SMART AQUARIUMS BASED ON IOT

by

SRIVAIKUNTHAN.N 19BEC1462

SHREYANSH KUMAR 19BEC1246

SAI PAVAN TEJA 18BCE7287

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1.INTRODUCTION

OVERVIEW

Fish keeping is a popular fad; almost people from all the age groups like to keep fish in their home, offices etc for decoration purpose or as a hobby. Fish keeping is itself an industry which comes in agriculture.

Fish keeping is not an easy job; we always need an aquarium or a pond for that. The hobby of fish keeping is broadly divided into three; freshwater, brackish, marine. Among all these three, freshwater is considered to be the most popular hobby of keeping fish because it is easy to handle with freshwater fish and aquariums.

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 water level , control the pump and always have to keep an eye on fish and aquarium. All these steps are done manually.

The project, SMART aquarium has been designed by keeping in mind, the problem of those who cannot take care of their aquarium every day. It does the feeding itself every day, gives the water level of the aquarium and also controls the pump based on the water level. The Fast2SMS sends the report or we can say the current situation of the aquarium like Water level, feeding etc via SMS on your cell phone.

PURPOSE

We all know, today is the world of new scientific inventions. Every day there are some new inventions in almost every field, in the world. World is becoming very fast and automatic because of these inventions day by day. So, we have decided very cheap alternative to make the process of maintaining the fish aquarium fully automatic.

The objective of this project is to design and construct an automatic aquarium for those who cannot take care and keep an eye on their fish and aquarium daily and minimize the manual factor as much as possible. The aquarium will perform all the steps automatically like displaying Water Level, pump control, feeding etc. and would send all the information on cell phone via FAST2SMS.

2.LITERATURE SURVEY

A.EXISTING PROBLEM

Usually, aquarium care takers face several problems in maintenance the vitality and health of fishes along with the presentation of the aquarium. Some of the problems are mentioned as under:

a. Difficulty in monitoring the Water Level
b. Difficulty in maintaining the Water pumping process
c. Difficulty in feeding the fish

B.PROPOSED SOLUTION

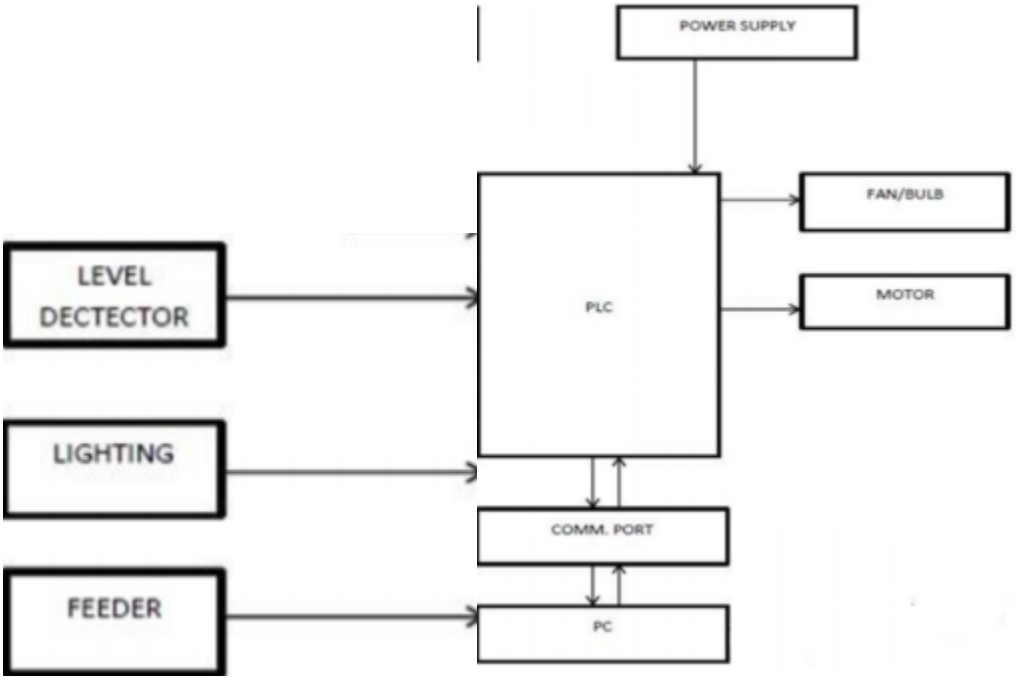
The project has been chosen to minimize the problems of fish keepers or aquarists by shifting it from manual to the automatic mode. Fish keepers or aquarists now would not have to watch out and keep an eye on their aquarium and fish again and again. SMART aquarium would be there. If any problem occurs, the aquarium would generate a report and send it on cell phone via FAST2SMS.

The advantages of this project are:

a. No need to watch out the Water Level
b. No need to monitor the Water Pump
c. No need to feed manually

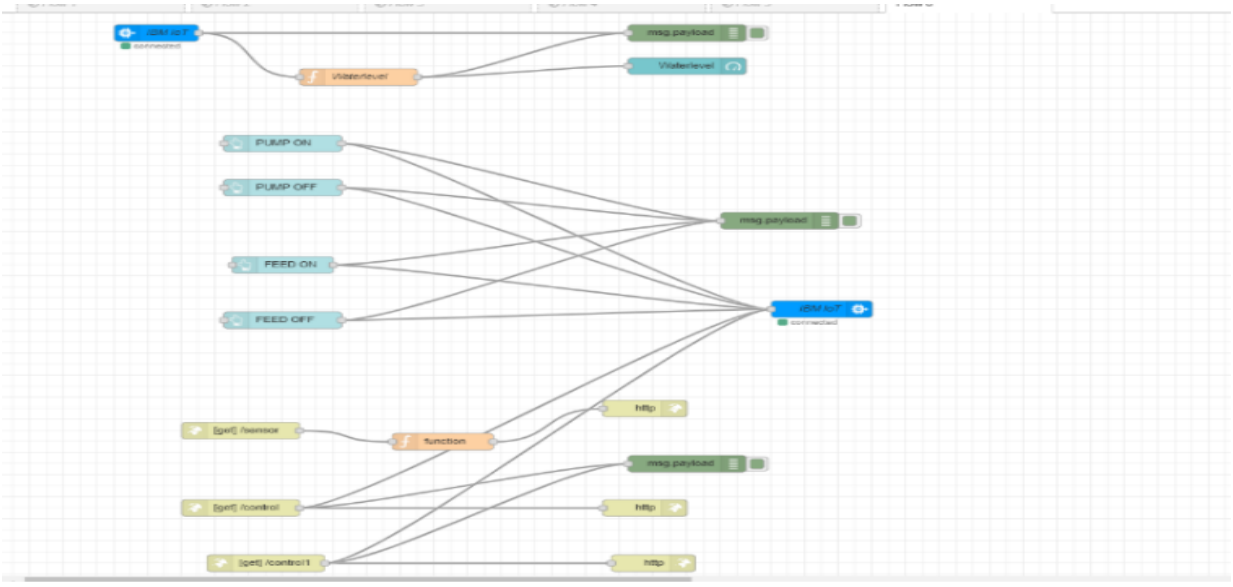
3.THEORETICAL ANALYSIS

A.BLOCK DIAGRAM

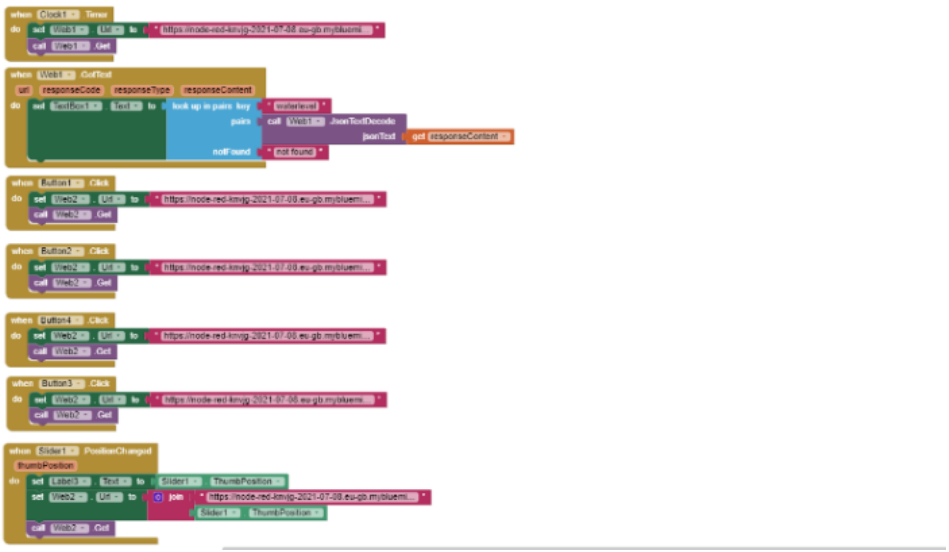


B.SOFTWARE DESIGN

NODE-RED DESIGN:



MIT-APP BACKEND:



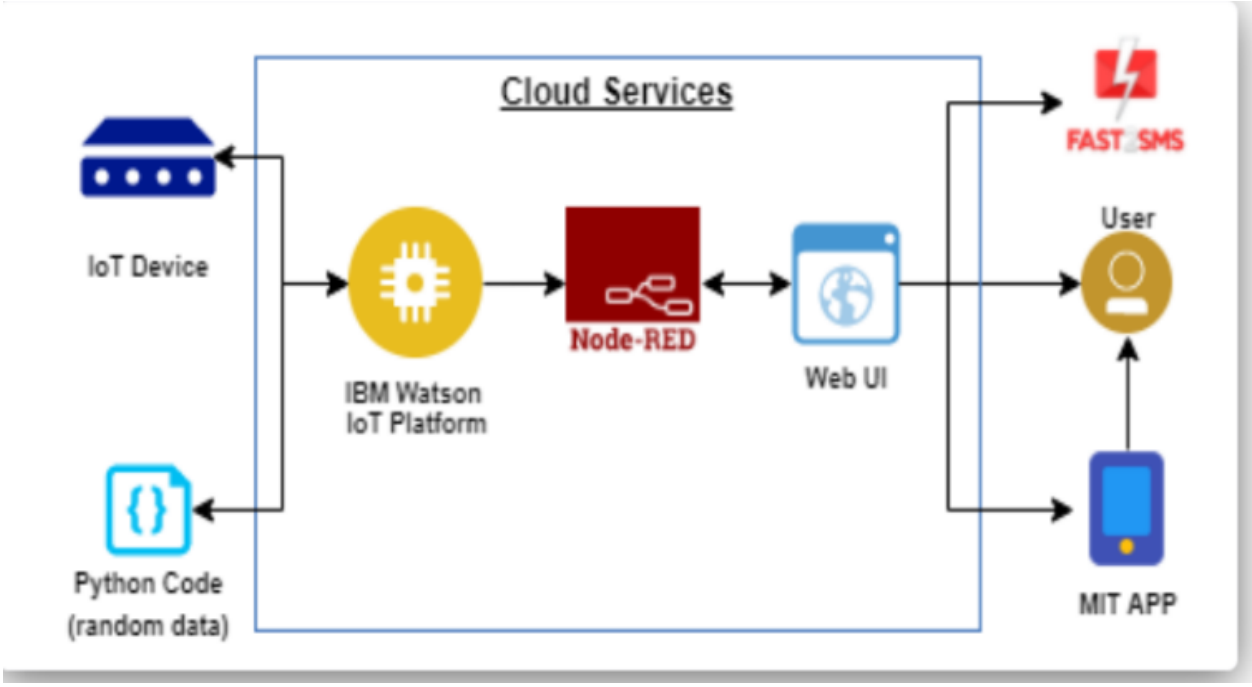
4.EXPERIMENTAL INVESTIGATION

Several devices are available in the market which can be helpful to automate the aquarium maintenance as required.

a. Feeders are available with timers to automate the feeding of fishes. The device can be replaced by a simple and cheap system comprising of a stepper motor based mechanical structure controlled by the controller.

b. Water coolers are available to reduce the temperature when it goes higher. It can be replaced using fans placed well to cool down the aquarium when temperature goes high. Similarly heaters can be replaced by high intensity lights

5.FLOWCHART

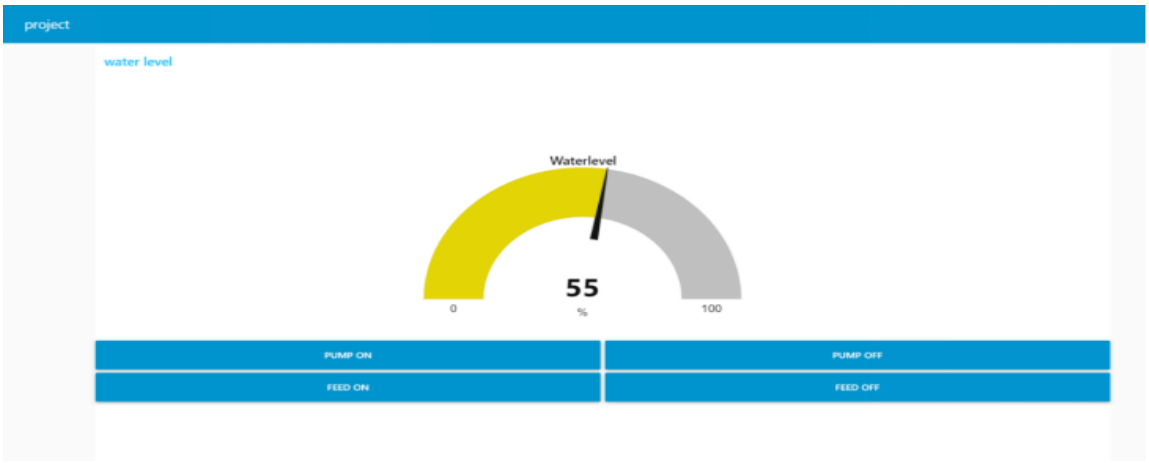


6.RESULT

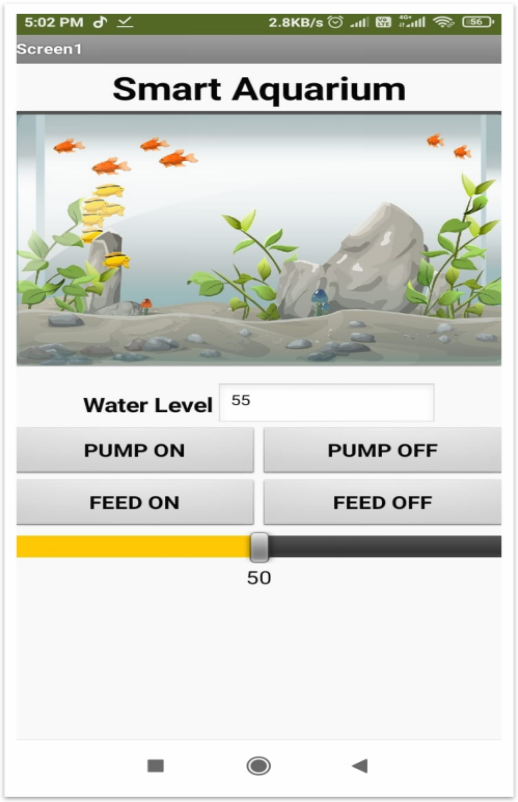
Different tests were conducted to investigate, troubleshoot and test different modules and nodes.

Here the data is received by the IBM Watson IOT platform:

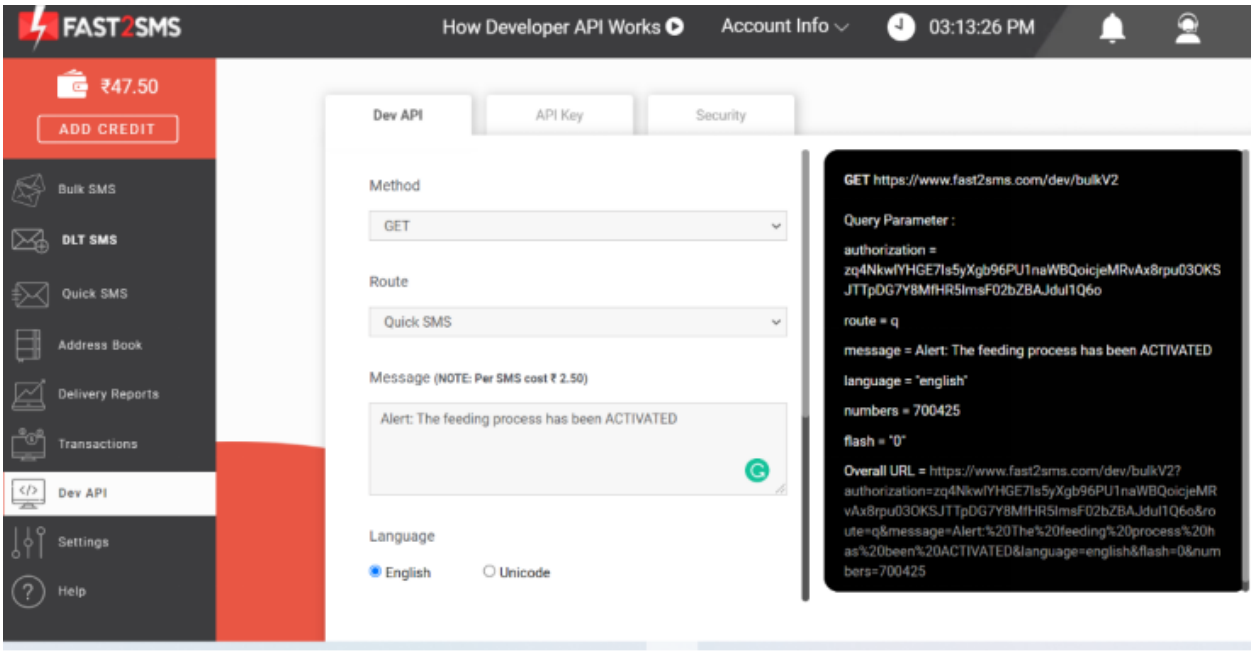
The web-page also created indicating the Water level and button for controlling the pump and feeder.



The output in the mobile application which keeps us updated with the water level and also enables us to control the pump and feeder.



The message service is carried out with the help of FAST2SMS Platform.



7.ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- Easily helps us monitor the well-being of the fish.
- Help us to monitor the working of the aquarium
- Keeps updating the status of the pump and feeder using the FAST2SMS application

DISADVANTAGES

- The project requires Internet access to receive the status of the aquarium
- Mechanical problems might arise in the pump and feeder
- Possibility of short circuit due to the overload of the pump and feeder

8.APPLICATIONS

- Can be used to build Smart Aquariums that can help build efficient and effective ways to maintain fishes
- This project can also be deployed on a larger scale and help maintaining the fishes and creates in ocean.
- The feeding system can be implemented in zoo's to provide the animals with food on time

9.CONCLUSION

We started off the project with aim to accomplish the simple looking task of designing an automatic aquarium (SMART Aquarium). But with time and experiences it was learnt that this was not at all an easy task, specially interfacing the Pump, Feeder and FAST2SMS. 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 Electronics Engineering concepts is concerned. The basic idea proposed in this project works well and can be implemented on large scale industries like agriculture etc. 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

After implementing and detailing the project, still it has many future advancement possibilities of which are stated as below:

Air Cooler:

Sometime the temperature of inside the aquarium or we can say the temperature of water increases in summers that's why fish die because of the sudden increase in the temperature. As there is nothing in the aquarium that could reduce the temperature when it has increased so a small air cooler or a fan can be used to decrease the temperature in case the temperature increases up.

Solar Cell:

As the aquarium needs 24/7 constant power in order to work so lots of power is consumed. Lots of power is utilized and it can be a burden on your pocket so in order to reduce this, solar cells or panels can be used to get the constant power.

So that there will be no issue of over billing and burden on your pocket. If in case of power failure, the aquarium would not stop its work.

Heater:

In winter, most of the time, the temperature of the water goes down like if it is in snowfall area then its temperature would go suddenly down and the sudden variation in the temperature can kill the fish inside the water. In our project we have used a bulb because we live in a region where temperature does not change suddenly. Heater can also be used in order to increase the temperature if it has fallen down

11.BIBLIOGRAPHY:

[1] Current USA

Title: AquaChef Automatic Fish Feeder | Visiting Date: 02/Feb/2011

©2005-2009 Current Inc. | Updated: March 2, 2009 - 16:10

http://www.current-usa.com/aquachef.html

[2] New York Times Company

Title: Nutrafin ProFeed Automatic Feeder | Visiting Date: 05/Feb/2011

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http://saltaquarium.about.com/od/toppicks/tp/TPautofeeders.htm

[3] Alibaba.com

Title: Automatic Aquarium | Visiting Date: 05/Feb/2011

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http://www.alibaba.com/product-gs/238098574/automatic_aquarium.html

[4] Aquarium Guys

Title: Aquarium size| Visiting Date:25/3/2011

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http://www.buzzle.com/articles/aquarium-care-choosing-the-right-aquarium-size-for-your fish.html

12.APPENDIX:

SOURCE CODE:

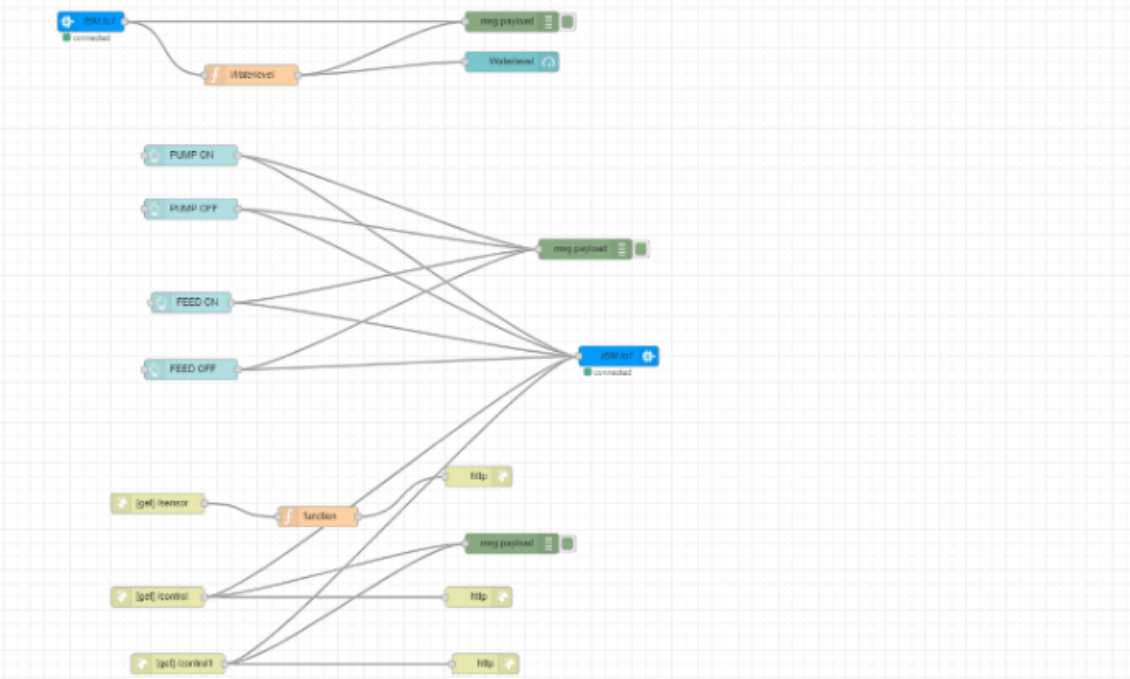
```
import wiotp.sdk.device
import time
import random
import requests

myConfig = {
    "identity": {
        "orgId": "1zlsjs",
        "typeId": "VITshre",
        "deviceId":"700425"
    },
    "auth": {
        "token": "7004251110"
    }
}

d= 0
def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
```

```
    m=cmd.data['command']


    if(m == "pumpon"):
        print("....PUMP is ON....")
    elif(m == "pumpoff"):
        print("....PUMP is OFF....")
    elif(m == "feedon"):
        print("....FEED is ON....")

alertf=requests.get('https://www.fast2sms.com/dev/bulkV2?authorization=zq4NkwlYHGE7Is5yXgb96PU1naWBQoicjeMRvAx8rpu03OKSJTTpDG7Y8MfHR5ImsF02bZBAJdul1Q6o&route=q&message=Alert:%20The%20feeding%20process%20has%20been%20ACTIVATED&language=english&flash=0&numbers=700425')
        print(alertf.text)


    elif(m == "feedoff"):
        d=0
        print("....FEED is OFF....")
    else:
        print(f"Feeding Motor speed is set to {m}")


    print()
```

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

client.connect()



c=0



while True:

##    waterlevel=random.randint(0,100)

   waterlevel=55

   if(waterlevel <= 60 and c!=1):

      c=1


alert=requests.get('https://www.fast2sms.com/dev/bulkV2?authorization=zq4NkwlYHGE7Is5yXgb96PU
1naWBQoicjeMRvAx8rpu03OKSJTTpDG7Y8MfHR5ImsF02bZBAJdul1Q6o&route=q&message=Alert
:%20Water%20Level%20Low&language=english&flash=0&numbers=700425')

      print(alert.text)


   myData={'waterlevel':waterlevel}

   client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)

   print("Published data Successfully: %s", myData)

   client.commandCallback = myCommandCallback

   time.sleep(2)

client.disconnect()
```

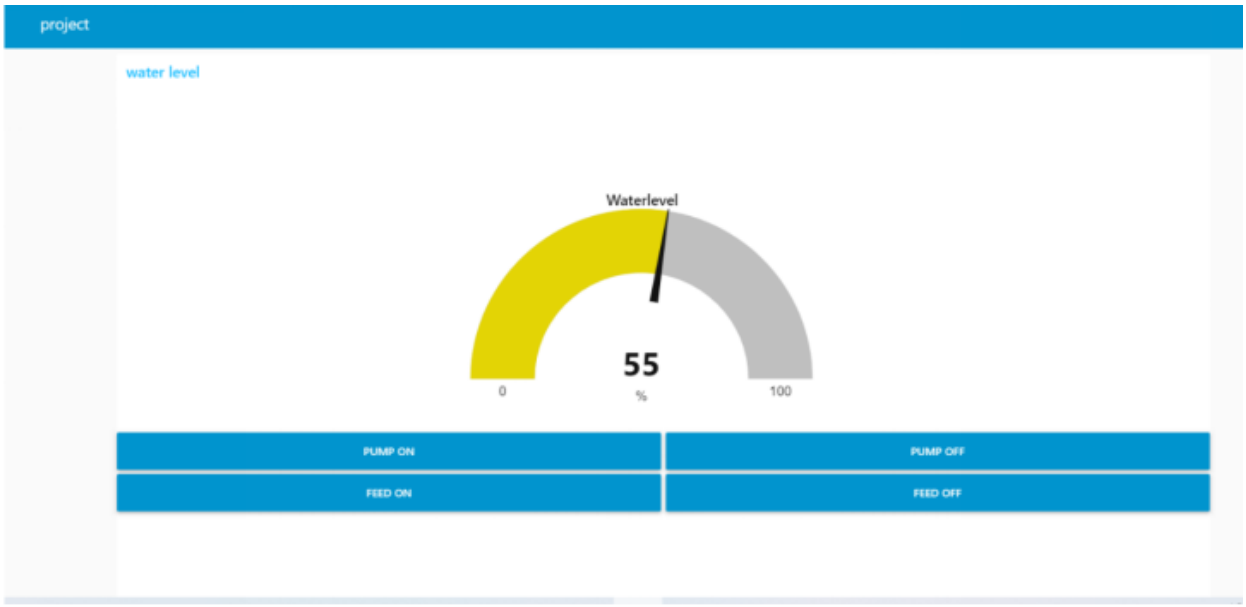
B.UI OUTPUT SCREENSHOT:

NODE-RED FLOW:

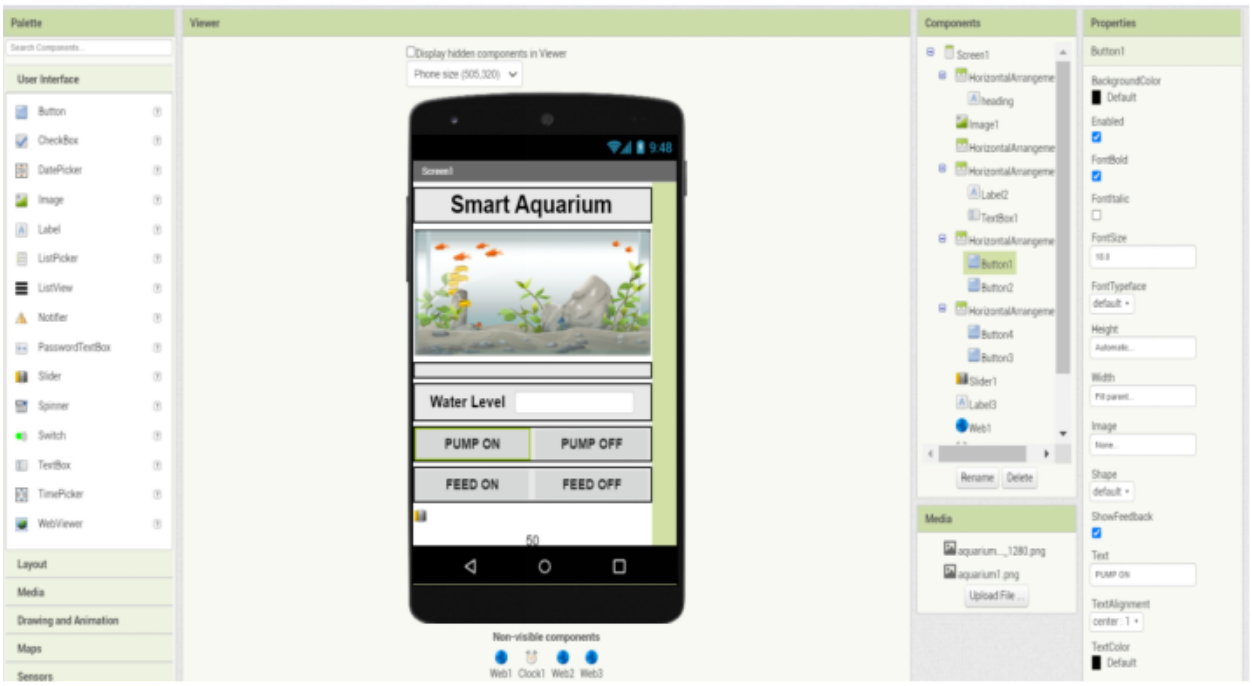


DEBUG WINDOW OUTPUT:

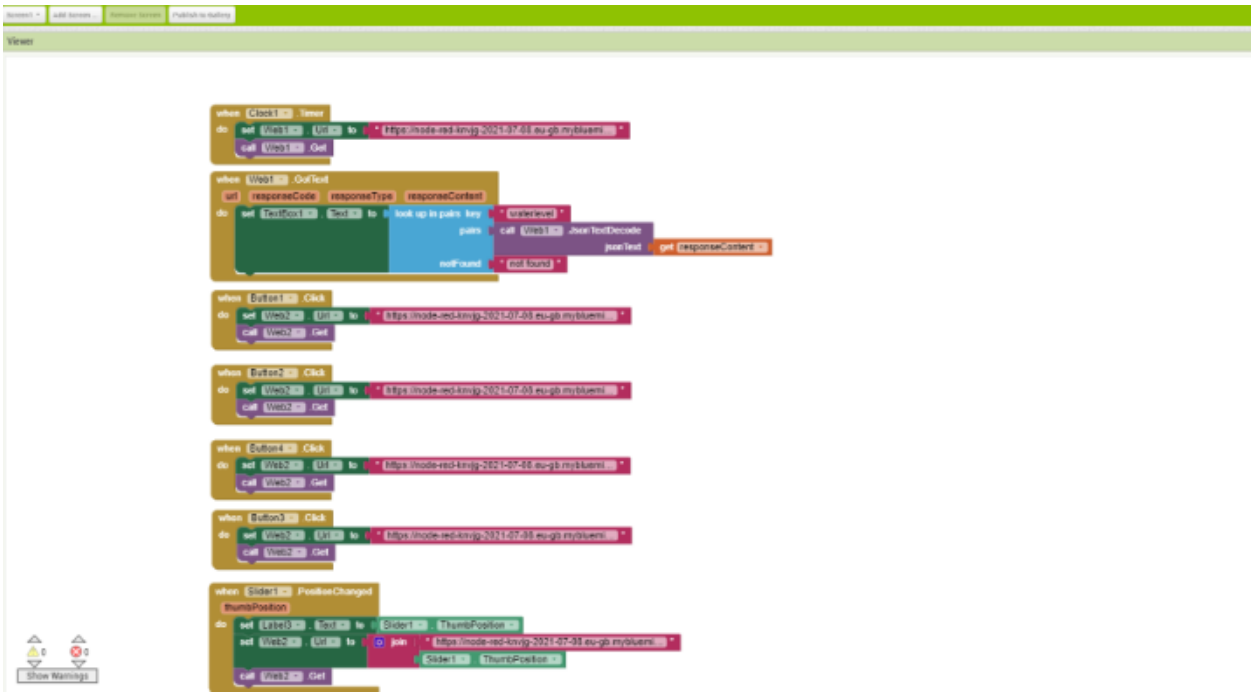
WEB-PAGE UI OUTPUT:



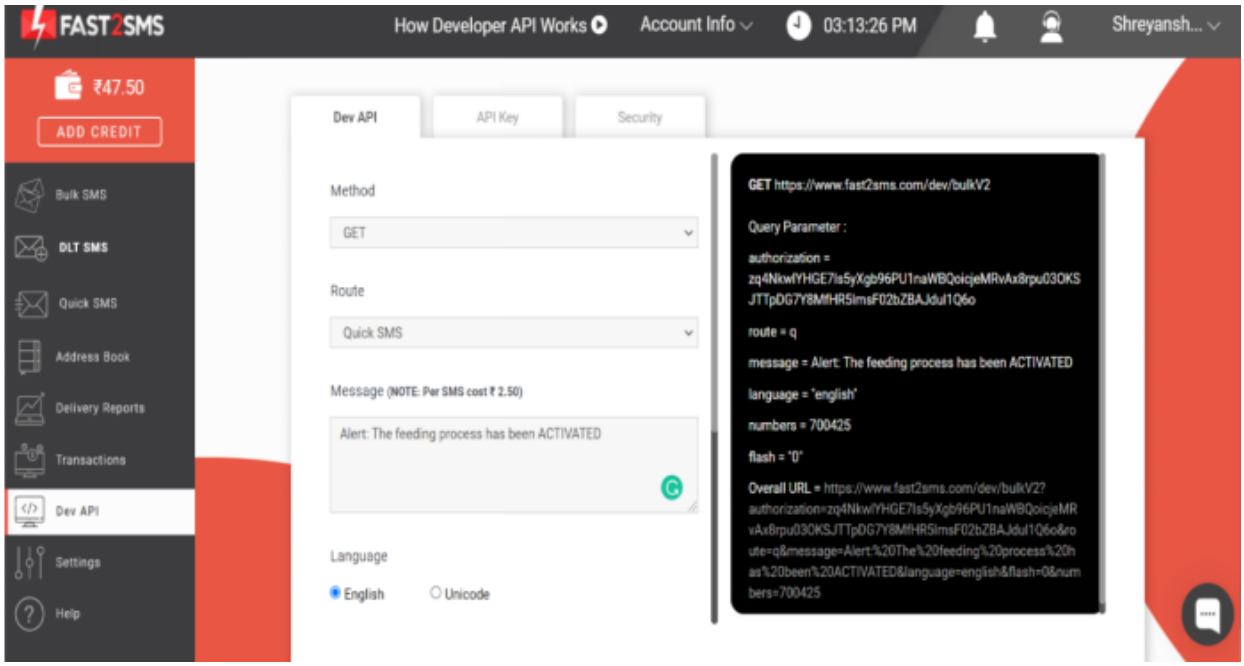
MIT APP INVENTOR UI:



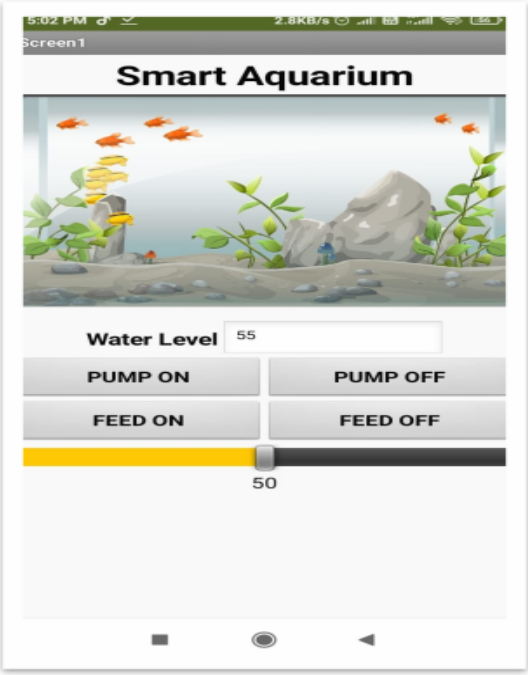
MIT APP INVENTOR BLOCK WINDOW:



SMS SERVICE PROVIDER:



PYTHON CODE OUTPUT:

```
Python 3.9.6 (tags/v3.9.6:db3ff76, Jun 28 2021, 15:26:21) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
====== RESTART: C:\Users\Shreyansh\OneDrive\Desktop\IOT\project\project.py =====
2021-07-30 15:07:25,328    wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:lzlsjs:VITshre:700425
{"return":true,"request_id":"qwzaexjypsio9vd","message":["SMS sent successfully."]}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Message received from IBM IoT Platform: pumpon
....PUMP is ON....

Message received from IBM IoT Platform: pumpoff
....PUMP is OFF....

Published data Successfully: %s {'waterlevel': 55}
Message received from IBM IoT Platform: feedon
....FEED is ON....
{"return":true,"request_id":"365k49awvsjmfhd","message":["SMS sent successfully."]}

Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Message received from IBM IoT Platform: feedoff
....FEED is OFF....

Published data Successfully: %s {'waterlevel': 55}
Message received from IBM IoT Platform: 33
Feeding Motor speed is set to 33

Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
Published data Successfully: %s {'waterlevel': 55}
```

MOBILE APPLICATION OUTPUT: