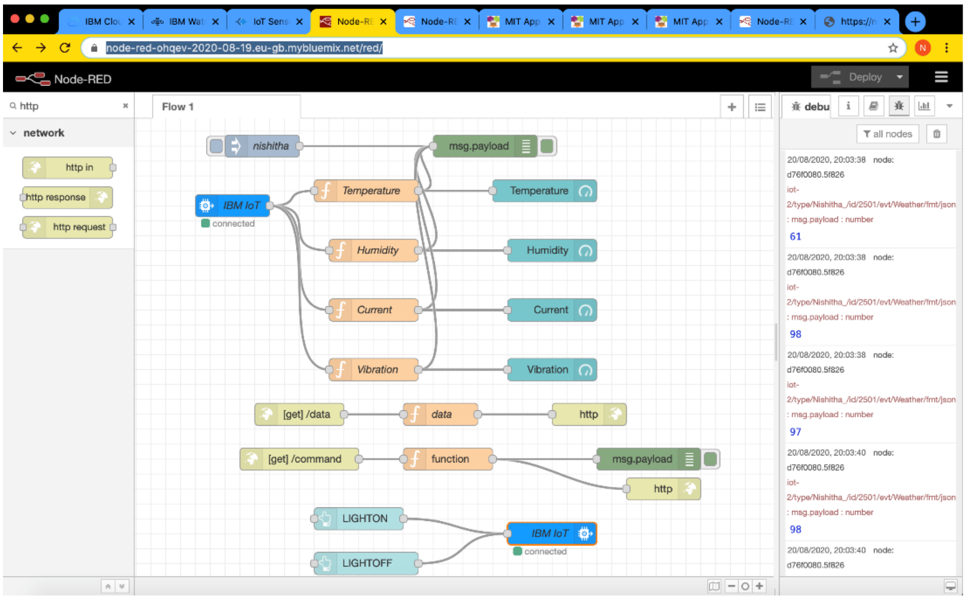
B. UI output Screenshot.



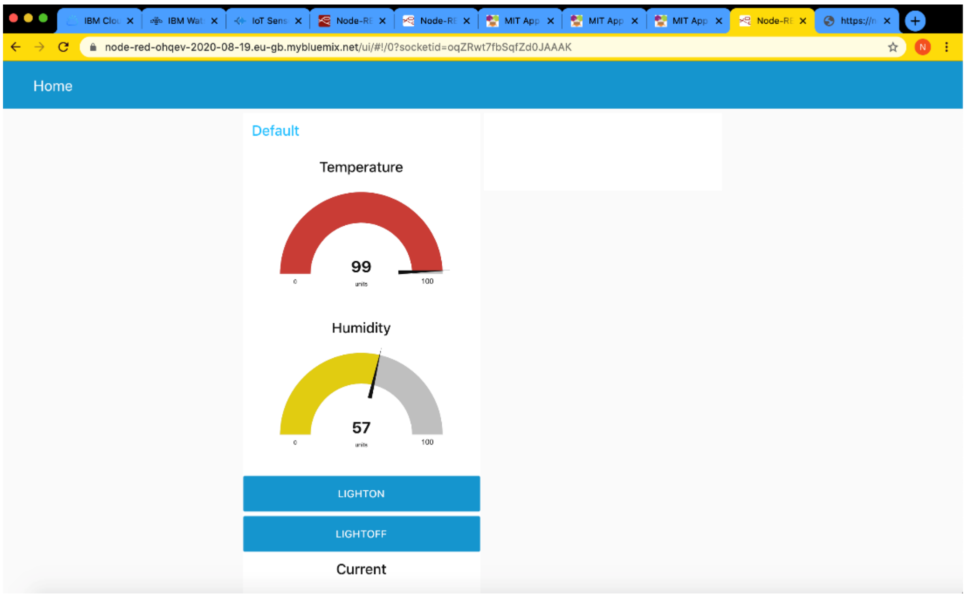
dw6qdw.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
nishitha.v2017@vitstudent.ac.in
ID: dw6qdw
Browse
Action
Device Types
Interfaces
Add Device
2501
Connected
Nishitha_
Device
19 Aug 2020 18:16
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
Weather {"Temperature":96,"Humidity":57,"Current":97,"... json a few seconds ago
Weather {"Temperature":97,"Humidity":63,"Current":97,"... json a few seconds ago
Weather {"Temperature":97,"Humidity":59,"Current":99,"... json a few seconds ago
Weather {"Temperature":97,"Humidity":61,"Current":96,"... json a few seconds ago
Weather {"Temperature":99,"Humidity":62,"Current":96,"... json a few seconds ago
2510
Disconnected
Nishi_
Device
20 Aug 2020 11:35
Items per page 50
1–2 of 2 items
0 Simulations running

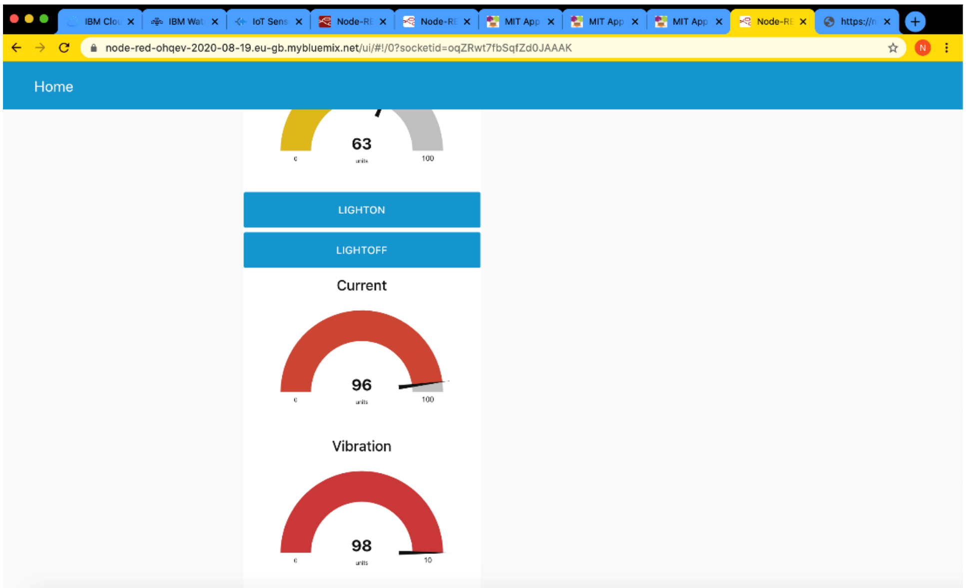


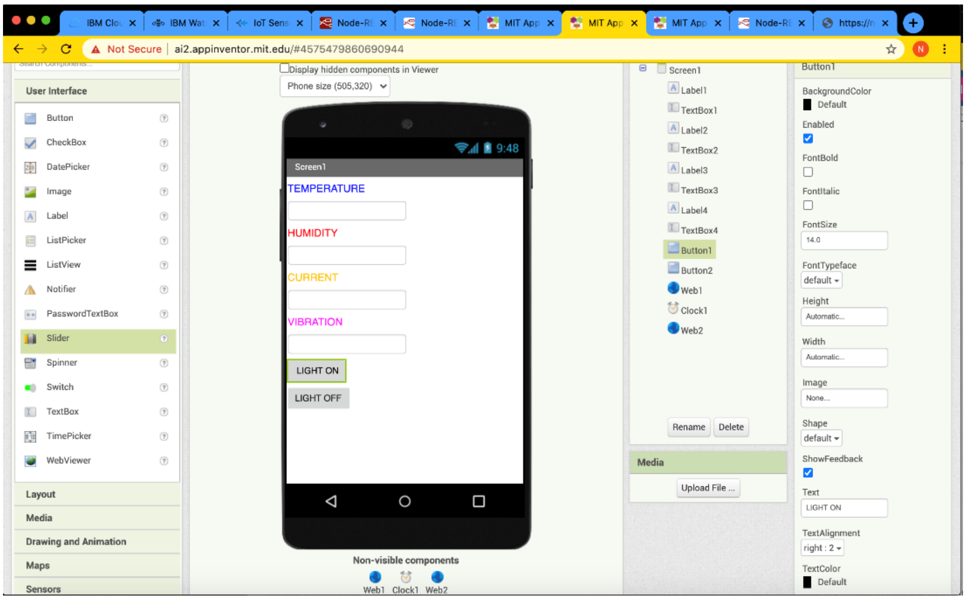
dw6qdw.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
sensor.py - /Users/arunkumar/Desktop/sensor.py (3.8.5)
Python 3.8.5 Shell
def myCommandCallback(cmd):
print("Command received: %s" % cmd.data)#Commands
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId
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 e
deviceCli.connect()
while True:
hum=random.randint(55, 65)
#print(hum)
temp =random.randint(96, 99)
cur =random.randint(96, 99)
vib =random.randint(96, 99)
#Send Temperature & Humidity & Current & Vibration to IBM Watson
#print (data)
def myOnPublishCallback():
success = deviceCli.publishEvent("Weather", "json", data, qos=0, on_publ
if not success:
print("Not connected to IoTF")
time.sleep(2)
deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
Ln: 40 Col: 0
Published Temperature = 97 C Humidity = 56 % Current = 98 % Vibration = 99 % to IBM Watson
2020-08-20 20:00:41,013 ibmiotf.device.Client INFO Connected successfully: d:dw6qdw:Nishitha_:2501
2020-08-20 20:01:03,862 ibmiotf.device.Client ERROR Unexpected disconnect from the IBM Watson IoT Platform: 1
Not connected to IoTF
Ln: 4483 Col: 24
Items per page 50
1–2 of 2 items
0 Simulations running



node-red-ohqev-2020-08-19.eu-gb.mybluemix.net/red/
Node-RED
Deploy
Flow 1
network
http in
http response
http request
nishitha
msg.payload
IBM IoT
connected
Temperature
Humidity
Current
Vibration
[get] /data
data
http
[get] /command
function
LIGHTON
LIGHTOFF
all nodes
20/08/2020, 20:03:38 node: d76f0080.5f826
iot-2/type/Nishitha_/id/2501/evt/Weather/fmt/json : msg.payload : number
61
98
97
20/08/2020, 20:03:40 node: d76f0080.5f826
98


node-red-ohqev-2020-08-19.eu-gb.mybluemix.net/ui/#!/0?socketid=oqZRwt7fbSqfZd0JAAAK
Home
Default
Temperature
99
Humidity
57
LIGHTON
LIGHTOFF
Current


node-red-ohqev-2020-08-19.eu-gb.mybluemix.net/ui/#!/0?socketid=oqZRwt7fbSqfZd0JAAAK
Home
63
LIGHTON
LIGHTOFF
Current
96
Vibration
98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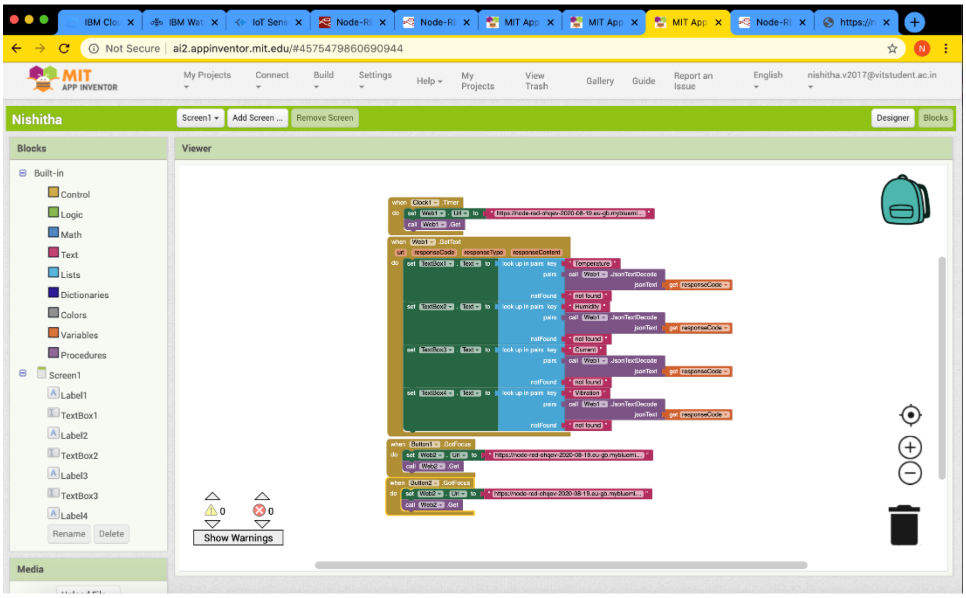
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Layout
Media
Drawing and Animation
Maps
Sensors
Display hidden components in Viewer
Phone size (505,320)
Screen1
TEMPERATURE
HUMIDITY
CURRENT
VIBRATION
LIGHT ON
LIGHT OFF
Non-visible components
Web1 Clock1 Web2
Screen1
Label1
TextBox1
Label2
TextBox2
Label3
TextBox3
Label4
TextBox4
Button1
Button2
Web1
Clock1
Web2
Rename Delete
Media
Upload File ...
Button1
BackgroundColor
Default
Enabled
FontBold
FontItalic
FontSize
14.0
FontTypeface
default
Height
Automatic...
Width
Automatic...
Image
None...
Shape
default
ShowFeedback
Text
LIGHT ON
TextAlignment
right : 2
TextColor
Default


Not Secure
ai2.appinventor.mit.edu/#4575479860690944
MIT APP INVENTOR
My Projects
Connect
Build
Settings
Help
My Projects
View Trash
Gallery
Guide
Report an Issue
English
nishitha.v2017@vitstudent.ac.in
Nishitha
Screen1
Add Screen ...
Remove Screen
Designer
Blocks
Viewer
Built-in
Control
Logic
Math
Text
Lists
Dictionaries
Colors
Variables
Procedures
Screen1
Label1
TextBox1
Label2
TextBox2
Label3
TextBox3
Label4
Rename
Delete
Media
Show Warnings