

LAMPIRAN 1

LISTING PROGRAM

```
//Inisialisasi port:
#include <Wire.h> //pemanggilan library komunikasi serial I2C
#include <LiquidCrystal_I2C.h> //pemanggilan library LCD I2C
#include <DS3231.h> //pemanggilan library RTC DS3231
#include <ESP8266WiFi.h> //pemanggilan library ESP8266 sebagai Wifi
#include "DHT.h" //pemanggilan library sensor DHT
#include "Servo.h" //pemanggilan library motor servo
#define DHTPIN 13 //pin DHT adalah 13
#define DHTTYPE DHT22 //menggunakan sensor dht22
Servo myservo; //variabel servo
DS3231 rtc(SDA, SCL); //komunikasi I2C dengan LCD dengan koneksi melalui
SDA dan SCL
LiquidCrystal_I2C lcd(0x3F, 20, 4); //0x3F adalah alamat LCD. 20, 4 merupakan
ukuran LCD
DHT dht(DHTPIN, DHTTYPE);
const float pTrig = A0; //menentukan pin A0 sebagai TRIGGER
const float pEcho = A1; //menentukan pin A1 sebagai ECHO
float Tinggi,T,durasi; //variabel penampung tinggi,T dan durasi
float cool,normal,hot,dry,moist,wet,low,medium,high,tinggi,suhu,lembab;
//menentukan variabel fuzzifikasi suhu, tinggi dan kelembaban
float a_suhu,a_lembab,a_tinggi; //menentukan variabel alpha predikat
float terkecil,terbesar; //variabel pembanding utama
float a,b,c,d,e,f,g,h,i,j,k,l,m,n; //variabel pembanding
float aa,bb,cc,dd,ee,ff,gg,hh,ii,jj,kk,ll,mm,nn; //variabel pembanding
float banding1,banding2,banding3,banding4,banding5,banding6, banding7,
banding8,banding9,banding10,banding11,banding12,banding13, banding14,
banding15,banding16,banding17,banding18,banding19,banding20,
```

```

banding21,banding22,banding23,banding24,banding25,banding26,banding27;
//variabel pembading
float satu, dua, tiga, empat, lima, enam, tujuh, delapan, sembilan, sepuluh,
sebelas, duabelas, tigabelas, empatbelas; //variabel pembanding
float minus1, minus2, minus3, minus4, minus5, minus6; //variabel pembanding
float minus11, minus22, minus33, minus44, minus55, minus66; //variabel
pembanding
float a_predikat1,a_predikat2,a_predikat3,a_predikat4,a_predikat5,a_predikat6,
a_predikat7,a_predikat8,a_predikat9,a_predikat10,a_predikat11,a_predikat12,
a_predikat13,a_predikat14,a_predikat15,a_predikat16,a_predikat17,
a_predikat18,a_predikat19,a_predikat20,a_predikat21,a_predikat22,
a_predikat23,a_predikat24,a_predikat25,a_predikat26,a_predikat27; //varibel
alpha predikat
double a1,a2,z_total,M1,M2,M3,luas1,luas2,luas3; //varibel rumus

float sensor;
String apiKey = "FO9IJCQNC95NBA7N"; //APIKey Thingspeak
char* ssid = "bungbaedi"; //SSID pengguna
const char* password = "bungbaedi123"; //password pengguna
const char* server = "api.thingspeak.com"; //alamat thingspeak
WiFiClient client; //setting sebagai client

void setup(){
  Serial.begin(115200); //serial monitor dengan baud rate 115200
  rtc.begin(); //memulai rtc
  rtc.setDOW(FRIDAY); //setting hari
  rtc.setTime(14,40,00); //setting waktu (jam)
  rtc.setDate(20,4,2018); //setting tanggal
  lcd.init(); //setting lcd. Bisa menggunakan lcd.begin();
  myservo.attach(2); //setting motor servo pada pin 2
  dht.begin(); //memulai sensor dht

```

```

pinMode(pTrig, OUTPUT); //TRIGGER sebagai OUTPUT
pinMode(pEcho, INPUT); //ECHO sebagai INPUT
Tinggi=30; //setting tinggi awal adalah 30 cm

WiFi.begin(ssid, password); //menggunakan ssid dan password sebagai koneksi
if (WiFi.status() != WL_CONNECTED) {
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print("Wifi Terhubung ");
    Serial.println(ssid);
  }
  else{Serial.print("Wifi Tidak Terhubung");
}

// Turn on the backlight and print a message.
lcd.backlight();
lcd.print("QIROM ");
delay(1000); //jeda waktu 1 detik
lcd.clear(); //hapus lcd
}

```

Untuk inisialisasi, DHT22 akan dihubungkan pada port pin 13, ultrasonik akan dihubungkan pada port A0 untuk trigger dan port A1 untuk echo, RTC3231 dan LCD 20x04 akan dihubungkan pada port SDA dan SCL yang dipasang paralel, motor servo akan dihubungkan pada pin 2, dan ESP8266 akan dihubungkan pada pin RX dan TX arduino.

Program utama terdapat pengaturan *sketch* dengan metode kendali *fuzzy* dan transfer data melalui esp8266. Berikut ini merupakan isi program utama berupa : menampilkan waktu RTC; menampilkan suhu, kelembaban udara dan tinggi air melalui LCD 20x04; dan proses logika fuzzy.

```

void loop(){
  lcd.setCursor(0,1); //setting lcd pada baris ke nol kolom ke satu

```

```
lcd.print(rtc.getDateStr()); //menulis tanggal di layar LCD
lcd.setCursor(12,1); //setting lcd pada baris ke 12 kolom ke 1
lcd.print(rtc.getTimeStr()); //menulis jam di LCD
delay(1000); //jeda waktu 1 detik
```

```
digitalWrite(pTrig,HIGH); //aktifkan TRIGGER
delayMicroseconds(10); //jeda 10 mikro detik
digitalWrite(pTrig,LOW); //non aktifkan TRIGGER
```

```
durasi = pulseIn(pEcho,HIGH); //menghitung durasi
T = durasi/58; //rumus waktu rambat (perambatan gelombang)
tinggi = (Tinggi)-(T); //tinggi akhir adalah T=30-T
```

```
float lembab = dht.readHumidity(); //pembacaan kelembaban
float suhu = dht.readTemperature(); //pembacaan temperatur
Serial.print("Humidity: ");
Serial.print(lembab);
Serial.println(" %\t");
Serial.print("Temperature: ");
Serial.print(suhu);
Serial.println(" *C ");
Serial.print("tinggi: ");
Serial.print(tinggi);
Serial.println("cm");
```

```
//DERAJAT KEANGGOTAAN SUHU
```

```
if (suhu<=16) {
  cool = 1;
  normal = 0;
  hot = 0;
}
```

```

else if (suhu>=16 && suhu<=28) {
    cool = (28-suhu)/(28-16);
    normal = (suhu-16)/(28-16);
    hot = 0;
}
else if (suhu==28) {
    cool = 0;
    normal = 1;
    hot = 0;
}
else if (suhu>=28 && suhu<=40) {
    cool = 0;
    normal = (40-suhu)/(40-28);
    hot = (suhu-28)/(40-28);
}
else if (suhu>=40) {
    cool = 0;
    normal = 0;
    hot = 1;
}

```

//DERAJAT KEANGGOTAAN LEMBAB

```

if (lembab<=40) {
    dry = 1;
    moist = 0;
    wet = 0;
}
else if (lembab>=40 && lembab<=60) {
    dry = (60-lembab)/(60-40);
    moist = (lembab-40)/(60-40);
}

```

```

    wet = 0;
}
else if (lembab==60) {
    dry = 0;
    moist = 1;
    wet = 0;
}
else if (lembab>=60 && lembab<=80) {
    dry = 0;
    moist = (80-lembab)/(80-60);
    wet = (lembab-60)/(80-60);
}
else if (lembab>=80) {
    dry = 0;
    moist = 0;
    wet = 1;
}

//DERAJAT KEANGGOTAAN TINGGI AIR
if (tinggi<=3) {
    low = 1;
    medium = 0;
    high = 0;
}
else if (tinggi>=3 && tinggi<=5) {
    low = (5-tinggi)/(5-3);
    medium = (tinggi-3)/(5-3);
    high = 0;
}
else if (tinggi==5) {
    low = 0;

```

```

    medium = 1;
    high = 0;
}
else if (tinggi >= 5 && tinggi <= 7) {
    low = 0;
    medium = (7-tinggi)/(7-5);
    high = (tinggi-5)/(7-5);
}
else if (tinggi >= 7) {
    low = 0;
    medium = 0;
    high = 1;
}

```

//Rule Evaluasi sebanyak 27 rule :

//[R1] IF SUHU COOL DAN KELEMBABAN DRY AND TINGGI AIR
LOW THEN PENYIRAMAN LONG

```

banding1 = min(cool,dry);
a_predikat1 = min(banding1,low);

```

//[R2] IF SUHU COOL DAN KELEMBABAN DRY AND TINGGI AIR
MEDIUM THEN PENYIRAMAN MEDIUM

```

banding2 = min(cool,dry);
a_predikat2 = min(banding2,medium);

```

//[R3] IF SUHU COOL DAN KELEMBABAN DRY AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

```

banding3 = min(cool,dry);
a_predikat3 = min(banding3,high);

```

//[R4] IF SUHU COOL DAN KELEMBABAN MOIST AND TINGGI AIR
LOW THEN PENYIRAMAN MEDIUM

banding4 = min(cool,moist);

a_predikat4 = min(banding4,low);

//[R5] IF SUHU COOL DAN KELEMBABAN MOIST AND TINGGI AIR
MEDIUM THEN PENYIRAMAN SHORT

banding5 = min(cool,moist);

a_predikat5 = min(banding5,medium);

//[R6] IF SUHU COOL DAN KELEMBABAN MOIST AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding6 = min(cool,moist);

a_predikat6 = min(banding6,high);

//[R7] IF SUHU COOL DAN KELEMBABAN WET AND TINGGI AIR
LOW THEN PENYIRAMAN MEDIUM

banding7 = min(cool,wet);

a_predikat7 = min(banding7,low);

//[R8] IF SUHU COOL DAN KELEMBABAN WET AND TINGGI AIR
MEDIUM THEN PENYIRAMAN SHORT

banding8 = min(cool,wet);

a_predikat8 = min(banding8,medium);

//[R9] IF SUHU COOL DAN KELEMBABAN WET AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding9 = min(cool,wet);

a_predikat9 = min(banding9,high);

//[R10] IF SUHU NORMAL DAN KELEMBABAN DRY AND TINGGI AIR
LOW THEN PENYIRAMAN LONG

banding10 = min(normal,dry);

a_predikat10 = min(banding10,low);

//[R11] IF SUHU NORMAL DAN KELEMBABAN DRY AND TINGGI AIR
MEDIUM THEN PENYIRAMAN MEDIUM

banding11 = min(normal,dry);

a_predikat11 = min(banding11,medium);

//[R12] IF SUHU NORMAL DAN KELEMBABAN DRY AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding12 = min(normal,dry);

a_predikat12 = min(banding12,high);

//[R13] IF SUHU NORMAL DAN KELEMBABAN MOIST AND TINGGI
AIR LOW THEN PENYIRAMAN MEDIUM

banding13 = min(normal,moist);

a_predikat13 = min(banding13,low);

//[R14] IF SUHU NORMAL DAN KELEMBABAN MOIST AND TINGGI
AIR MEDIUM THEN PENYIRAMAN SHORT

banding14 = min(normal,moist);

a_predikat14 = min(banding14,medium);

//[R15] IF SUHU NORMAL DAN KELEMBABAN MOIST AND TINGGI
AIR HIGH THEN PENYIRAMAN SHORT

banding15 = min(normal,moist);

a_predikat15 = min(banding15,high);

//[R16] IF SUHU NORMAL DAN KELEMBABAN WET AND TINGGI AIR
LOW THEN PENYIRAMAN MEDIUM

banding16 = min(normal,wet);

a_predikat16 = min(banding16,low);

//[R17] IF SUHU NORMAL DAN KELEMBABAN WET AND TINGGI AIR
MEDIUM THEN PENYIRAMAN SHORT

banding17 = min(normal,wet);

a_predikat17 = min(banding17,medium);

//[R18] IF SUHU NORMAL DAN KELEMBABAN WET AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding18 = min(normal,wet);

a_predikat18 = min(banding18,high);

//[R19] IF SUHU HOT DAN KELEMBABAN DRY AND TINGGI AIR
MEDIUM THEN PENYIRAMAN MEDIUM

banding19 = min(hot,dry);

a_predikat19 = min(banding19,medium);

//[R20] IF SUHU HOT DAN KELEMBABAN DRY AND TINGGI AIR
HIGH THEN PENYIRAMAN MEDIUM

banding20 = min(hot,dry);

a_predikat20 = min(banding20,high);

//[R21] IF SUHU HOT DAN KELEMBABAN MOIST AND TINGGI AIR
LOW THEN PENYIRAMAN MEDIUM

banding21 = min(hot,moist);

a_predikat21 = min(banding21,low);

//[R22] IF SUHU HOT DAN KELEMBABAN MOIST AND TINGGI AIR
MEDIUM THEN PENYIRAMAN MEDIUM

banding22 = min(hot,moist);

a_predikat22 = min(banding22,medium);

//[R23] IF SUHU HOT DAN KELEMBABAN MOIST AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding23 = min(hot,moist);

a_predikat23 = min(banding23,high);

//[R24] IF SUHU HOT DAN KELEMBABAN WET AND TINGGI AIR
LOW THEN PENYIRAMAN MEDIUM

banding24 = min(hot,wet);

a_predikat24 = min(banding24,low);

//[R25] IF SUHU HOT DAN KELEMBABAN WET AND TINGGI AIR
MEDIUM THEN PENYIRAMAN SHORT

banding25 = min(hot,wet);

a_predikat25 = min(banding25,medium);

//[R26] IF SUHU HOT DAN KELEMBABAN WET AND TINGGI AIR
HIGH THEN PENYIRAMAN SHORT

banding26 = min(hot,wet);

a_predikat26 = min(banding26,high);

//[R27] IF SUHU HOT DAN KELEMBABAN DRY AND TINGGI AIR
MEDIUM THEN PENYIRAMAN MEDIUM

banding27 = min(hot,dry);

a_predikat27 = min(banding27,medium);

//FUNGSI IMPLIKASI dengan melakukan mencari nilai minimum sehingga dilakukan perbandingan dari masing - masing alpha predikat

```
a = min(a_predikat1,a_predikat2);
b = min(a_predikat3,a_predikat4);
satu = min(a,b);
c = min(a_predikat5,a_predikat6);
d = min(a_predikat7,a_predikat8);
dua = min(c,d);
e = min(a_predikat9,a_predikat10);
f = min(a_predikat11,a_predikat12);
tiga = min(e,f);
g = min(a_predikat13,a_predikat14);
h = min(a_predikat15,a_predikat16);
empat = min(g,h);
i = min(a_predikat17,a_predikat18);
j = min(a_predikat19,a_predikat20);
lima = min(i,j);
k = min(a_predikat21,a_predikat22);
l = min(a_predikat23,a_predikat24);
enam = min(k,l);
m = min(a_predikat25,a_predikat26);
n = a_predikat27;
tujuh = min(m,n);
```

```
minus1 = min(satu,dua);
minus2 = min(tiga,empat);
minus3 = min(lima,enam);
minus4 = tujuh;
minus5 = min(minus1,minus2);
minus6 = min(minus3,minus4);
terkecil = min(minus5,minus6);
```

```

Serial.print("a_terkecil =");
Serial.println(terkecil);

//Menacari nilai maksimum dengan melakukan perbandingan semua alpha
predikat
aa = max(a_predikat1,a_predikat2);
bb = max(a_predikat3,a_predikat4);
delapan = max(aa,bb);
cc = max(a_predikat5,a_predikat6);
dd = max(a_predikat7,a_predikat8);
sembilan = max(cc,dd);
ee = max(a_predikat9,a_predikat10);
ff = max(a_predikat11,a_predikat12);
sepuluh = max(ee,ff);
gg = max(a_predikat13,a_predikat14);
hh = max(a_predikat15,a_predikat16);
sebelas = max(gg,hh);
ii = max(a_predikat17,a_predikat18);
jj = max(a_predikat19,a_predikat20);
duabelas = max(ii,jj);
kk = max(a_predikat21,a_predikat22);
ll = max(a_predikat23,a_predikat24);
tigabelas = max(kk,ll);
mm = max(a_predikat25,a_predikat26);
nn = a_predikat27;
empatbelas = max(mm,nn);

minus11 = max(delapan,sembilan);
minus22 = max(sepuluh,sebelas);
minus33 = max(duabelas,tigabelas);
minus44 = empatbelas;

```

```

minus55 = max(minus11,minus22);
minus66 = max(minus33,minus44);
terbesar = max(minus55,minus66);
Serial.print("a_terbesar =");
Serial.println(terbesar);

```

```

//MENCARI DEFUZZIFIKASI DENGAN METODE COA (CENTROID OF
AREA / CENTER OF GRAVITY)

```

```

if (terbesar == a_predikat1)//[R1] {
    a1 = 34+(14*terkecil);
    a2 = 34+(14*terbesar);
    M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
    M2 = (((((1/14)/3)*a2*a2*a2)-(((34/14)/2)*a2*a2))-(((1/14)/3)*a1*a1*a1)-
    (((34/14)/2)*a1*a1));
    M3 = ((terbesar/2)*48*48)-((terbesar/2)*a2*a2);
    luas1 = (a1*terkecil);
    luas2 = (terkecil+terbesar)*(a2-a1)/2;
    luas3 = (48-a2)*terbesar;
    z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat2)//[R2] {
    a1 = 34;
    a2 = a1;
    z_total = a2;
}
else if (terbesar == a_predikat3)//[R3] {
    a2 = 34-(14*terkecil);
    a1 = 34-(14*terbesar);
    M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
    M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);

```

```

M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
//z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat4)//[R4] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat5)//[R5] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat6)//[R6] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));

```

```

luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
//z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat7)//[R7] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat8)//[R8] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat9)//[R9] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);

```



```

luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
//z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat10)//[R10] {
a1 = 34+(14*terkecil);
a2 = 34+(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = (((((1/14)/3)*a2*a2*a2)-(((34/14)/2)*a2*a2))-(((1/14)/3)*a1*a1*a1)-
(((34/14)/2)*a1*a1));
M3 = ((terbesar/2)*48*48)-((terbesar/2)*a2*a2);
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1)/2;
luas3 = (48-a2)*terbesar;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat11)//[R11] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat12)//[R12] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2)); luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;

```

```

// z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat13)//[R13] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat14)//[R14] {
a1 = 20+(14*terkecil);
a2 = 20+(14*terbesar);
M1 = ((terbesar/2)*a1*a1)-((terbesar/2)*0*0);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
M3 = ((terbesar/2)*34*34)-((terbesar/2)*a2*a2);
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat15)//[R15] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
// z_total = (M1+M2+M3)/(luas1+luas2+luas3);

```

```

z_total = 0;
}
else if (terbesar == a_predikat16)//[R16] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat17)//[R17] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat18)//[R18] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
//z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;

```

```

}
else if (terbesar == a_predikat19)//[R19] {
    a1 = 34;
    a2 = a1;
    z_total = a2;
}
else if (terbesar == a_predikat20)//[R20] {
    a1 = 34;
    a2 = a1;
    // z_total = a2;
    z_total = 0;
}
else if (terbesar == a_predikat21)//[R21] {
    a1 = 34;
    a2 = a1;
    z_total = a2;
}
else if (terbesar == a_predikat22)//[R22] {
    a1 = 34;
    a2 = a1;
    z_total = a2;
}
else if (terbesar == a_predikat23)//[R23] {
    a2 = 34-(14*terkecil);
    a1 = 34-(14*terbesar);
    M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
    M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
    M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
    luas1 = (a1*terkecil);
    luas2 = (terkecil+terbesar)*(a2-a1);
}

```

```

luas3 = (34-a2)*terbesar/2;
// z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat24)/[R24] {
a1 = 34;
a2 = a1;
z_total = a2;
}
else if (terbesar == a_predikat25)/[R25] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;
z_total = (M1+M2+M3)/(luas1+luas2+luas3);
}
else if (terbesar == a_predikat26)/[R26] {
a2 = 34-(14*terkecil);
a1 = 34-(14*terbesar);
M1 = ((terkecil/2)*a1*a1)-((terkecil/2)*0*0);
M2 = ((terbesar/2)*a2*a2)-((terbesar/2)*a1*a1);
M3 = (((2.428/3)*34*34*34)-((0.071/2)*34*34))-(((2.428/3)*a2*a2*a2)-
((0.071/2)*a2*a2));
luas1 = (a1*terkecil);
luas2 = (terkecil+terbesar)*(a2-a1);
luas3 = (34-a2)*terbesar/2;

```

```

//z_total = (M1+M2+M3)/(luas1+luas2+luas3);
z_total = 0;
}
else if (terbesar == a_predikat27)//[R27] {
a1 = 34;
a2 = a1;
z_total = a2;
}

```

```

Serial.print("a1;");
Serial.println(a1);
Serial.print("a2;");
Serial.println(a2);
Serial.print("z_total:");
Serial.println(z_total); //adalah lama penyiraman
float delayku = z_total*1000;
myservo.write(0);
delay(delayku);
myservo.write(90);

lcd.setCursor(0,0);
lcd.print("PENYIRAMAN OTOMATIS");
lcd.setCursor(0,2);
lcd.print("%RH:");
lcd.setCursor(4,2);
lcd.print(lembab);
lcd.setCursor(10,2);
lcd.print("SUHU:");
lcd.setCursor(15,2);
lcd.print(suhu);
lcd.setCursor(0,3);

```

```

lcd.print("T:");
lcd.setCursor(2,3);
lcd.print(tinggi);
lcd.setCursor(9,3);
lcd.print("SIRAM:");
lcd.setCursor(15,3);
lcd.print(z_total);
}

```

Untuk program utama dari ESP8266 dapat dilihat dari sketch di berikut:

```

Serial.print("a1;");
Serial.println(a1);
Serial.print("a2;");
Serial.println(a2);
Serial.print("z_total:");
Serial.println(z_total); //adalah lama penyiraman
float delayku = z_total*1000;

if (client.connect(server,80)){ // "184.106.153.149" or api.thingspeak.com
String postStr = apiKey; //meneruskan data melalui alamat apikey
postStr += "&field1="; //mengirim data ke field1
postStr += suhu; //yang dikirim ke field1 adalah suhu
postStr += "&field2="; //mengirim data ke field2
postStr += lembab; //yang dikirim ke field1 adalah kelembaban
postStr += "&field3="; //mengirim data ke field3
postStr += tinggi; //yang dikirim ke field1 adalah tinggi
postStr += "&field4="; //mengirim data ke field4
postStr += delayku; //yang dikirim ke field1 adalah hasil fuzzinya
postStr += "\r\n\r\n"; //ganti baris

```

```

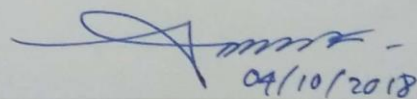
    client.print("POST /update HTTP/1.1\n"); //menuliskan "POST /update
HTTP/1.1\n" di cloud
    client.print("Host:    api.thingspeak.com\n");    //menuliskan    "Host:
api.thingspeak.com\n" di cloud
    client.print("Connection: close\n"); //menuliskan "Connection: close\n" di
cloud
    client.print("X-THINGSPEAKAPIKEY: "+apiKey+"\n"); //menuliskan "X-
THINGSPEAKAPIKEY: "+apiKey+"\n di cloud
    client.print("Content-Type: application/x-www-form-urlencoded\n");
    client.print("Content-Length: ");
    client.print(postStr.length());
    client.print("\n\n");
    client.print(postStr);
}
client.stop(); //menghentikan
delay(5000); //kirim data ke thingspeak setiap 5 detik
}

```


PERANCANGAN PROTOTIPE
SISTEM PENGAIRAN
OTOMATIS BERBASIS IOT
DENGAN METODE LOGIKA
FUZZY

by Qirom Phb Tegal

ACC


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