Plant.io

Aqila F. Karim – Haekal F.R – Whisnu Samudra

2017

1

Introduction

What and why

Why?

Gardens, even small ones, means **better and greener environment**

Society nowadays are so busy with their daily works, people rarely plant

Average people spent **24 minutes in playing mobile games a day** with their smartphone

We wanted to make an application that helps you to start your gardening life with an enjoyable app and a real-life plant with self-watering pot

What is this app's feature?

- Real-time plant's condition (soil moisture, light intensity, temperature)
- Automatic watering pot
- Fertilizing Scheduler
- General info and tips

How does it work?

1

Pot

In plant's pot, embedded system will be installed and used to deliver plant's condition using sensors and Wi-Fi module

2

Connect

App will request data on every connected launches and display it via interesting GUI

3

Mobile App

Plant's mood will be happy if two from three condition are specified good.

4

Additional Features

User can use additional features such as set the schedule for fertilizing plant and set plant's name

2

Project Plan

What are our plans?

Cost and budgeting

Arduino soil moisture hygrometer sensor	Rp. 21 000
LDR light sensor	Rp. 2000
Arduino Uno R3	Rp. 90 000
TMP36 temperature sensor	Rp. 12 000
Small water submersible pump	Rp. 30 000
Small hose	Rp. 12 000
Plastic plant pot	Rp. 10 000
Total	**Rp. 177 000**

System Requirements

Software Requirements

- Arduino IDE (embedded system programming)
- Android Studio (mobile application building)
- Visual Paradigm (diagram designing)
- Adobe Photoshop (interface and layout designing)
- Ms. Project and GitHub (project managing)

Hardware Tools

- Soil moisture sensor (LM293)
- LDR sensor (Model 3190)
- Temperature sensor (DHT11)
- Mini hose
- Water pump
- Arduino UNO R3
- Wi-Fi module (ESP8266)

Risk Analysis

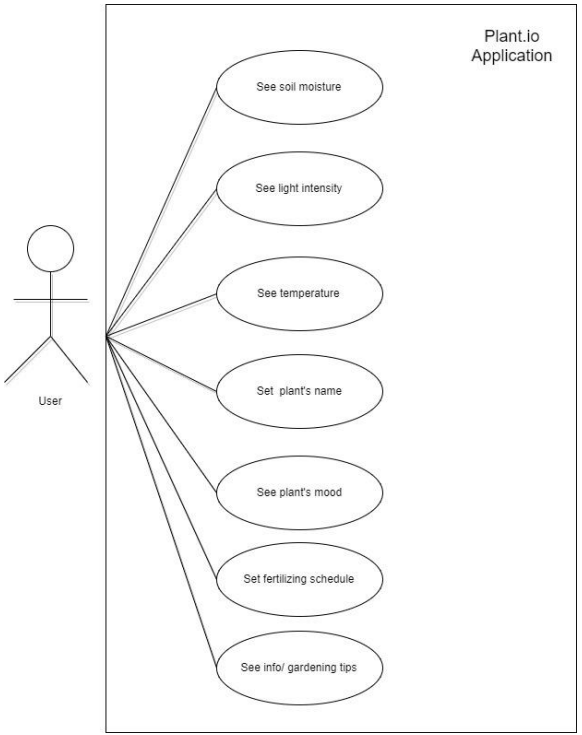
Risk Identification	Response Control
Lack of experience in android programming	Intense learning and reference searching
Interface design not interesting and user-friendly	Reference searching and sample user questioning
Project not reached on time	Consistent in doing works based on timeline
Delayed works due to sudden obstacles	Communicating each member's concern that might arise
Bugs in software or feature failures	Always evaluating and reviewing

3

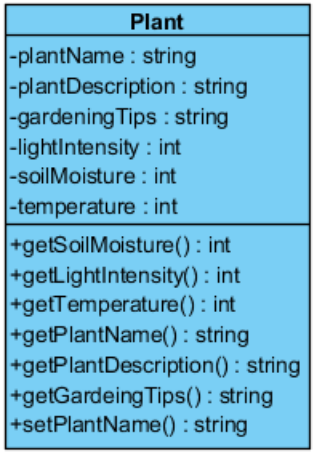
Design Diagrams

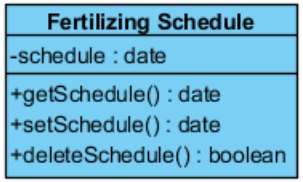
Project's UML design diagrams

●Use-case diagram

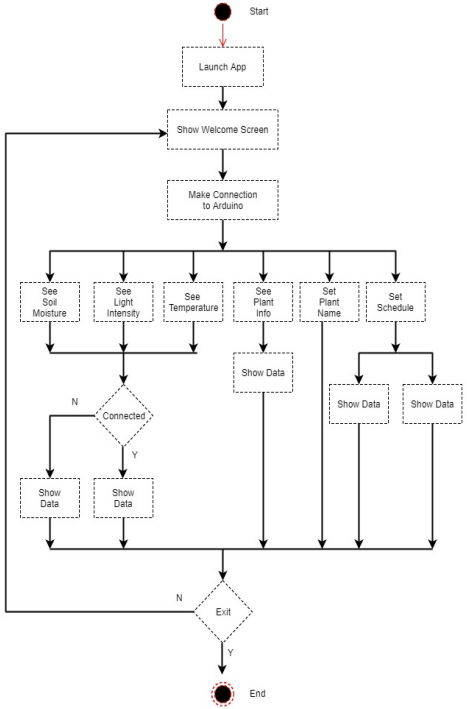


●Class diagram

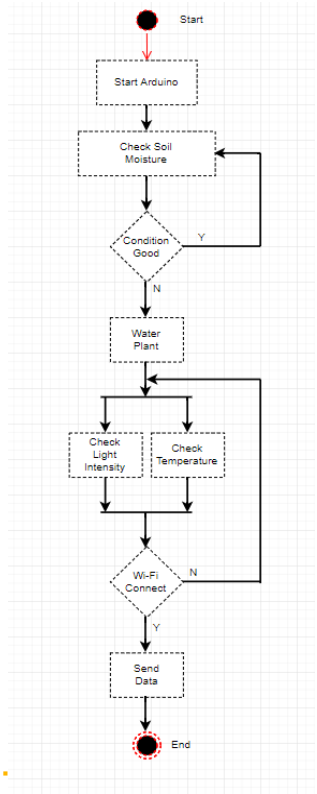




- App activity diagram



- Pot activity diagram



4

Implementation

Snippets of codes

Mobile App

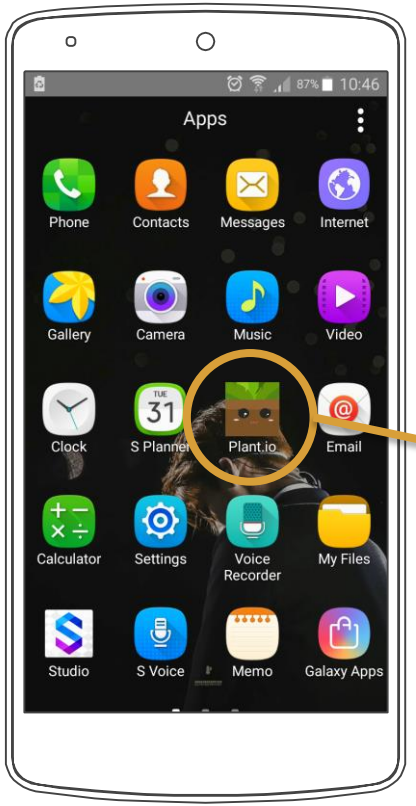
Aimed for: Android 4.0 and above

Developed using: Android Studio version 3.0

Using MVC model

Code divided to Java codes and XML codes

Consists of 8 Activity Java codes, 8 Activity Layout XML codes, and 1 android manifest XML code



Some code snips..

Wi-fi connectivity activity code to send http get request

```
public final static String RESPONSE = "SERVER_RESPONSE";
```

```
public String sendRequest(String ipAddress, String portNumber) {
    String serverResponse = "ERROR";
    try {

        HttpClient httpclient = new DefaultHttpClient(); // create an HTTP client
        // define the URL e.g. http://myIpaddress:myport/?pin=13 (to toggle pin 13 for example)
        URI website = new URI( str: "http://"+ipAddress+":"+portNumber);
        HttpGet getRequest = new HttpGet(); // create an HTTP GET object
        getRequest.setURI(website); // set the URL of the GET request
        HttpResponse response = httpclient.execute(getRequest); // execute the request
        // get the ip address server's reply
        InputStream content = null;
        content = response.getEntity().getContent();
        BufferedReader in = new BufferedReader(new InputStreamReader(
                content
        ));
        serverResponse = in.readLine();
        // Close the connection
        content.close();
    } catch (ClientProtocolException e) {
        // HTTP error
        serverResponse = e.getMessage();
        e.printStackTrace();
```

Soil moisture activity code to display shared preferences

```
SharedPreferences pref = getSharedPreferences( name: "HTTP_HELPER_PREFS",MODE_PRIVATE);
if (pref.contains(RESPONSE)) {
    conmoist.setText(pref.getString(RESPONSE, s1: ""));
}
else {
    conmoist.setText("-");
    condimoist.setText("NOT CONNECTED");
}
```

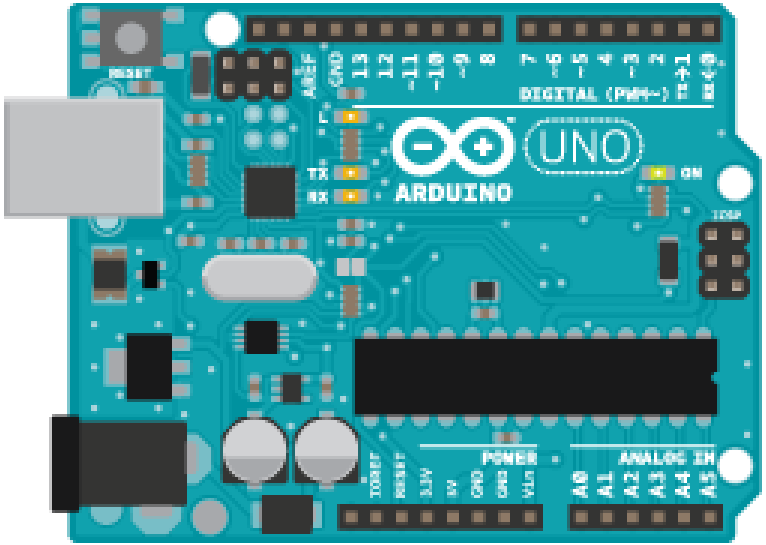
```
editor.putString(RESPONSE,serverResponse);
// return the server's reply/response text
return serverResponse;
```

Saving to shared preferences

Pot system

Developed using: Arduino IDE 1.8.4

Language: embedded C



Some code snips..

```
Serial.begin(9600);
pinMode(READSOILPIN, INPUT);
pinMode(DHT11_PIN, INPUT);
pinMode(SensorPin, INPUT);
pinMode(WATERPIN, OUTPUT);
esp8266.begin(9600);
sendCommand("AT+RST\r\n",2000,DEBUG); // reset module
sendCommand("AT+CWMODE=3\r\n",1000,DEBUG); // configure as access point
sendCommand("AT+CWSAP=\"Plant.io\",\"\",1,0\r\n",3000,DEBUG); //set SSID as Plantio and password as Rplgroup9
delay(10000);
sendCommand("AT+CWLIF=\r\n",1000,DEBUG);
sendCommand("AT+CIPMUX=1\r\n",1000,DEBUG); // configure for multiple connections
sendCommand("AT+CIPSERVER=1,80\r\n",1000,DEBUG); // turn on server on port 80 (http)
Serial.println("Server Ready");
```

Pin and Wi-Fi configuration

```
int SensorValueSoil = analogRead(READSOILPIN);
Serial.print("Soil Moisture\t= ");
Serial.println(SensorValueSoil);
if(SensorValueSoil >= MAXDRYNESS)
{
  Serial.print("Soil Dry, Start Watering");
  digitalWrite(WATERPIN, HIGH);
  delay(WATERDELAY);
  digitalWrite(WATERPIN, LOW);
  delay(WATERPOSTDELAY);
```

Read data and self-water code

```
if(esp8266.available())
{
   // get the connection id so that we can then disconnect
   int connectionId = esp8266.read()-48;
   // subtract 48 because the read() function returns
   // the ASCII decimal value and 0 (the first decimal number) starts at 48

   String content;
   content = ("Soil Moisture:");
   content += SensorValueSoil;
   sendHTTPResponse(connectionId,content);
```

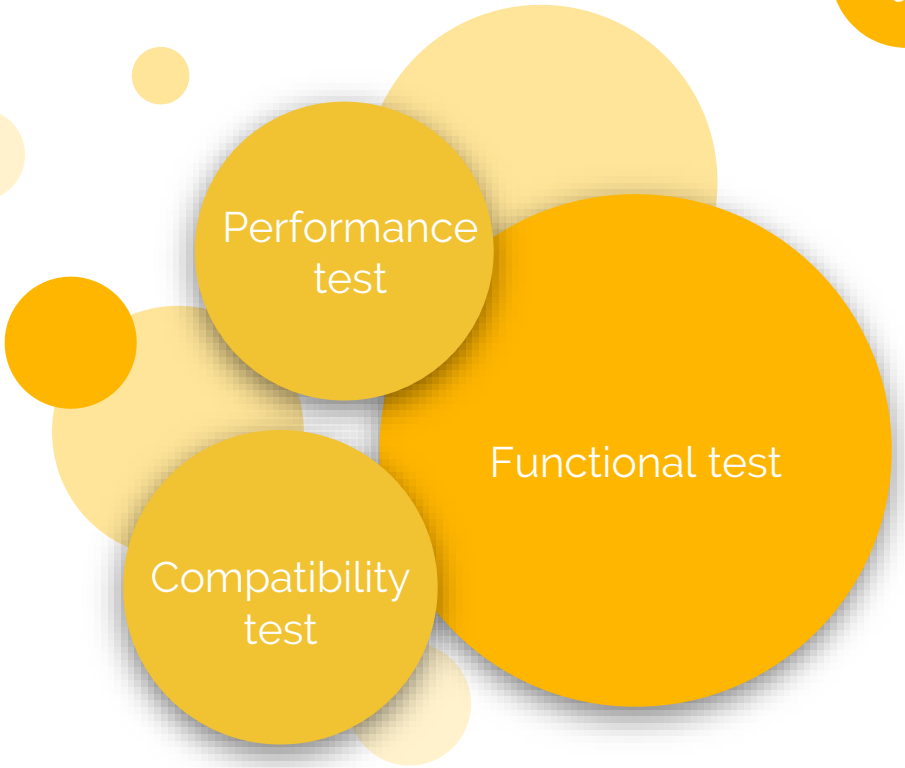
Prepare to send read data

5

Testing

Unit testing and analysis

Testing are divided into 3 main parts



Compatibility test

- Test goal is to find OS or device not compatible with the application

Tester Number	Device's Name	Device's OS	Passed or Failed
1	Samsung Galaxy S6 Edge	Android Nougat, API 24	Passed
2	Samsung Galaxy A5	Android Marshmallow, API 23	Passed
3	Asus Zenfone 3 Max	Android Marshmallow, API 23	Passed

Functional test

- Test goal is to compare the application's functionality with what the application was planned to be

Tester Number	Trials	Problems Encountered	Solution	Passed or Failed
1	5	Splash screen won't show, connection cannot be established	Working on the splash screen activity code and connection code	5 out of 6 test items passed
2	6	Scheduling screen won't show the calendar, connection cannot be established	Working on the scheduling screen activity code and connection code	5 out of 6 test items passed
3	4	Plant's name can't be saved, connection cannot be established	Working on the main screen activity code and connection code	5 out of 6 test items passed

Performance test

- Tested application will be measured by the amount of time needed to load screen and features

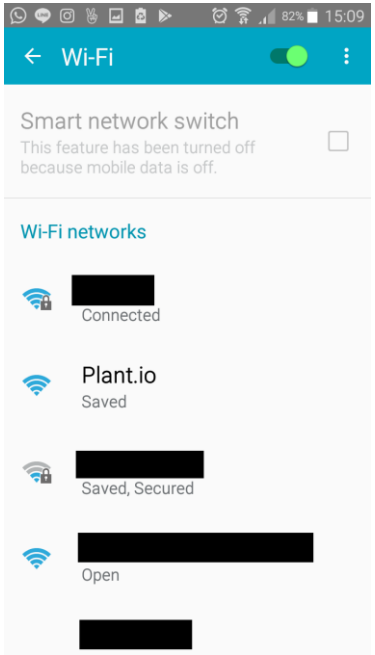
Test Device	Average of Loading Time (second)	Bug Found	Passed or Failed
1	1	Nothing	Passed
2	2	Nothing	Passed
3	2	Nothing	Passed

6

Release

The final product achieved and user's manual

Mobile App

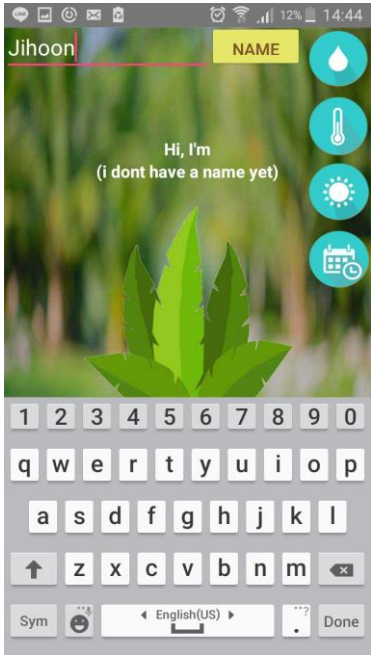

Wi-Fi
Smart network switch
This feature has been turned off because mobile data is off.
Wi-Fi networks
[redacted]
Connected
Plant.io
Saved
[redacted]
Saved, Secured
[redacted]
Open
[redacted]


Plant.io


Name your plant
NAME
Hi, I'm
(i dont have a name yet)
HAPPY


192.168.4.1
Port Number:
80
CONNECT

Mobile App

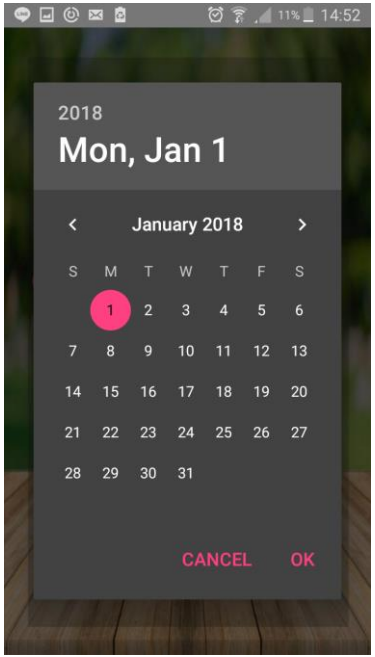

Jihoon
NAME
Hi, I'm
(i dont have a name yet)


Jihoon
NAME
Hi, I'm
Jihoon
HAPPY


A Quick Guide to Plant.io
Hello, Growers!
Welcome to Plant.io, a gardening companion to give you the most fun and convenient gardening experience like never before!
Here's to get started:
To give your plant a name, simply type in your desired name and click 'NAME'. Ta-da! Your lovely plant now has a name (this name will be saved but you can change it anytime you want).
click this button to see details of your plant's environment temperature
click this button to see details of your plant's environment lighting
click this button to see details of your plant's soil moisture
click this button to set your next fertilizing routine schedule
If you want to know what your plant actually likes, what to do if your plant is mad at you, or you just want to know its real name, simply click on your plant's name to view general info and tips!
lastly, make sure you are connected to our pot's wi-fi
Happy gardening!


Plant Info and Gardening Tips
Name: Basil (Ocimum basilicum)
Spacing:
Depending upon the variety, basil grows anywhere from 12 to 24 inches in height.
Plant Needs
Sun: Basil grows well in warm environments that receive about 6-8 hours of sun (afternoon shade) each day.
Water: Give basil water when the soil is dry to the touch, doing your best to water the plant at its base and not all over its leaves.
Soil: Basil does its best in well-drained, moist soil with a neutral pH.
Temperature: Basil grows very fast in 80- to 90-degree fahrenheit weather (27-33 celcius)
Fertilizing: Because it is harvested continually for lots of leaves, it needs a little fertilizer every couple of weeks to help keep tender new leaves coming on
Additional tips:
Choose a location with great drainage, wait till the temperature is right, harvest often, remove flowers.
If your plants get away from you to the point at which they are making seeds and have stopped growing, shear off the top third of the stems and fertilize with liquid fertilizer

Mobile App

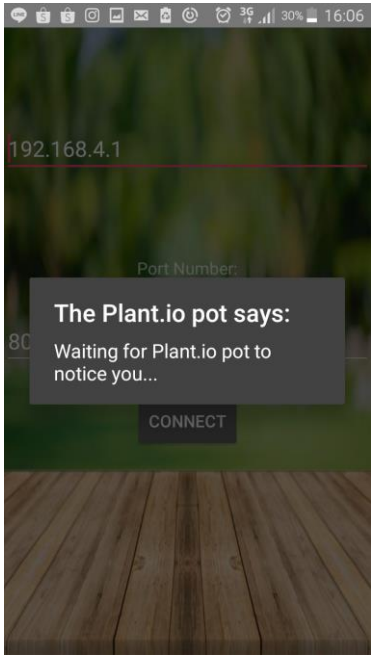

14:52
2018
Mon, Jan 1
January 2018
S M T W T F S
1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30 31
CANCEL
OK

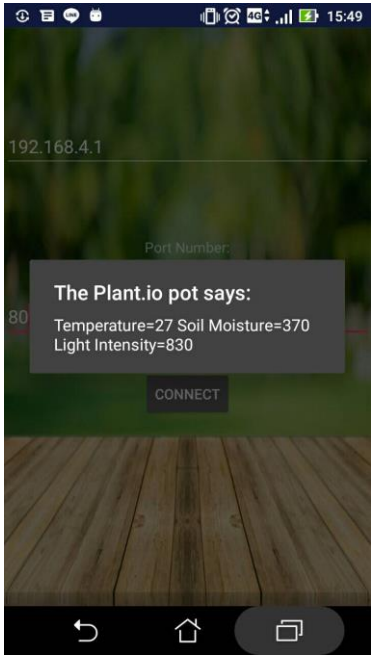

14:52
December 2017
S M T W T F S
1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
To-do Fertilizing Schedule:
1/1/2018


14:51
NOT CONNECTED

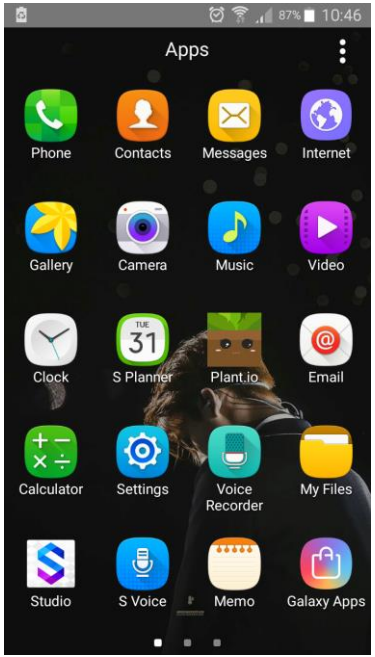

14:51
NOT CONNECTED

Mobile App


192.168.4.1
Port Number:
The Plant.io pot says:
Waiting for Plant.io pot to notice you...
CONNECT


192.168.4.1
Port Number:
The Plant.io pot says:
Temperature=27 Soil Moisture=370
Light Intensity=830
CONNECT


NOT CONNECTED


Apps
Phone
Contacts
Messages
Internet
Gallery
Camera
Music
Video
Clock
S Planner
Plant.io
Email
Calculator
Settings
Voice Recorder
My Files
Studio
S Voice
Memo
Galaxy Apps


Thank
You