CONTROLLED ENVIRONMENT AGRICULTURE

USING IOT AND AI

A Project Report

submitted by

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in partial fulfillment for the award of the degree

Of

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PROGRESS THROUGH KNOWLEDGE

BONAFIDE CERTIFICATE

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ABSTRACT

Agriculture is the heart of India's economic activity and our experience during the last 60 years has demonstrated the strong relationship between agricultural growth and economic wealth. The present agricultural system is a mix of outstanding achievements and missed opportunities in India. If India want to become powerful economically in the world, our agricultural productivity should be equal to those countries, which are currently rated as economic power of the world. We need a new and emerging technology which can improve continuously the productivity, profitability, quality of our major farming systems. One such technology used in India is the greenhouse technology. Although it is centuries old, it is new to India. In India, dependence on agricultural productivity and geographical conditions contribute majors to underdevelopment and poverty. These can be achieved by alternative new and latest technology of farming such as hydroponics. The goal of this project is to design and construct a hydroponic system which is fully automatic and remotely accessible that can be integrated into the agricultural curriculum while introducing business skills.

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACRONYM	EXPLANATION
CCP	Clued click points
PAKE	Password authenticated key exchange
PCFG	Probabilistic context-free grammar
JVM	Java Virtual Machine
SQL	Structured Query Language

CHAPTER 1

INTRODUCTION

1.1 INTERNET OF THINGS

The main idea of hydroponics is to use a controlled-environment agriculture (CEA) technology, where all environmental factors can be controlled. Therefore, in this project, an automatic system, which consists of the Internet of Thing [IoT] is implemented in providing the controlled environment for the hydroponics. The main purpose of this project is to build a system to monitor the temperature ,pH , humidity, and to control water content through the web browser on the laptop, mobile phone and other handheld and compact devices. In this project, a temperature sensor, humidity sensor , pH sensor, EC sensor is used to detect the moisture , temperature ,pH level , EC level so that the plant can be consecutively monitored and controlled in a efficient manner. The signals are continuously sent to the Raspberry-pi. Then, the data is stored eventually in the Raspberry-pi IDE software and simultaneously sent to the web browser through the Wi-fi that is connected to the internet router. The user can monitor their plant through the web browser that allows them to read the status of the plant and can control remotely. With this development, the monitoring of the hydroponics has been so helpful and the growth of the plant can be supervised from time to time without having the operator at the event.

1.2 MACHINE LEARNING

Machine learning is the scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions, relying on patterns and inference instead. It is seen as a subset of artificial intelligence. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in a wide variety of applications, such as email filtering, detection of network intruders, and computer vision, where it is infeasible to develop an algorithm of specific instructions for performing the task. Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a field of study within machine learning, and focuses on exploratory data analysis through unsupervised learning. In its application across business problems, machine learning is also referred to as predictive analytics.

1.3 SYSTEM OVERVIEW

The innovation is simple-instore hydroponic farming. Hydroponic farms with perfect temperature, lighting, water and nutrient supply are setup by our team inside the grocery store or supermarket. Customers can then harvest the produce right into their baskets.

By moving our plants indoors, we eliminate our dependence on the weather. Instead, we are able to control the climate inside the container, creating the absolutely ideal artificial growing environment as well as nurturing the well being of our plants. Using hydroponics and a closed loop system, we are also able to reduce our water usage by up to 90 percent,deploy our product in any geographic location and, perhaps most importantly, we do not need to use any pesticides or herbicides throughout the entire growing process.

Light is an essential product in plant growth and development.As producers in most ecosystems, plants rely heavily on some sort of light source. Plants respond to the quality,quantity, and direction of light. Light is required in photosynthesis, a plant’s process of creating food and energy.The sun is the greatest light source for outdoor plants.However, substitute lighting can support the growth of plants indoors.So we used LED light to provide nearly all the benefits of sunlight. Most importantly, they produce the wavelengths of light that a plant needs to grow.

Plants require a suitable temperature and humidity for their growth. So we are control them with the help of two fans ,one fogger and one cooling system.For sensing the temperature and humidity of the surrounding we use AM2301(Temperature&humidity sensor).The temperature and humidity is sensed and the data in given to Raspberry pi.Usually, due to the LED light temperature increases humidity decreases.When temperature is above the required value we need to cool down the surrounding, so the cooling system is switched ON.When humidity is below the required value we need to increase it, so the fogger is switched ON.Both the fans ,cooling system and LED light are controlled with help of a relay.

Now, deep water culture method is used because instore hydroponics could be made efficent by this.A tray has been designed to regulate water supply and to hold the plants.

An submersible water pump is used to circulate water and a relay is used to control it.Periodically every 30 minutes it is switched ON.

A tub acts as a reservoir and if the water containing nutrient solution in exposed to direct sunlight it produce algae.so it is with black which would be a very good idea for algae control.Here nutrients and pH up&down solutions are added accordingly using a dc motor and dc motor is controlled using a relay.A PH and EC sensors is used to monitor the levels of nutrients in the water tank and added accordingly to the requirement.

Camera is placed to take pictured on regular intervals which are being used to and using raspberry pi

Using Iot temperature, humidity, PH levels,Nutrition levels can be monitored.

Our product will managing the following:

- Nutrient solution
- Electrical conductivity
- Acidity
- Temperature
- Relative humidity
- Temperature
- Water Pump

1.4 SCOPE OF THE PROJECT

We want to help more people grow and eat sustainable, organic, and hyperlocal food.We believe that our can spark a movement towards trust and ownership in our food system, and we envision a future where people source most of their food from local farmers, from outside in their garden, and from inside their home.Monitor and control your plants from web interface through Raspberry-pi. That's how we are committing to change the future of food.

CHAPTER 2

LITERATURE SURVEY

[1] Karishma Rahman,Amitabha chakrabarty,”Agricultural production output prediction using Supervised Machine Learning techniques”, 1st International Conference on Next Generation Computing Applications (NextComp), 2017.

Farmers usually plan the cultivation process based on their previous experiences. Due to the lack of precise knowledge about cultivation, they end up cultivating undesirable crops. To help the farmers take decisions that can make their farming more efficient and profitable, the research tries to establish an intelligent information prediction analysis on farming in Bangladesh. However, this way of farming here is still at the initial stage. The research suggests area based beneficial crop rank before the cultivation process. It indicates the crops that are cost effective for cultivation for a particular area of land. To achieve these results, we are considering six major crops which are Aus rice, Aman rice, Boro rice, Potato, Jute and Wheat. The prediction is based on analyzing a static set of data using Supervised Machine Learning techniques. This static dataset contains previous years' data taken from the Yearbook of Agricultural Statistics and Bangladesh Agricultural Research Council of those crops according to the area. The research has an intent to use Decision Tree Learning-ID3 (Iterative Dichotomiser 3) and K-Nearest Neighbors Regression algorithms.

[2] Ankita Patil, Akshay Naik, Mayur Beldar, Sachin Deshpande, "Smart Farming using Arduino and Data Mining", International Conference on Computing for Sustainable Global Development (INDIACom), 2016.

The current scenario in India depicts a steady decrease of agriculture contribution to the Indian GDP. The reasons for this condition are mainly - the current erratic weather condition and crop loss. New technologies and advanced fertilizers have not penetrated through the corners of India where majority of the farmers reside. Through this paper, we introduce a concept for smart farming which utilizes wireless sensor web technology for moisture detection in the soil in conjunction with a smart phone application which plays a vital role in helping farmers. We introduce Arduino based automatic plant watering system and android application which will help to control Arduino via internet. Also, this android application provides farmers with agricultural related information such as costs of seeds, moisture level required, type of soil needed, weather forecast, fertilizers and pesticides to be used.

[3] Narayut Putjaika, Sasimanee Phusae, Anupong Chen-Im, Phond Phunchongharn, Khajonpong Akkarajitsakup, "A Control System in an Intelligent Farming by using Arduino Technology", Fifth ICT International Student Project Conference (ICT-ISPC), 2016.

"Internet of Things" (IoT) is a technology that allows things to communicate and connect with each other. This will change the patterns and processes in both industry and agriculture towards higher efficiency. Particularly, agriculture is an important foundation of Thai economy. Consequently, we propose an intelligent farming system (IF) to improve the production process in planting. IF composes of two main parts which are a sensor system and a control system. In this paper, we focus on the control part which are watering and roofing systems of an outdoor farm based on the statistical data sensed from the sensor systems (including temperature, humidity, moisture and light intensity sensors) Since the sensed data would not be always accurate due to noises, we apply Kalman filtering to smooth the data before using as an input in our decision making process. For the decision making process, we do not consider only the sensed data, but also the weather information. A decision tree model is generated to predict the weather condition. Then, a set of decision rules based on both the sensed data and the predicted weather condition is developed to automatically make a decision on whether watering and roofing system should be on or off. Moreover, we also provide functions for users to manually control the watering and roofing systems via our mobile application.

[4] Vijendra Sahare, Preet Jain " Automated Hydroponic System using Psoc4 Prototyping Kit to Deliver Nutrients Solution Directly to Roots of Plants on Time Basis" Dept. of ECE, SVITS College, Indore, MP, India,2015.

Hydroponics is method of growing plants using mineral Nutrients solutions in Water without soil. Hydroponics not only save water but also save land. This paper represents Automated Hydroponic systems that automatically deliver nutrients solution into water in every week for tomato plants. The mix of Water and nutrient solution is continuously recirculate throw the water pump. Automated hydroponic system supply water and mix of nutrient solution, directly to the roots of plants continuously. System use less water and fertilizer as compared to soil system. Main parts of Automated System are PSoC4 CY8CKIT-049-42xx Prototyping kit, LCD, nutrient pump, water pump and relay.

[5] Nattapol Kaewmard, Saiyan Saiyod, "Sensor Data Collection and Irrigation Control on Vegetable Crop Using Smart Phone and Wireless Sensor Networks for Smart Farm", 2014 IEEE Conference on Wireless Sensors, 2014.

Feeding of the world in the 21st century is the biggest challenge, especially for smart farm business. The smart farm has used agriculture automation system instead of traditional agriculture. Traditional agricultural methods employed by the local people are highly sustainable, although the all inclusive cost is not cheap. Our research goal is to provide long term sustainable solution for automation of agriculture. Agriculture automation has several methods to getting data from vegetable crop like sensor for environmental measurement. Therefore, we developed a portable measurement technology including soil moisture sensor, air humidity sensor and air temperature sensor. Moreover, irrigation system using wireless sensor network has installed these sensors, with the purpose for collecting the environment data and controlling the irrigation system via smart phone. The purpose of the experiment is to find better ways of controlling an irrigation system with automatic system and manual control by smart phone. In order to control an irrigation system, we have developed the communication methodology of the wireless sensor network for collected environment data and sending control command to turn on/off irrigation system. It is successful for controlling the irrigation system and controlling the water near the vegetable roots. In this paper, we have attempted to demonstrate the automation of the irrigation system that is useful for farm business which make it comfortable than using traditional agriculture by using smart phone for monitoring and controlling the system. Accordingly, in the long-term has reduced cost as well. The experimental result shows that the accuracy of sending and receiving command control for irrigation system is 96 percent and accuracy of environment collection is 98 percent.

[6] Carlos A.P.camara "Automated system developed to control pH and concentration of nutrient solution evaluated in hydrophonic lettuce", Department of Chemistry, State University of Londrina,Brazil,2012.

Lettuce is one of the most widely consumed leaf vegetables. In hydroponic the growth depends upon the composition of nutrient solution. Due to its nutrient absorption, the conductivity and pH suffer continuous variations. This paper describes the development of a system completely managed by a lab-made software. It monitors the conductivity and pH throughout 24 h during the whole cycle of production. Also, allows adjust automatically any variation, through solenoid valves which dispense solutions of acid/base or nutrient. The efficiency of the proposed instrumentation was evaluated by simultaneously cultivation of same kind of lettuce (Vanda) in two different ways, hydroponics in greenhouse controlled with the developed devices, and grown conventionally in soil, adopted as referential. Agronomic and chemical parameters of commercial interest were analyzed for both crop, attesting the precocity in harvest (64 against 71 days) with reduced labor, better control and higher productivity, especially in fresh and dry matter of aerial parts, presenting 267.56 and 13.33 g plant^{-1} respectively, using the developed system. The data sequence regarding the concentration of nutrients for the automated hydroponic system was similar to those obtained by the mentioned researchers, as follows: K > N > Ca > P > Mg > S > Fe > Zn > Mn > Cu. This similarity highlights the efficiency of controlling the parameters of conductivity and pH in the instrumental system applied to hydroponics, offering the producer an effective and viable alternative in the production of lettuce.

[7]. O. V. Avercheva, "Growth and photosynthesis of Chinese cabbage plants grown under light-emitting diode-based light source", Russia journal of plant pysiology, Volume 56, Issue 1, pp 14–21, January,2009.

We compared growth and the content of sugar, protein, and photosynthetic pigments, as well as chlorophyll fluorescence parameters in 15- and 27-day-old Chinese cabbage (*Brassica chinensis*L.) plants grown under a high-pressure sodium (HPS) lamps or a light source built on the basis of red (650 nm) and blue (470 nm) light-emitting diodes (LEDs) with a red to blue photon ratio of 7: 1. One group of plants was grown at a photosynthetic photon flux (PPF) level of

391 ± 24 μ mol/(m^2 s) (normal level); the other, at a PPF level of 107 ± 9 μ mol/(m^2 s) (low light). Plants of the third group were firstly grown at the low light and then (on the 12th day) transferred to the normal level. When grown at the normal PPF level, the plants grown under LEDs didn't differ from plants grown under HPS lamps in shoot fresh weight, but they showed a lower root fresh and dry weights and the lower content of total sugar and sugar reserves in the leaves. No differences in the pigment content and photosystem II quantum yield were found; however, a higher Chl *a/b* ratio in plants grown under LEDs indicates a different proportion of functional complexes in thylakoid membranes. The response to low light conditions was mostly the same in plants grown under HPS lamps and LEDs; however, LED plants showed a lower growth rate and a higher nonphotochemical fluorescence quenching. In the case of the altered PPF level during growth, the plant photosynthetic apparatus adapted to new conditions of illumination within three days. Plants grown under HPS lamps at a constant normal PPF level and those transferred to the normal PPF level on the 12th day, on the 27th day didn't differ in shoot fresh weight, but in plants grown under LEDs, the differences were considerable. Our results show that LED-based light sources can be used for plant growing. At the same time, some specific properties of plant photosynthesis and growth under these conditions of illumination were found.

[8]. Dimitrios Savvas "Hydroponics: A modern technology supporting the application of integrated crop management in greenhouse ", Department of Floriculture and Landscape Architecture, Faculty of Agricultural Technology,Greece,2003.

Commercial hydroponics is a modern technology involving plant growth on inert media in place of the natural soil, in order to uncouple the performance of the crop from problems associated with the ground, such as soil-borne diseases, nonarable soil, poor physical properties, etc. Various non-toxic porous materials are used as plant growth substrates, including rockwool, perlite, pumice, expanded clay, various volcanic materials, polyurethane foam, coir dust, etc. A balanced distribution of small and larger pores is required in a substrate to ensure adequate availability of water to the plants without to affect the supply of oxygen to the roots. Hydroponics has no adverse effect on the quality of fruits and flowers produced in such systems. In contrast, the complete control of nutrition via the nutrient solution may enable an enhancement of product quality, particularly in vegetable crops, such as tomato, melon, and lettuce. The switching over from the soil to hydroponics results in a decreased application of pesticides and other toxic agrochemicals, which are necessary in soil-grown crops to disinfect the soil and to control soil-borne pathogens. Moreover, the recycling of the excess nutrient solution that drains off after each watering application may contribute to a considerable reduction of nitrate and phosphate leaching to surface- and groundwater resources. To restrict costs and increase profitability, hydroponics is increasingly based on automation of nutrient and water supply. Future developments in hydroponics are mainly focused on further automation of the nutrient solution management, particularly in closed systems in which the excess nutrient solution is recycled, as well as on a complete standardization of the substrate analysis in order to obtain more reliable results and to facilitate their interpretation.

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

In existing system, the soil based systems take longer to grow and mature. Growing food slowly and naturally creates a system that encourages biodiversity. The existing system has generously sized, hexagonal pots, allowing plenty of room for your plants to develop a good root base. Every agricultural base needs a soil medium which needs lot of oxygen, nutrition and enzymes. This needs gradual maintenance of the agricultural land with plenty of nutrition and water. This also occupies lot of area and the complete spread of nutrition are hard

3.1.1 DISADVANTAGES OF THE EXISTING SYSTEM

- This agricultural system depends on the fertilization content. There may not be a micronutrient a plant in the soil requires or may need lot of micronutrient in the soil. Also, pH is altered upon fertilization so plants and soil microorganisms existing in the soil could react conversely to the change.
- Actually traditional agricultural medium includes topsoil erodes first. As the nutrient-rich topsoil erodes, the soil that becomes exposed is less likely to contain enough nutrients to sustain plant life.
- Agricultural areas relying on nutrients on growth, fertilizer is mandatory to add the essential nutrients such as nitrogen, phosphorus and potassium to the soil to a larger extent.

3.2 PROPOSED SYSTEM

In hydroponics farming system the water is recirculated thus it achieves 20 times less water consumption than the traditional soil culture. It works by automatically getting the complete nutrient mixture and water to the roots without drowning the plant. Plants get everything they need all the time, so they do not waste growing a lot of roots or searching the nutrients. In addition to grow better food we keep on monitoring the effects of variables like pH,EC temperature and humidity using predictive analytics and thereby developing the perfect crop.Datas like temperature,humidity,water level,presence of pH and ECC from sensors are send to Cloud IOT.

3.2.1 ADVANTAGES OF PROPOSED SYSTEM

- Machines can produce natural, fresh and non polluted plant.It is easy to install and maintain.

- Because all that plants need are provided and maintained in a system, you can grow in your small apartment, or the spare bedrooms as long as you have some spaces.Plants' roots usually expand and spread out in search for foods, and oxygen in the soil. This is not the case in Hydroponics, where the roots are sunk in a tank full of oxygenated nutrient solution and directly contact with vital minerals. This means you can grow your plants much closer, and consequently huge space savings.

- The advantages of the Hydroponics against traditional farming is concentrated around; no soil, no weeds, no herbicides, few pests, precise control nutrients, farming will be done in all extreme weather conditions cold and hot.

3.3 REQUIREMENTS SPECIFICATION

3.3.1 HARDWARE REQUIREMENTS

- Raspberry pi 3
- LED light(50v)
- Fans(12v)
- Cooling system(12v)
- Submersive motor(12v)
- 8 Channel relay
- Fogger(24v)

3.3.2 SOFTWARE REQUIREMENTS

Operating System	:	Raspberry Pi.
Languages used	:	Python.
Tools	:	Eclipse with PyDev.
Backend	:	MySQL

3.4 LANGUAGE SPECIFICATION

3.4.1.Python

Overview

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

Working of Python

Python is an object oriented programming language like Java. Python is called an interpreted language. Python uses code modules that are interchangeable instead of a single long list of instructions that was standard for functional programming languages. The standard implementation of python is called "cpython". It is the default and widely used implementation of the Python. Python doesn't convert its code into machine code, something that hardware can understand. It actually converts it into something called byte code. So within python, compilation happens, but it's just not into a machine language. It is into byte code and this byte code can't be understood by CPU. So we need actually an interpreter called the python virtual machine. The python virtual machine executes the byte codes.

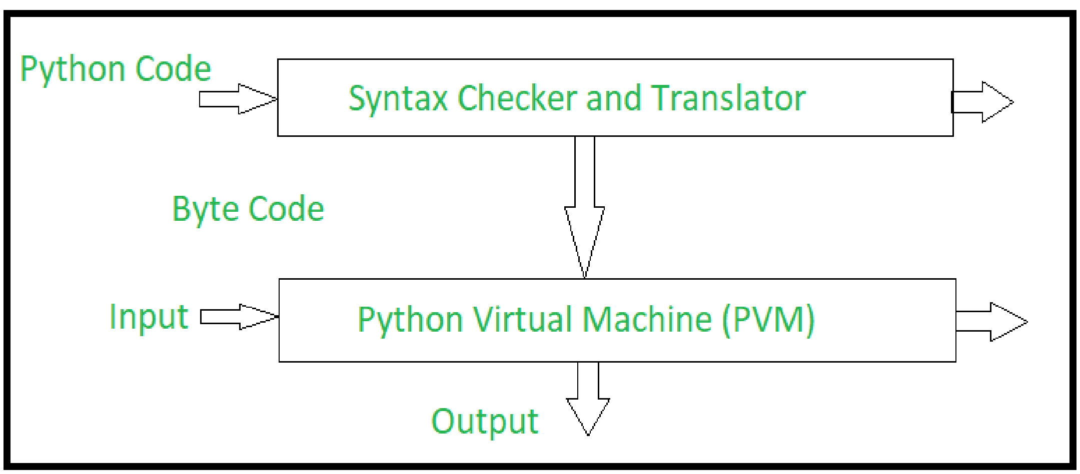

Fig 3.1 The Python Interpreter

3.4.2 MYSQL

MySQLis a database management system (DBMS). A database is a structured collection of data. To access, and process data stored in a database, you need a DBMS. Because computers are very effective at handling large amounts of data, database management plays a central role in computing. But more than being a DBMS, MySQL is relational database management (RDBMS). A relational database stores data in separate tables rather than putting all the data into one large repository. Doing adds tremendous speed and flexibility. MYSQL is easy to use, yet extremely powerful, secure and scalable. And because of its small size and speed, it is the ideal database solution for Web sites.

3.4.3 ECLIPSE

Eclipse is an integrated development environment (IDE) for developing applications using the Java programming language and other programming languages such as C/C++, Python, PERL, Ruby etc.The Eclipse platform which provides the foundation for the Eclipse IDE is composed of plug-ins and is designed to be extensible using additional plug-ins. Developed using Java, the Eclipse platform can be used to develop rich client applications, integrated development environments and other tools. Eclipse can be used as an IDE for any programming language for which a plug-in is available.The Java Development Tools (JDT) project provides a plug-in that allows Eclipse to be used as a Java IDE, PyDev is a plugin that allows Eclipse to be used as a Python IDE, C/C++ Development Tools (CDT) is a plug-in that allows Eclipse to be used for developing application using C/C++, the Eclipse Scala plug-in allows Eclipse to be used an IDE to develop Scala applications and PHPeclipse is a plug-in to eclipse that provides complete development tool for PHP.

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE

Implementation is the stage of the project when the theoretical design is turned into a working system. Thus it can be considered to be the most critical in achieving a successful new system and in giving the user, confidence that the new system will work and be effective.

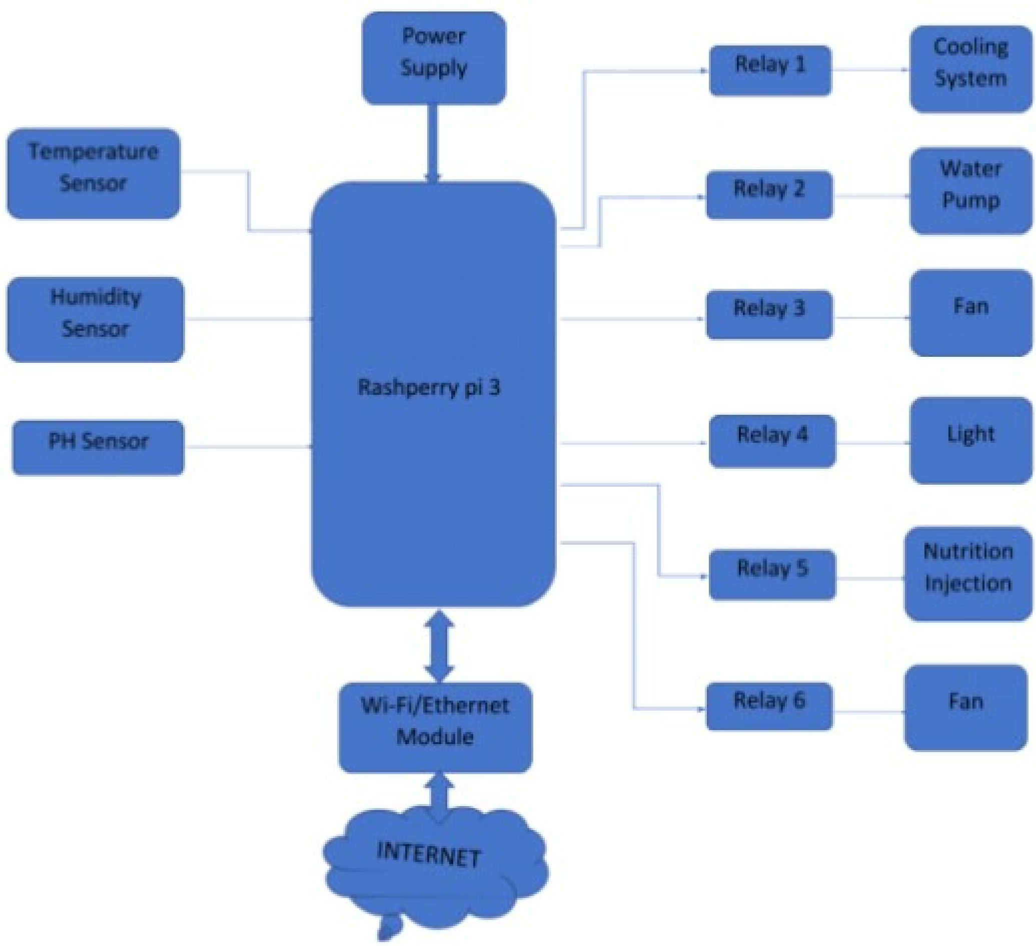

Figure 4.1 Architecture of proposed system

In Fig. 4.1

The above diagram denotes the overall system architecture of the proposed system. The major component is the raspberry pi which is connected to main sensors which provide main readings from temperature sensor, humidity sensor and pH sensor. The raspberry pi board is connected to a relay system which is connected to additional devices like cooling system, water pump, fan, light, nutrition injection, and fan which provides nutrition and life-like condition to the leaf system. Thus, plants convert carbon dioxide, water and light into sugars and oxygen through a process called photosynthesis. The photosynthesis process requires that the plant has access to certain minerals, especially nitrogen, phosphorus and potassium. These nutrients can be naturally occurring in soil and are found in most commercial fertilizers. Notice that the soil itself is not required for plant growth: the plant simply needs the minerals from the soil. This is the basic premise behind hydroponics -- all the elements required for plant growth are the same as with traditional soil-based gardening. Hydroponics simply takes away the soil requirements.

4.2 USECASE DIAGRAM

Most known diagram type of the behavioral UML diagrams, is use case diagram gives a graphic view of the actors involved in a system, different functions needed by those actors and how these different functions are interacted. It’s a great starting point for any project discussion because you can easily identify the main actors involved and the main processes of system.

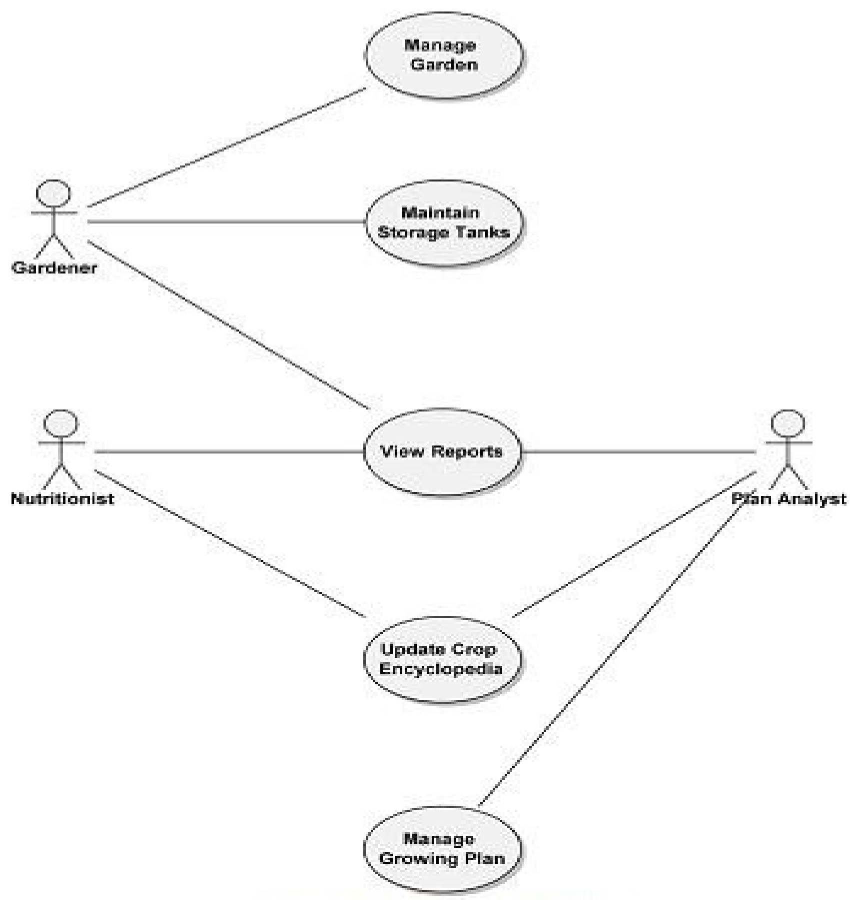

Fig 4.2 Use case diagram

4.3 CLASS DIAGRAM

A class diagram is a type of diagram and part of a unified modeling language (UML) that defines and provides the overview and structure of a system in terms of classes, attributes and methods, and the relationships between different classes.It is used to illustrate and create a functional diagram of the system classes and serves as a system development resource within the software development life cycle.

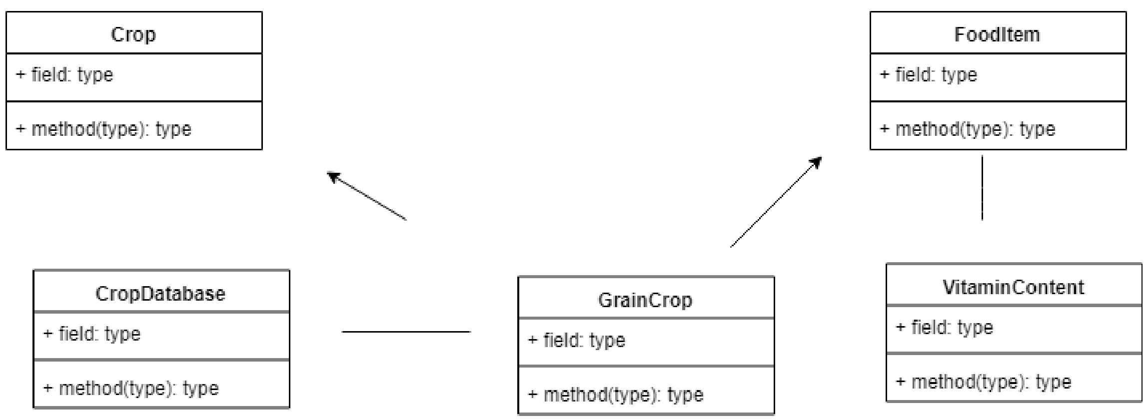

Fig 4.3 Class diagram

CHAPTER 5

SYSTEM IMPLEMENNTATION

5.1 MODULES

1.User authentication
2.Amount credited and transaction
3.Unique id generation

5.1.1 User authentication

The initial authentication is done using the username and password. The server prompts the user to enter the username and password for authentication. After the username and password is validated, the further authentication is proceeded by selecting a particular pixel in the first image. If the first pixel is selected correctly then it jumps to the second image. Then the pixel in the second image is also selected correctly, which allows user to login and proceed with the process. If the pixels are not selected correctly, then random images are generated and then user cannot login

5.1.2 Amount credited and transaction

Those currencies concept is one of the security layers to reduce the black money propagation. There are three various currencies model,

1. Two Thousand Currencies

2. Five Hundred Currencies

3. Hundred Currencies

These are the typical way in which money isolates in the E-Coin Application. The different cash that is being demonstrated are utilized in a special incentive for every rupee note. The client can view balance and transaction history. When the client clicks the view balance, account number, account name and number of various currencies demonstrated above are displayed. Client need to check and enter for the right outsider record number and right name of payee list. After the login module, the admin beholds all procedures with administrator for the validation of the subtle elements.That administrator is able to put the underlying cash for an incentive to his/her constraints. The admin can view the user details. The username and account details of all the client are recorded. The admin can also view further details of the client such as name, address which were entered by the client while registration.

5.1.3 Unique id generation

After the store procedure gets over, the Administrator has an opportunity to check every single client's exchange points of interest and furthermore the admin claims to check for the id of those monetary standards. Whether it is legally transferred or in a illegal motive. The cash methodology in the terms of application has an extraordinary ID which is generated by our application. To watch out for the monetary forms exchange, it is important to track the cash which is exchanged from one particular source to the other. To track further more details we utilize one of the kind of unique ID generation which is produced or put away in the DB. Some banks do keep a record of a couple of the serial numbers from the money packages they send for settlement/exchange to different banks or cash chest. This record is useful for the Police to keep a watch on these numbers to track the guilty parties in the event of robbery amid development of the currency

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

Finally, plant production value grows higher without any damages to the ecosystem and self-sufficiency can be in agriculture produces using modern farming methods.

6.2 FUTURE ENHANCEMENT

As the system design can be seen in all future farming centers as they practice all type of hydroponics there. As soil is unnecessary for this method of agriculture one can do it easily in any place which he likes and the farmers don't need to worry about infertility, more amount of water, infections by pests and many other problems faced by them in the ancient and normal method of agriculture.

APPENDIX 1

SAMPLE CODE

Watertank.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftime

GPIO.setmode(GPIO.BOARD)

GPIO.setup(40, GPIO.OUT) #relay9-Water solenoid

try:

    while 1:

            s=0

           while s<3602:

                    if s in range(0, 300):

                   GPIO.output (40,GPIO.LOW)

                   print(s)

                   s+=1

                   print("water on")
```

```
            time.sleep(1)#
        elif s in range(300,3600) :                 #LED_LIGHT
          GPIO.output (40,GPIO.HIGH)
                s+=1
                print(s)
                print("water off")
                time.sleep(1)
                if s == 10:
                  s=0
                  break
           except KeyboardInterrupt:
    print("Keyboard interrupt")
finally:
    print("clean up")
    GPIO.cleanup()
```

Led.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftime

GPIO.setmode(GPIO.BOARD)

GPIO.setup(16, GPIO.OUT) #relay1-LED light



try:

    while 1:

                s=0

                while s<86401:

                      if s==86400:

                         s=0

                      if s>57600:

                        GPIO.output (16,GPIO.HIGH)

                        print(s)

                        s+=1

                        print("led off")
```

```
            time.sleep(1)
           else :                    #LED_LIGHT
            GPIO.output (16,GPIO.LOW)
            print(s)
            s+=1
            print("led on")
            time.sleep(1)
except KeyboardInterrupt:
    print("Keyboard interrupt")
finally:
    print("clean up")
    GPIO.cleanup()
```

Humidity.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftime



GPIO.setmode(GPIO.BOARD)

GPIO.setup(11, GPIO.OUT) #relay9-Water solenoid

try:

    while 1:

                s=0

                while s<2702:

                      if s in range(0, 300):

                              GPIO.output (11,GPIO.LOW)

                              print(s)

                              s+=1

                              print("mist on")

                              time.sleep(1)#

                          elif s in range(300,2700) :                          #LED_LIGHT
```

```
                GPIO.output (11,GPIO.HIGH)
                s+=1
                print(s)
                print("mist off")
                time.sleep(1)
                if s == 10:
                    s=0
                    break
except KeyboardInterrupt:
    print("Keyboard interrupt")
finally:
    print("clean up")
    GPIO.cleanup()
```

Fan1.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftime

GPIO.setmode(GPIO.BOARD)

GPIO.setup(11, GPIO.OUT) #relay7-Fan 1

try:

    while 1:

                f1=0

                while f1<901:

                    if f1==900:

                       f1=0

                    if f1>10:

                       GPIO.output(11,GPIO.HIGH)

                       f1+=1

                       print(f1)

                       print("fAN OFF")

                    else:                          #FAN1(ATMOSPHERE)
```

```
                GPIO.output(11,GPIO.LOW)

                f1+=1

                print(f1)

                print("FAN ON")

            time.sleep(1)

except KeyboardInterrupt:

    print("Keyboard interrupt")


finally:

    print("clean up")

    GPIO.cleanup()
```

Fan2.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftime

GPIO.setmode(GPIO.BOARD)

GPIO.setup(13, GPIO.OUT) #relay7-Fan 1

try:

    while 1:

                    f1=0

                    while f1<61:

                         if f1==60:

                            f1=0

                         if f1>30:

                            GPIO.output(13,GPIO.HIGH)

                            f1+=1

                            print(f1)

                            print("fAN2 OFF")
```

```
            else:                    #FAN1(ATMOSPHERE)
              GPIO.output(13,GPIO.LOW)
              f1+=1
              print(f1)
              print("FAN2 ON")
            time.sleep(1)
except KeyboardInterrupt:
    print("Keyboard interrupt")

finally:
    print("clean up")
    GPIO.cleanup()
```

Cooling.py

```
import RPi.GPIO as GPIO

import time

import Adafruit_DHT

from time import gmtime,strftim

GPIO.setmode(GPIO.BOARD)

GPIO.setup(12, GPIO.OUT) #relay9-Water solenoid

try:

  while 1:

          s=0

          while s<1802:

              if s in range(0, 900):

                  GPIO.output (12,GPIO.LOW)

                  print(s)

                  s+=1

                  print("coolling on")

                  time.sleep(1)#


             elif s in range(300,1800) :                    #LED_LIGHT
```

```
                GPIO.output (12,GPIO.HIGH)

                s+=1

                print(s)

                print("coolling off")

                time.sleep(1)

                if s == 10:

                    s=0

                    break


except KeyboardInterrupt:

    print("Keyboard interrupt")



finally:

    print("clean up")

    GPIO.cleanup()
```

APPENDIX 2

SCREENSHOTS

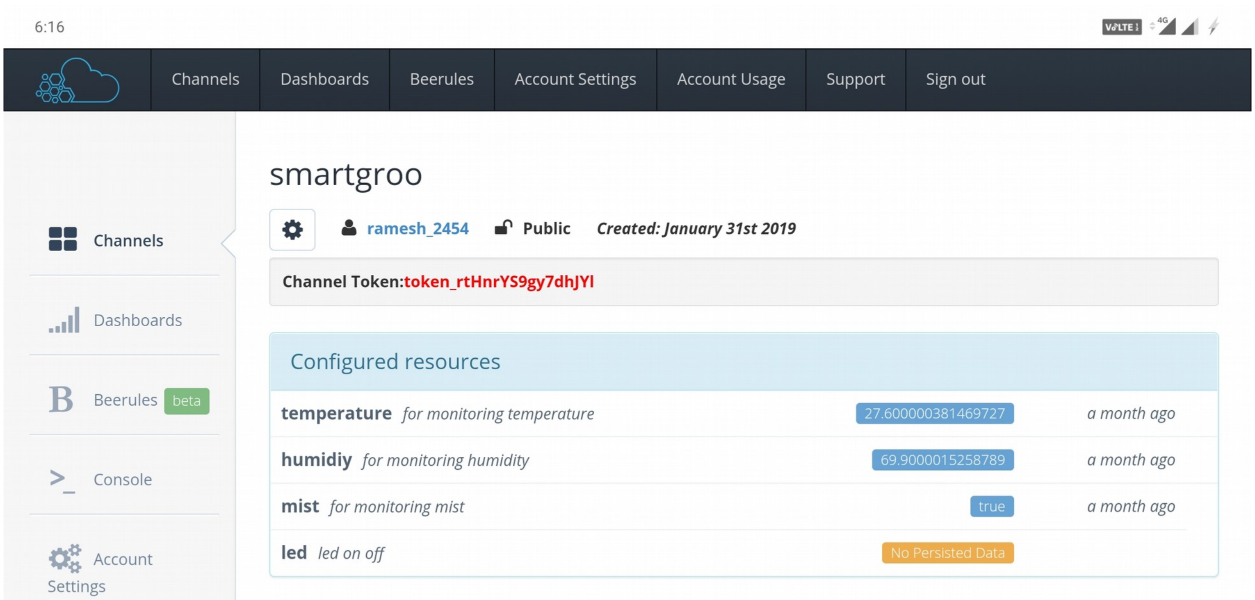

Fig1.1

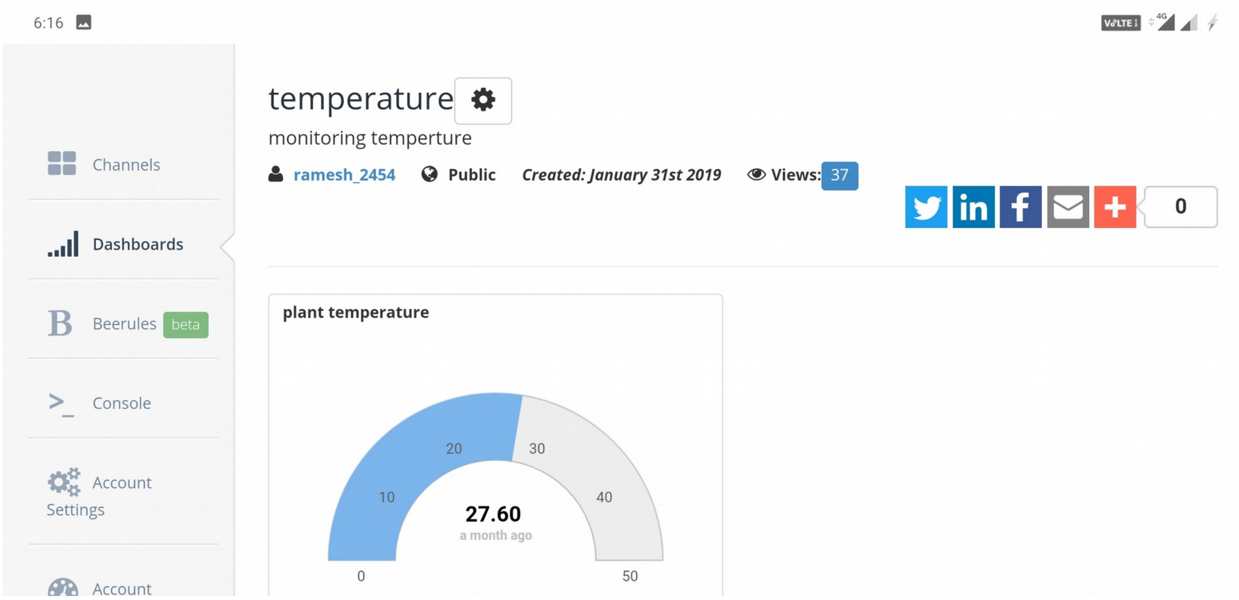
6:16
temperature
monitoring temperture
ramesh_2454
Public
Created: January 31st 2019
Views: 37
0
Channels
Dashboards
Beerules
beta
Console
Account Settings
Account
plant temperature
27.60
a month ago
0
10
20
30
40
50

Fig1.2

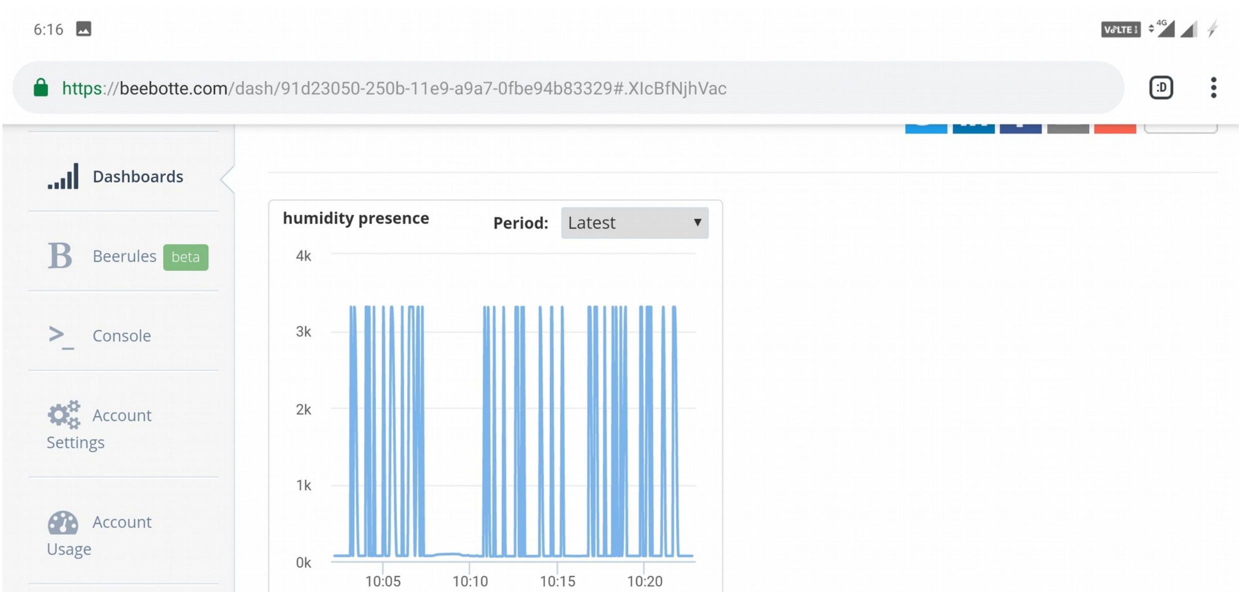
6:16
https://beebotte.com/dash/91d23050-250b-11e9-a9a7-0fbe94b83329#.XIcBfNjhVac
Dashboards
Beerules
beta
Console
Account Settings
Account Usage
humidity presence
Period:
Latest
4k
3k
2k
1k
0k
10:05
10:10
10:15
10:20

Fig1.3

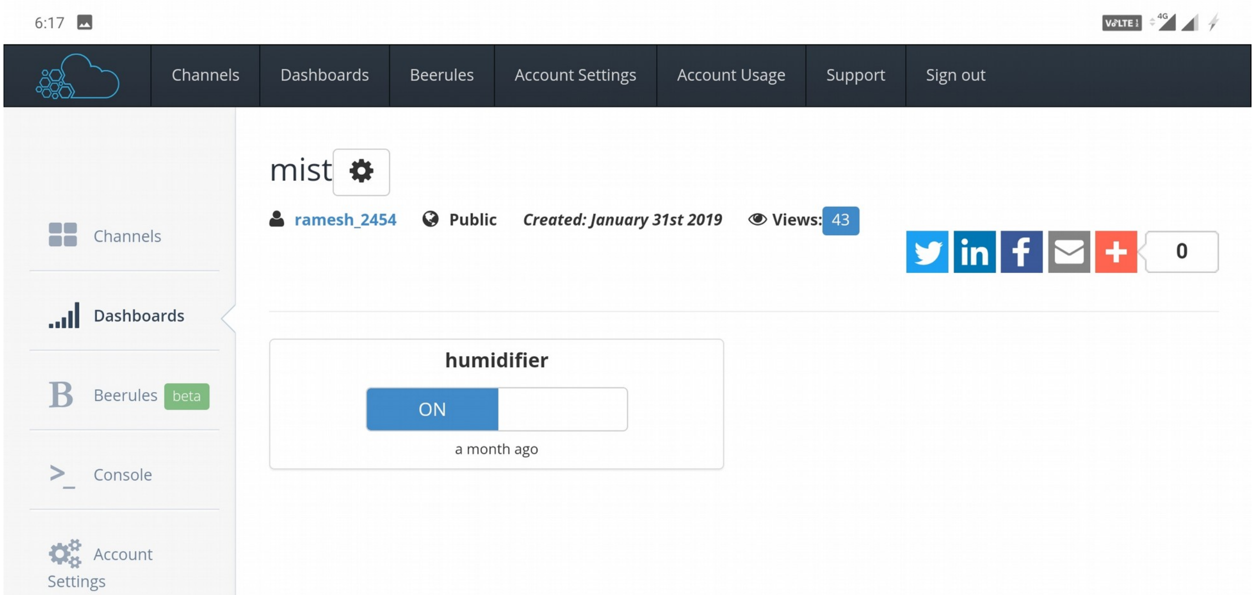
6:17
Channels
Dashboards
Beerules
Account Settings
Account Usage
Support
Sign out
mist
ramesh_2454
Public
Created: January 31st 2019
Views: 43
0
Channels
Dashboards
Beerules beta
Console
Account Settings
humidifier
ON
a month ago

Fig1.4

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