SMART AQUARIUM BASED ON IOT

By Team ECE_C12

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1.INTRODUCTION

1.1 OVERVIEW

Fish kepping is a popular fad. Almost people from all the age groups like to keep fish in their home,offices etc for decoration purpose as a hobby. Fish keeping is not an easy job. We always need an aquarium for that . It has always been a headache to take care of the fish and aquariums.

We have to change the water after sometime,we have to feed the fish on time,we have to maintain the temperature and turbidity level of the water and always have to keep an eye on fish and aquarium. All these steps are done manually.

The project ,SMART AQUARIUM based on IOT has been designed by keeping in mind,the problem of those who cannot take care of their aquarium every day.

1.2 PURPOSE

This project is used for Indoor fish tanks are an effective way to observe living things and access water in the house, and using a smart aquarium based on IoT makes it possible for users to easily utilize the benefits of living things and water, such as water quality and food management, proper lighting intensity control , etc.

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

Aquarists face several problems to support the healthy living of fish in aquariums. The feeding of fish is a difficult task for the fish keepers during their absence or whenever they travel out-of-station. Moreover, the temperature and salinity of water needs to be inspected frequently for the healthy living of fish. Suspended particles of fish have to be removed if it exceeds the limit so water has to be changed if it exists in a state of high turbidity. The oxygen flow inside the water has to be monitored for the easy breathing of fish. So, A system has to be developed for continuous monitoring, controlling and taking care of the fish.

2.2 PROPOSED SOLUTION

The main objective of the project is to setup an aquarium which can be monitorising the waterlevel ,controlling the temperature and feeding the fishes via

the internet and remote monitoring of all the parameters. The fish feed dispenser is setup using the servo motor and controlled in mobile application. Flow random data is added to detect the water flow rate, which is automatically operated depending on the water level of the tank and update to the mobile application and motor can be ON\OFF using the mobile app.The temperature random data is added to detect the water temperature and upadate to the mobile application and light can be ON\OFF using mobile app.

3.THEORITICAL ANALYSIS

3.1 BLOCK DIAGRAM:

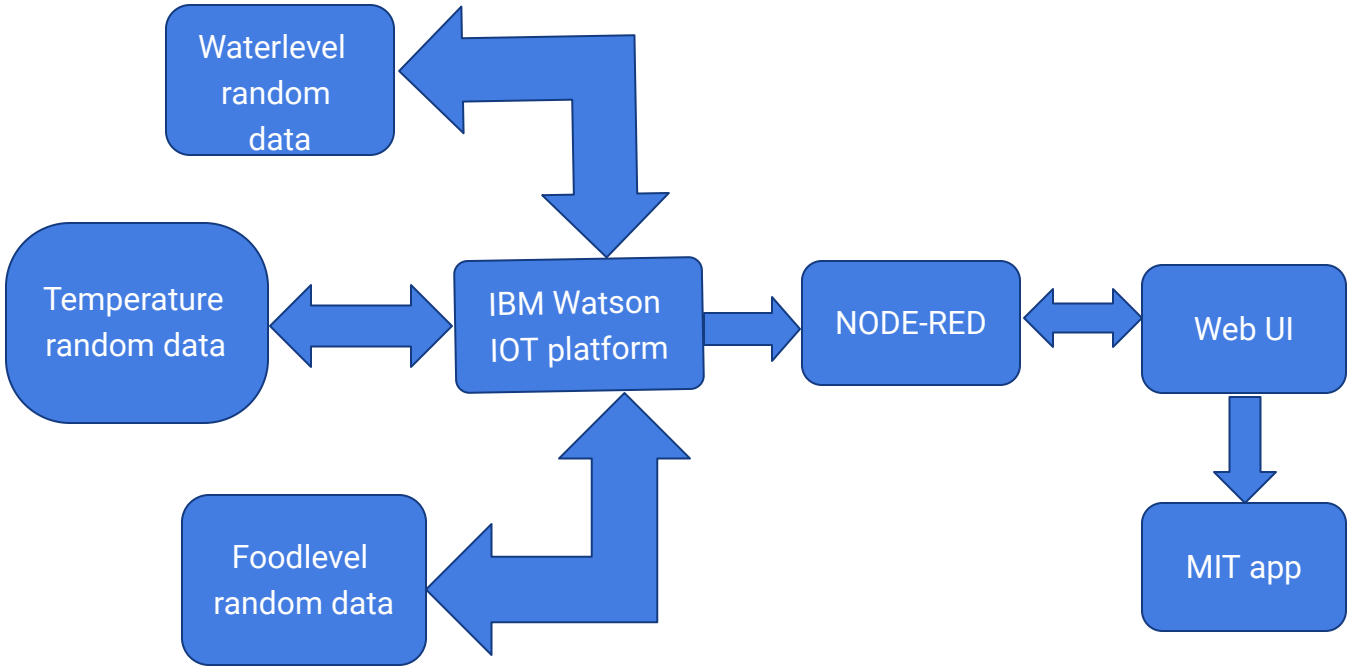


Fig: Block digram of smart aquarium Based on IOT

3.2 HARDWARE/SOFTWARE DESIGNING:

SOFTWARE DESIGNING:

By using

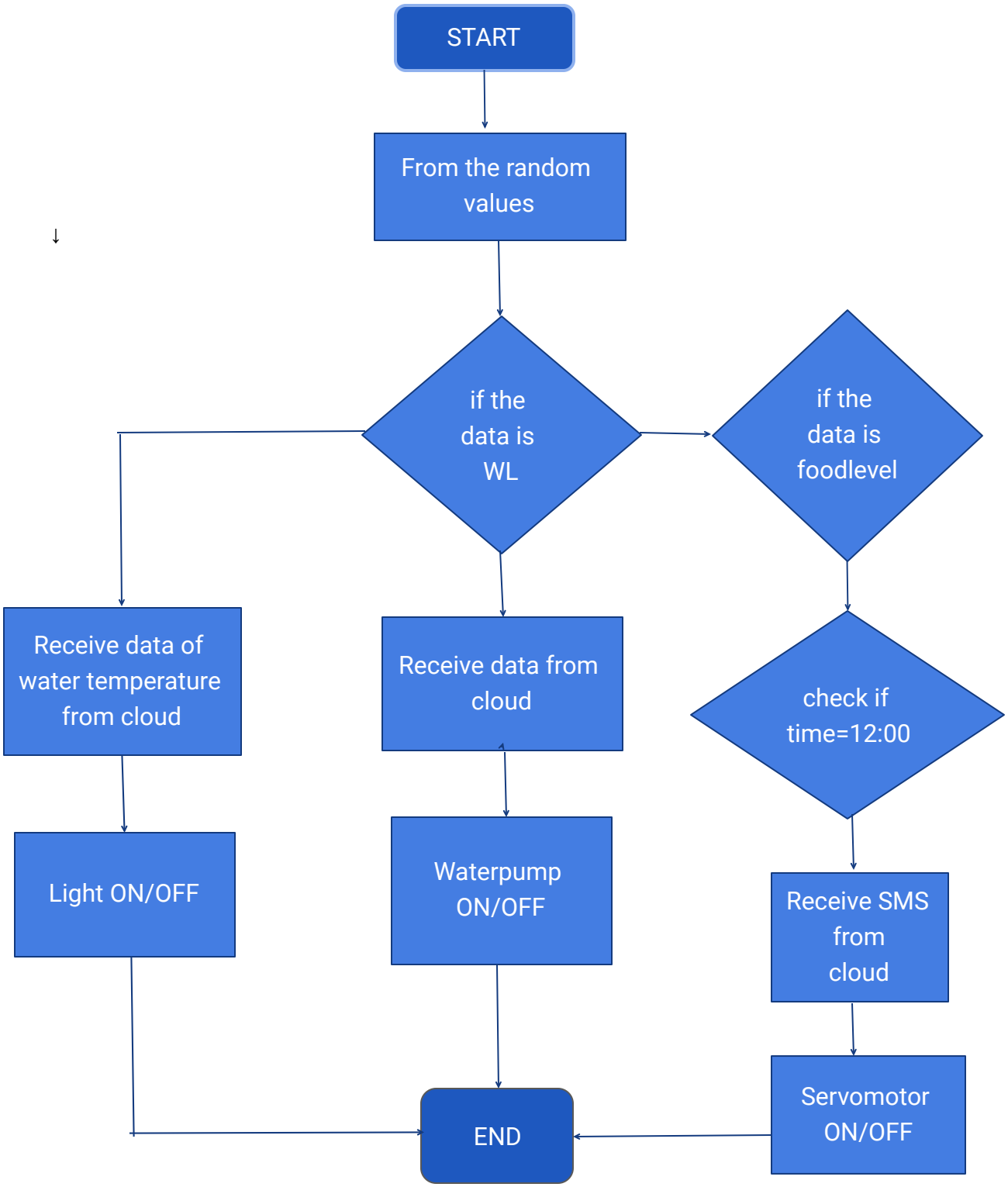
- Python
- IOT Platform
- Node Red
- MIT App
- Fast2SMS

4.EXPERIMENTAL INVESTIGATIONS:

As the trend of keeping pets increases, people are keeping all sorts of animals at home and it is not a new concept in any way.All of these animals require special care and sometimes humans cannot attend to their needs and these days there are many people fighting to protect the ethical rights of animals.Out of these animals, fish require the utmost care because their environment is completely different from land animals, so they need specific conditions like a temperature range, waterlevel range and food feeding.This project is designed to decrease the labor time and can be controlled from anywhere, such as a mobile phone .

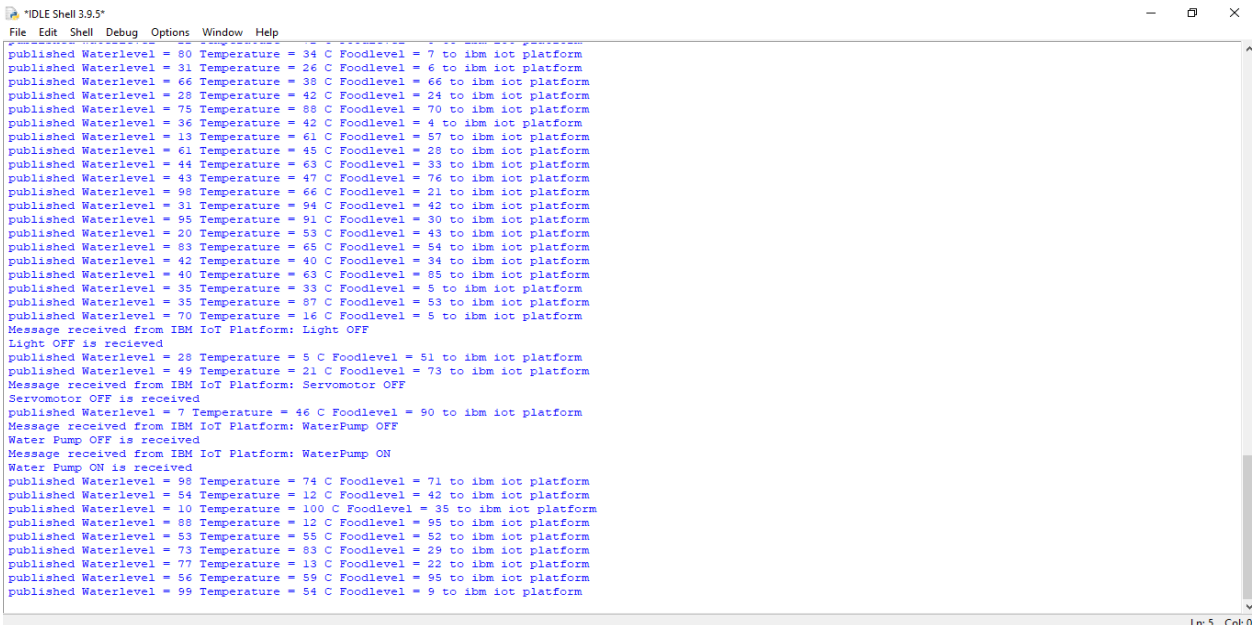
The term "IOT" stands for Internet of Things and it can be defined as the interconnection between the individually identifiable embeded computing apparatus in the accesible internet infrastructure .'IOT' connects various devices and transportations with the help of internet as well as electronic sensors.The IOT is a system of interrelated computing devices,mechanical and digital machines provided with unique identifiers and ability to transfer data over a network without requiring human- to human or human-to computer interaction.The definition of IOT has evolved due to convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Smart aquarium based on IOT is aims to mointor and control the the vitals of fish feeding , controlling the temperature level and also monitor and control the water level , inside the home aquarium . Also the data will be displayed on the developed mobile application.

5.FLOWCHART:

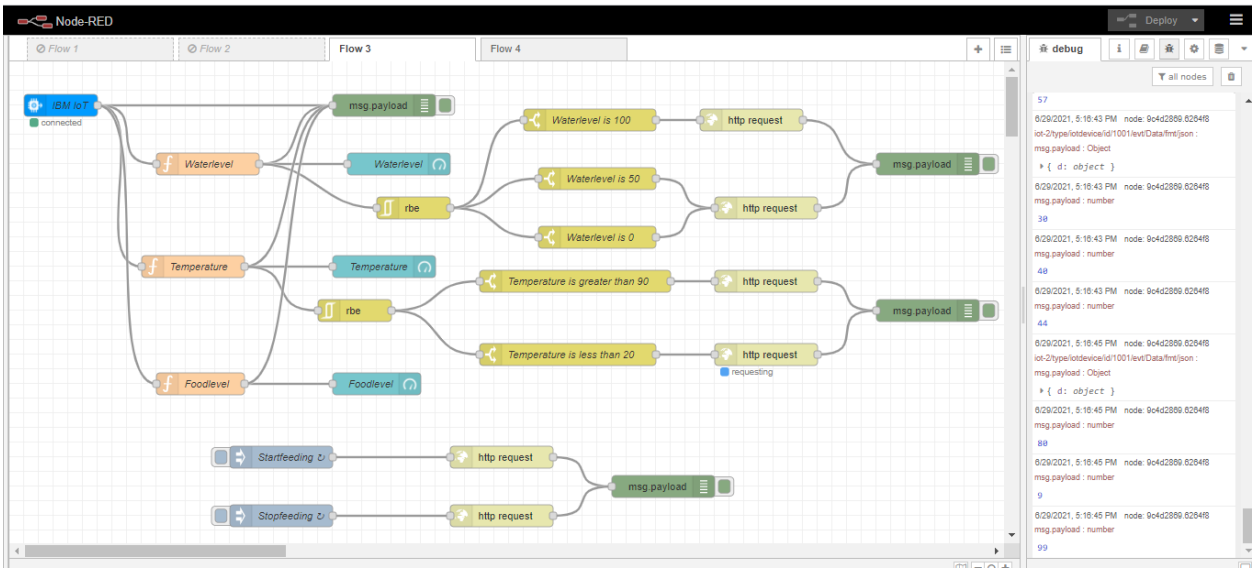

START
From the random values
if the data is WL
if the data is foodlevel
Receive data of water temperature from cloud
Receive data from cloud
check if time=12:00
Light ON/OFF
Waterpump ON/OFF
Receive SMS from cloud
Servomotor ON/OFF
END

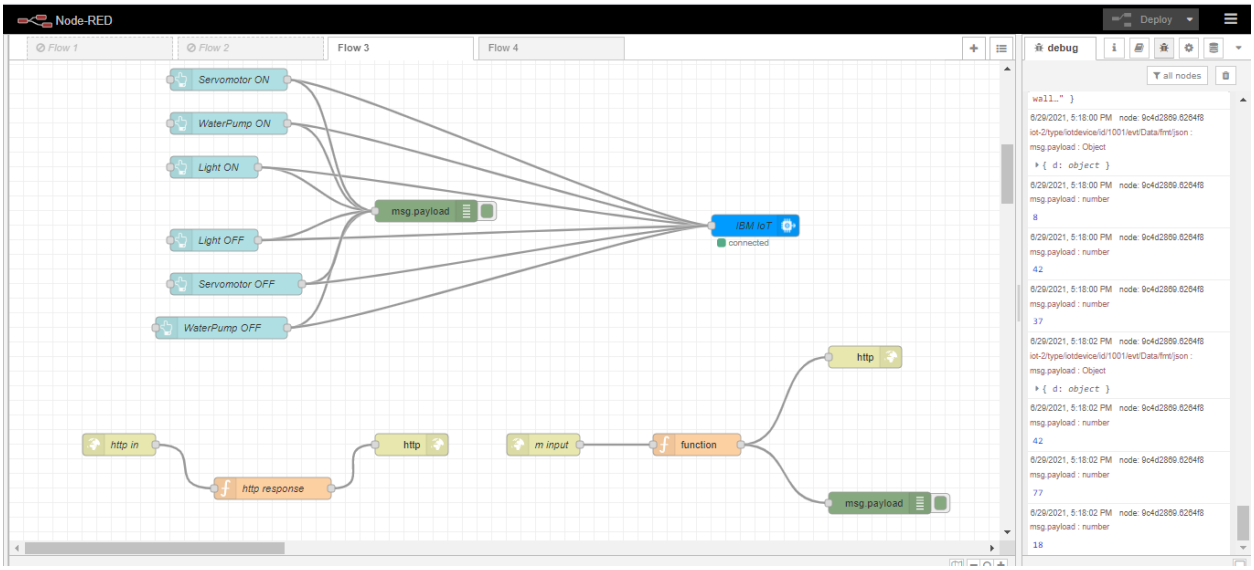
6.RESULT

Python code:

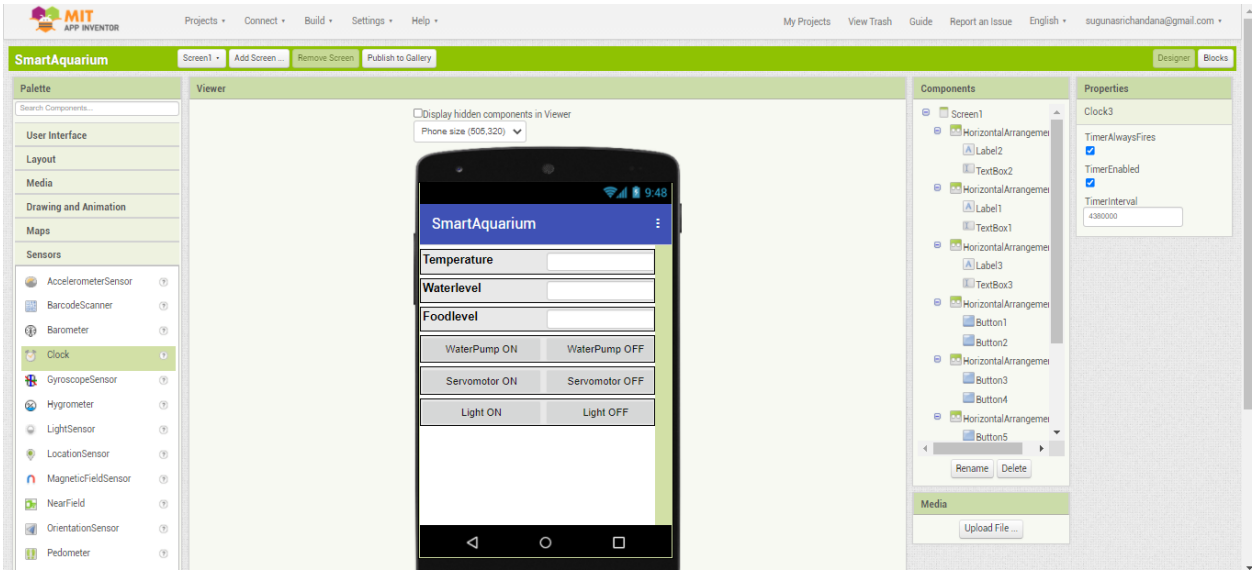


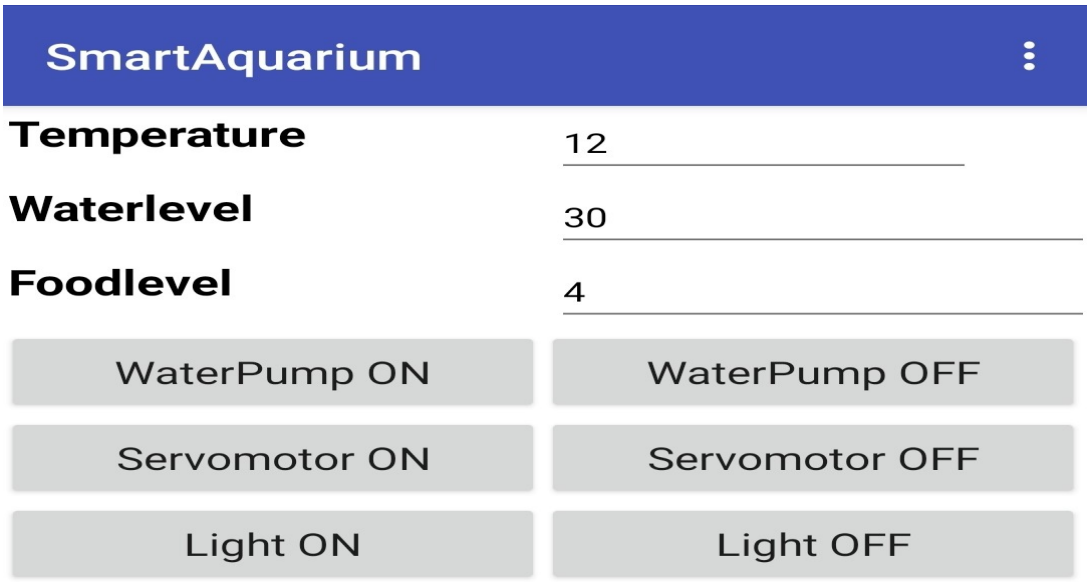
Node-Red:




Node-RED
Deploy
Flow 1
Flow 2
Flow 3
Flow 4
debug
Servomotor ON
WaterPump ON
Light ON
Light OFF
Servomotor OFF
WaterPump OFF
msg.payload
IBM IoT
connected
http
http in
http response
m input
function
msg.payload

MIT App:


MIT APP INVENTOR
Projects
Connect
Build
Settings
Help
My Projects
View Trash
Guide
Report an Issue
English
sugunasrichandana@gmail.com
SmartAquarium
Screen1
Add Screen ...
Remove Screen
Publish to Gallery
Designer
Blocks
Palette
Viewer
Components
Properties
Display hidden components in Viewer
Phone size (505,320)
SmartAquarium
Temperature
Waterlevel
Foodlevel
WaterPump ON
WaterPump OFF
Servomotor ON
Servomotor OFF
Light ON
Light OFF
Clock3
TimerAlwaysFires
TimerEnabled
TimerInterval
Media
Upload File ...
Rename
Delete



7.ADAVANTAGES AND DISADAVNTAGES:

Advantages:

- Time saving.
- Maintains the aquarium temperature.
- Auto fish feeding.
- Notifications in case of trouble.

Disadvantages:

- Reliable internet connection is crucial.
- Maintenance and repair isuues.
- Significant installation cost.

8. APPLICATIONS:

- Retirement and Nursing Homes.
- Memory Care Facilities.
- Childcare Pediatrics.
- Attorneys and Law Offices.

9. CONCLUSION:

IoT technology can be developed in any field. One of them is the development of IoT technology in hobby keeping fish. Smart aquarium is a concept of hobby by combining aquarium with IoT System. Smart aquarium is an emerging and real concept for the world of modern hobby keeping fish that combines aquaponics with IoT technology. We started the project with aim to accomplish the simple looking task of designing an Smart Aquarium. But with time and experiences it was learnt that this was not at all an easy task, specially interfacing the servomotor.Though we are able to achieve all the goals of our project but still we think that lots of advancement can be done on this project. We have provided the platform and the platform is ready for everyone to work on it. For advancements, we need more time, money and hard work .Money would remain the critical issue cause in order to upgrade the project many of the stuff would need an up-gradation. Nevertheless this project has been a success as far as learning and practical implementation of Computer science and engineering concepts is concerned. The basic idea proposed in this project works well and can be implemented on any aquarium. Having a Smart Aquarium, will save our time and we would not have to be worried for our fish and their aquariums for long time.

10.FUTURE SCOPE:

In the future we hope to expand our work by obtaining multiple views from different camera angles. using sensors to determine ph level in the water and maintain right ph levels. To enable user to carry out water changes with just a cick of a button. To have automatic modules to control lights, filter, heater and feeder. Light timing to be synched with sunrise and sunset timings. Enable notifications on android app to remind user for unknown activity. Use of artificial intelligence and image recognition to determine fish and plants health. The biggest challenge will be to find amount of nitrates in water as it involves chemical procedures. And to reduce the size of the entire system using nano electronics.

11.BIBLIOGRAPHY:

https://cloud.ibm.com/
https://zkpdkt.internetofthings.ibmcloud.com/dashboard/devices/browse
https://node-red-lwgij-2021-05-12.mybluemix.net/red/#flow/9f0ad8a0.b4f008
https://node-red-lwgij-2021-05-12.mybluemix.net/ui/#!/0?socketid=rHDrIZNFFIZhg6GAAAAu
http://ai2.appinventor.mit.edu
https://www.fast2sms.com/dashboard/sms/bulk

12.APPENDIX

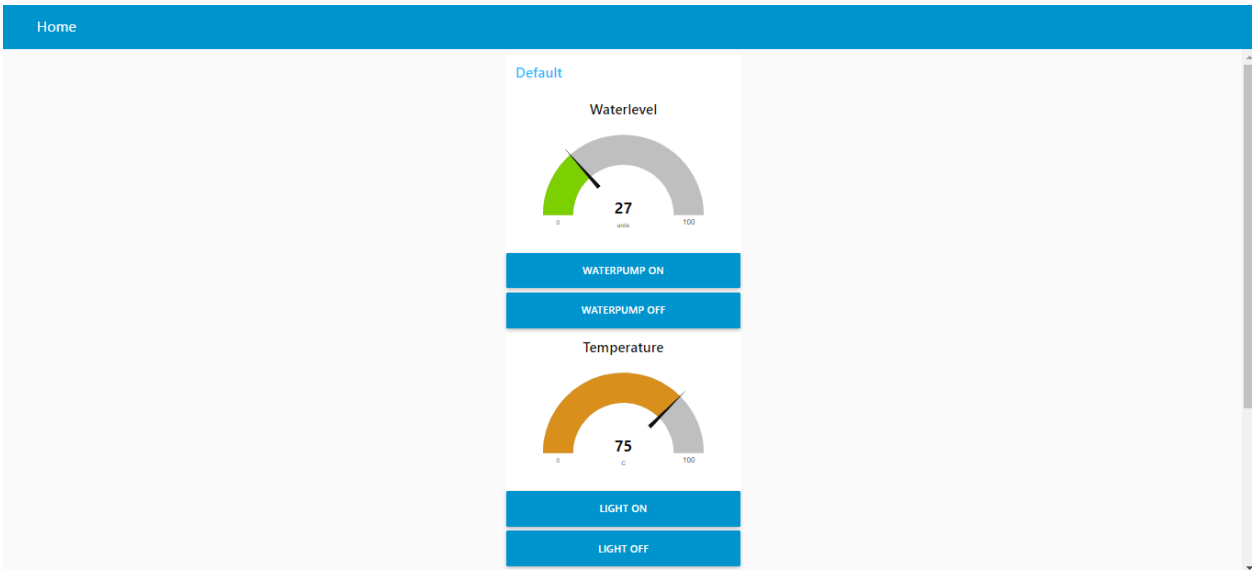
A.SOURCE CODE

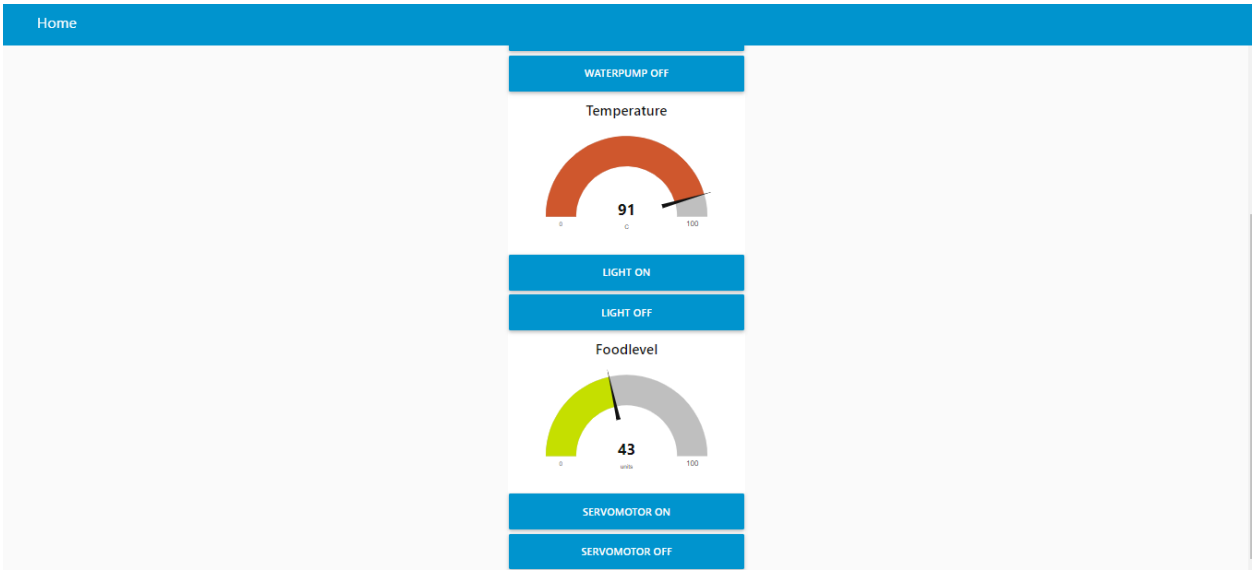
```
import time
import random
import json
import ibmiotf.application
import ibmiotf.device
import sys

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


# Initialize the device client.
Waterlevel=0
T=0
FI=0
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
```

```
if cmd.data['command']=='Servomotor ON':
        print("Servomotor ON is received")


elif cmd.data['command']=='Servomotor OFF':
        print("Servomotor OFF is received")


elif cmd.data['command']=='WaterPump ON':
         print("Water Pump ON is received")


elif cmd.data['command']=='WaterPump OFF':
         print("Water Pump OFF is received")


elif cmd.data['command']=='Light ON':
         print("Light ON is received")


elif cmd.data['command']=='Light OFF':
         print("Light OFF is recieved")


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:
   Waterlevel=random.randint(0,100)
   T=random.randint(0,100)
   Fl=random.randint(0,100)
   data={"d":{'Waterlevel': Waterlevel,'Temperature':T,'Foodlevel':Fl}}
   def myOnPublishCallback():
      print("published Waterlevel = %s" %Waterlevel,"Temperature = %s C" %T ,"Foodlevel =
%s" %Fl ,"to ibm iot platform")

   success = deviceCli.publishEvent("Data", "json", data, qos=0,
on_publish=myOnPublishCallback)
   if not success:
     print("Not connected to IOTF")
   time.sleep(2)

   deviceCli.commandCallback = myCommandCallback

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

B.UI Output:


Home
Default
Waterlevel
27
0
100
WATERPUMP ON
WATERPUMP OFF
Temperature
75
0
C
100
LIGHT ON
LIGHT OFF


Home
WATERPUMP OFF
Temperature
91
0
C
100
LIGHT ON
LIGHT OFF
Foodlevel
43
0
100
SERVOMOTOR ON
SERVOMOTOR OFF