PROJECT REPORT

DESIGNING INTERNET OF THINGS (IoT) FOR MONITORING pH-VALUE,HUMIDITY, AND TEMPERATURE IN THE RIVER OF KALIGARANG

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APPROVAL AND RATIFICATION PAGE

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Semarang, Juli, , 2018

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ABSTRACT

The conventional method of water quality testing is to collect water samples manually and send to the laboratory for testing and analysis. This method is time consuming, a waste of human labor, and uneconomical. Our water quality measurement system checks water quality in real time through various sensors (one for each parameter: pH and turbidity) to measure water quality.

This paper discusses the development of preservation and maintenance of river kaligarang associated with water pH value, water level monitoring (ultrasonic module), temperature (DHT module) around the river, the location of the sensor installation to be connected using Wi-Fi module. There will also be Wi-Fi based applications or on web servers. The interaction between the device and the system will be done over the network and using Micro-Controller. All messages are programmed and controlled by Arduino UNO microcontroller. Also, the main control system implements wireless Wi-Fi technology to provide remote access from the computer.

This system can closely monitor the pollution of water resources and be able to provide a safe water environment. It is important to monitor it periodically and display monitoring data from wifi and display latitude / longitude from Global Positioning System (GPS). Water quality monitoring assists in evaluating the nature and level of pollution control required, and the effectiveness of pollution control measures.

Real-time, low cost, efficient water quality monitoring system has been implemented and tested. Through this system, officials can track the level of pollution occurring in water bodies and send warnings directly to the public. This can help prevent diseases caused by water pollution and metal presence. Rapid action can be taken to curb extreme levels of pollution as in the case of the Ganges and Yamuna. This system can be easily installed, with base stations fixed close to the target area, and monitoring tasks can be performed by less trained individuals. Modeling performance in different environments is important to learn

in the future as different types of monitoring applications require different settings during system installation.

Keyword: PH meter, DHT, turbidity, ultrasonic, arduino UNO, GPS.

PREFACE

This project's topic is "DESIGNING INTERNET OF THINGS (IoT) FOR MONITORING pH-VALUE,HUMIDITY, AND TEMPERATURE IN THE RIVER OF KALIGARANG" which consist of 6 chapters. The first chapter discuss about background problem, scope and the objective of the project. On the second chapter there is literature study that describes another researches that related to this project. Third chapter is research metodology which discuss the stages and methods applied in the project. Fourth chapter is analysis and design that illustrates how the system works. The fifth chapter is implementation and testing describing the implementation of the system design and the testing process of the project mode and output produced. The last chapter is conclusion of the project.

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CHAPTER 1
INTRODUCTION

1.1 Background

Kaligarang river, located in Semarang is one of essential clean water resource for the local communities. However, the rapid development of the society and numerous human activities speeded up the contamination and deteriorated the water resources. Water pollution is one of the greatest issue in the world, especially in developing country like Indonesia. Water pollution can be sourced from household waste and industrial waste that is not through adequate treatment (waste water treatment plant). So that, water quality monitoring is necessary to identify any changes in water quality parameters from time-to-time to make sure its safety in real time.

There are several parameters to categorize water as clean water, one of them is the degree of acidity (pH). Good / neutral water quality is in the range of pH 7. Water with pH below 7 is said to be acidic and above 7 is said to be a base. Based on Permenkes (416/MENKES/PER/IX/1990) pH requirement for clean water is 6.5-9.0. While for drinking water the pH should be 6.5 to 8.5.

This project was aimed to ease the process of monitoring the water quality of Kaligarang River by the concept of IoT (Internet of Things). By this system officials can keep track of the levels of acidity in the water bodies and send immediate warnings to the public. This can help in preventing diseases caused due to polluted water. Moreover, it can give education and information to society on how their activities can affect the environment so that we can maintain good habit for sustainable environment. The system will be equipped with other sensors such as ultrasonic, GPS and DHT sensor to give more information of the river's

condition. These sensor will generate report about depth of water, device's location, temperature, and PH levels contained in the river.

1.2 Scope

Scope based on the above background are:

1. What is the function of IOT (Internet of Things)?
2. How does IOT work?
3. How does the project can help society to monitor the water quality of Kaligarang?

Constraints in the project are:

1. The parameters used in this project are temperature, pH, location, ketinggian air
2. The modules used in this project are pH meter, arduino UNO, ultrasonic, gps module that require substantial funds in procurement.
3. Difficult track when fetching data.
4. This system is intended for the use of monitoring water quality including river depth, sensor device's location tracking and pH at Kaligarang.
5. Data taken from a less healthy environment.

1.3 Objective

The first objective of the project is to record any relevant changes in water acidity level that affect the environment. The second goal to implement the project that can be easily used by users in participating in monitoring & maintaining the environment.

CHAPTER 2
LITERATURE STUDY

Kaligarang is a river located in Semarang, where the river is included in the class 1 which is used as raw drinking water. Based on information from Bapedal Province of Central Java (2008) there are 9 factories disposing waste in Kaligarang River: a tile factory, 2 textile factories, a pipe factory, a cooking oil and cosmetics factory, a pharmaceutical factory, a ceramic factory, and a steel factory. Control of water quality in the river is certainly being a concern of the government because besides this river serves as a source of raw water for Drinking Water Company (PDAM) in Semarang, it is also used as a flood control indicator.

IoT is an idea that all objects in the real world can communicate with each other as part of an integrated system entity using the internet network as a liaison. Internet of Things is a very promising scientific development to optimize life based on intelligent sensors and smart equipment that work together through the internet network. There are a lot of potential that can be developed with the technology of the Internet of Things (IoT). IoT is a cloud of interconnected physical devices, which can communicate with each other over the Internet. Physical devices such as microcontrollers, microprocessors, actuators, and sensors will not directly communicate with the Internet; they do so by using an IoT gateway. This entire infrastructure is known as IoT infrastructure (Jaishetty and Patil, 2016). loT includes many different systems like smart cars, wearable devices and even human implanted devices, home automation systems and lighting controls; smartphones which are increasingly being used to measure the world around them. Similarly, wireless sensor networks measures weather, flood defences, tides and more (Mrs. G. Abinaya, and friends, 2018).

Global Positioning System (GPS) is a tool or system that can be used to inform the user where he is (globally) on earth-based satellite. Data sent from satellite is a radio signal with digital data. Application of IoT and GPS technology can be applied in natural resource management. The focus of this project is to monitor the quality, as well as water level in Kaligarang River. The use of this method has been applied by previous researchers, by utilizing IoT for real-time water quality monitoring system (Jain, 2017).

DHT is temperature and humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability [1]. In this study using DHT 22. Overall, DHT11 is better than DHT22 in temperature measurement for platform Arduino both inside and outside the room. Similarly, the measurement of outside intensity outside for the AVR platform. While DHT22 benefits for better results the temperature measurements on the AVR platform are good for location both outside and indoors (Arief, 2014)

Ultrasonic sensor is a sensor that is able to measure the distance from the ground of selected points. This sensor is based on the ultrasonic wave pulse that will be reflected on objects .[2]. pH Sensor measures the pH of aqueous solutions in industrial and municipal process applications including: acid-base titrations, monitoring pH in an aquarium, and investigating the water quality of streams and lakes.[3]. pH meter is an electronic instrument used to measure pH levels acidity or alkalinity or bases of drugs Tool for measuring pH of semi solid matter. The pH is the degree of acidity used to express the acidity or cleanness as a source of life (Eko Ihsanto, Sadri Hidayat, 2014). The usual PH meter consists of measurements pH measuring instrument electrode connected to the highest readings that measure and display a measurable pH. The working principle of this tool is the more electrons on the sample will be much more, because the pH at pH the meter

contains a weak electrolyte. This tool is digital and analog. pH gauge very important in chemical analysis[4].

In this project, the author also made MYSQL database. MYSQL is selected because it is quite fast and the library owned is quite complete. MySQL also has sufficient layers of securities such as subnetmask level, hostname, and user. It is also an option for a simple and easy-to-understand database tool.

CHAPTER 3
RESEARCH METHODOLOGY

1. Literature study

   Analyze problems and solution for water quality monitoring system in Kaligarang River. Collect 5 literatures (journals and books) about IoT system, sensors and database.

2. Planning

   Arrange schedule for field observation and plan the budget for the project.

   The Schedule of activities of this research are as follow:

NO	ACTIVITIES	Month				
		March	April	May	June	July
1.	Literature Study					
2.	Planning					
3.	Observation					
4.	System Trial					
5.	Evaluation					
6.	Report Writing					

Table 3.1: Table Planning

3. Observation

   Field observation to understand the characteristics of Kaligarang river and to determine possible location to implement the solutions. Collecting sample of river water at 5 different locations where the sensors will be placed.

4. System Trial

   Make the computer program, sensor trial on maquette model.

5. Evaluation

   Collect and analyze data from system trial. Data will be retrieved from module sensor and transferred via wifi.

6. Report Writing

   Write scientific report on the project, generate conclusions and give suggestions for next research.

CHAPTER 4

ANALYSIS AND DESIGN

4.1 Analysis

Internet of Things (IoT) is a concept of a network which connected by the internet where information exchange / delivery (Deliver Intelligence) can be conducted. This project is done to solve the problem of pollution that occurred along the Kaligarang. This is done with the application of networking community (network society) so there will be established relationship between the government and the community in solving the problem of contamination in Kaligarang. Through the sensors connected to the internet, we will get real-time data, so it will facilitate the community in the monitoring.

The analysis was conducted based on sampling of Kaligarang River water. As well as the performance of systems that have been created such as acid and base graphs, temperature, humidity, voltage, water level, and location of sensor placement.

4.2 Design

4.2.1 Sensor Working

Sensor working process from above view using flowchart. Flowchart can be read that when taking data from the sensor dht will produce data temperature and humidity. The pH meter sensor will produce acid or base water quality. The Ultrasonic Sensor will read the water level. The GPS sensor will send the latitude and longitude of the laying of the appliance.

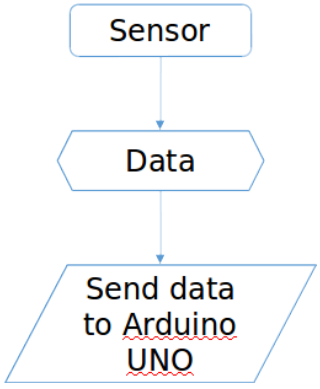

Illustration 4.1: Flowchart of Sensor Working

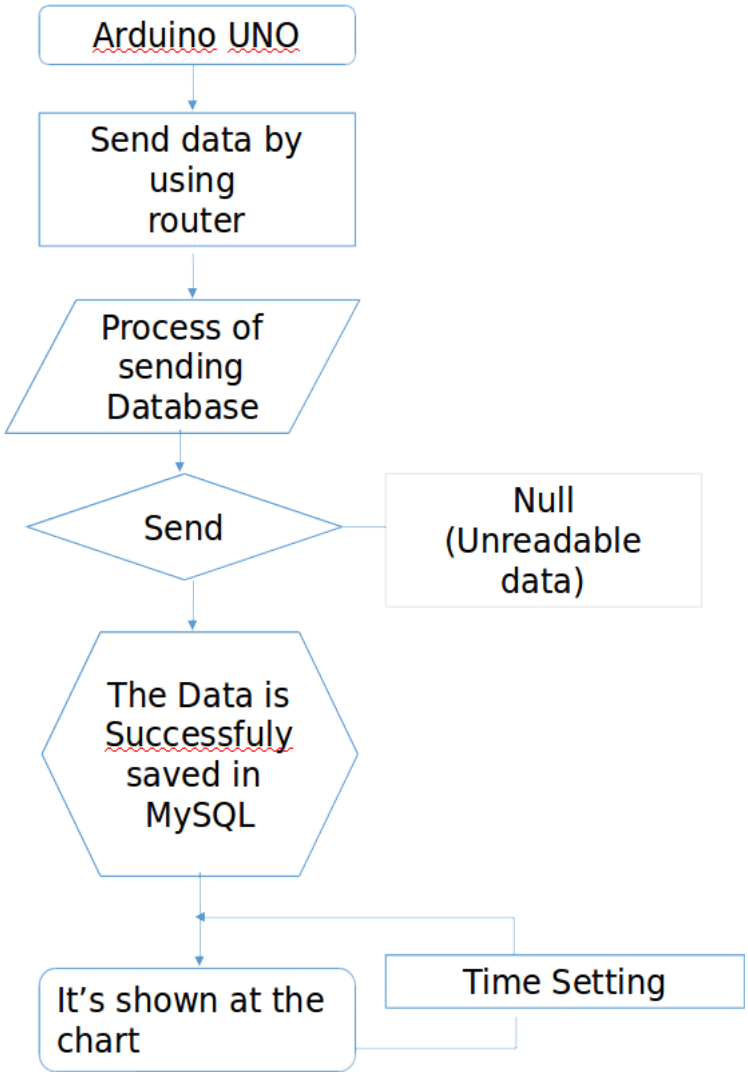

Illustration 4.2: Flowchart of all Sensor Working

4.2.2 Server Pervormance

Based on this flow chart it can be illustrated that sensor read data will be sent to data server in real time. Mac addresses, ip ethernet, and ip pc are required in connecting the pc to the server. The data that has been stored will be displayed with php into the monitor chart that has been used.

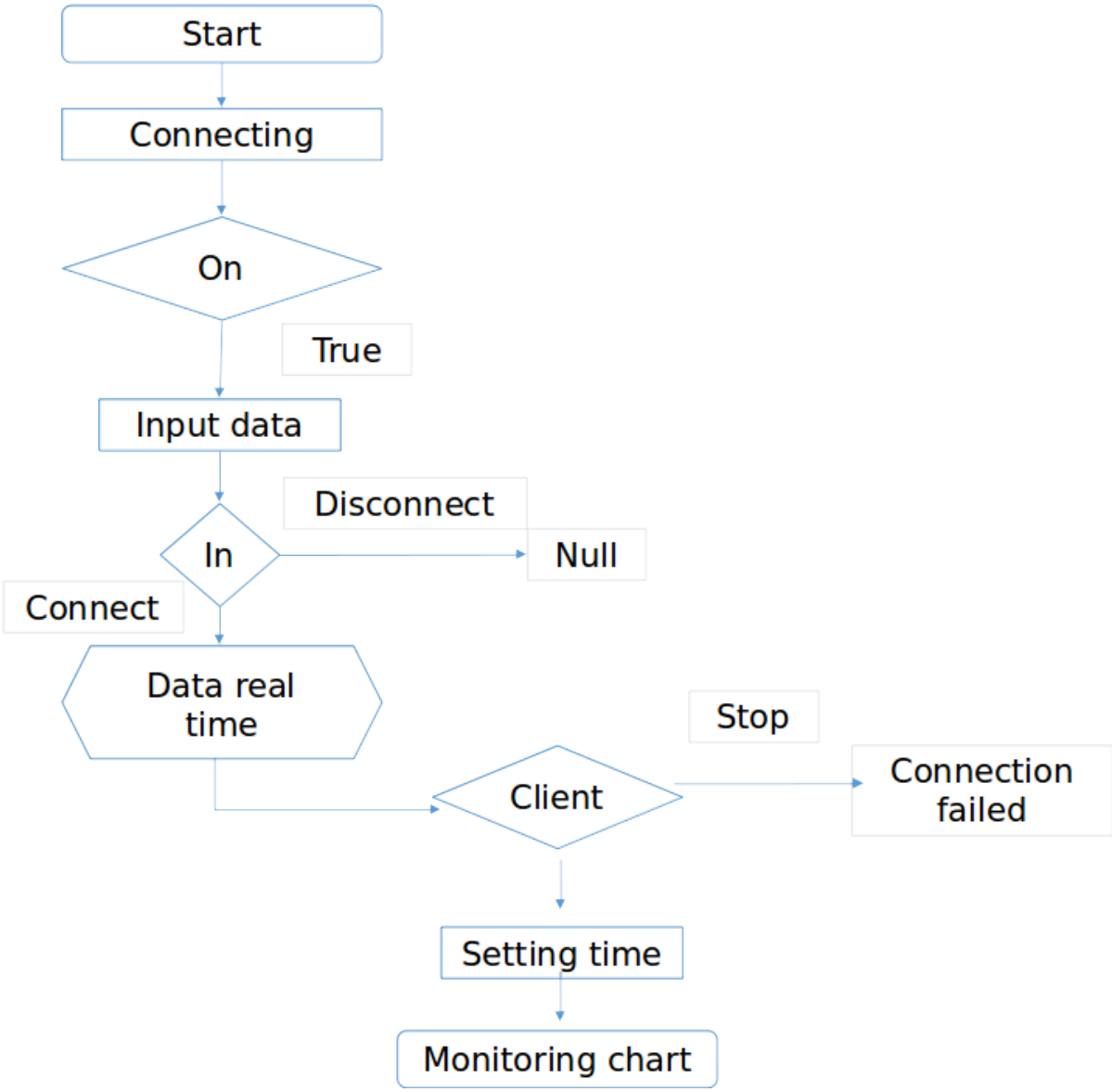

Illustration 4.2: Flowchart of server performance

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation

5.1.1 Source code Arduino

Include

This code for including the libraries than will be needed.

```
1 #include <SPI.h>
2 #include <Ethernet.h>
3 #include <TinyGPS++.h>
4 #include <SoftwareSerial.h>
5 #include "DHT.h"
6
```

Pin location

Variable that contain pin location of DHT sensor

```
 7
 8 #define DHTPIN 7
 9 #define DHTTYPE DHT22
10
```

Ethernet Client

The contents of the ethernet client are mac address, ip ethernet, ip pc

```
16 byte mac[] = { 0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xEA };
17 byte ip[] = {192, 168, 1, 64 };
18 byte serv[] = {192, 168, 1, 41} ;
19 EthernetClient cliente;
20
```

Setup

Setup called when input starts. This structure is useful for initializing variables, pin modes, etc. Function settings will only run once, ie any powerup or restart Arduino

```
//SETUP----------------------------------
void setup() {
Serial.begin(9600); //setting the baud rate: 9600
serial_gps.begin(9600);
Ethernet.begin(mac, ip);
dht.begin();
pinMode(trigger,OUTPUT);
pinMode(echo,INPUT);
}
```

Loop

In this project, most of the formulas are in the void loop(). Each sensor has include data as needed.

Code:

```
1.  void loop() {
2. for(int i=0;i<10;i++)   //The code consists of taking 10 samples of the analogue input A0. berikut ke bawah adalah codes untuk mengkalibrasi nilai tegangan yg ideal utk sensor ph. for disini
3.  {
4.   buf[i]=analogRead(analogInPin);
5.   delay(10);
6.  }
7.  for(int i=0;i<9;i++)
8.  {
9.    for(int j=i+1;j<10;j++) //This loop for ordering them and discarding the highest and the lowest.
10.          {
11.           if(buf[i]>buf[j])
12.           {
13.            temp=buf[i];
14.            buf[i]=buf[j];
15.            buf[j]=temp;
16.           }
17.          }
18.         }
19.         avgValue=0;
```

```
20.         for(int i=2;i<8;i++)
21.         avgValue+=buf[i];    //this will sum of the six data that been choosed as
    limitation of relevant analog value.
22.         digitalWrite(trigger,LOW);
23.         delayMicroseconds(5);
24.         digitalWrite(trigger,HIGH);
25.             delayMicroseconds(10);
26.             digitalWrite(trigger,LOW);
27.             jrk = pulseIn(echo,HIGH);
28.
29.             while(serial_gps.available())
30.                {
31.                gps.encode(serial_gps.read());
32.                }
33.              if(gps.location.isUpdated())
34.                {
35.                  latitude = gps.location.lat();
36.                  longitude = gps.location.lng();
37.                }
38.          String lokasi = String(latitude) + "," + String(longitude);
39.         float hum = dht.readHumidity(); //Pembacan humidity dan akan
    memunculakan di hum
40.         float temp = dht.readTemperature(); //Pembacaan temperatur dalam
    celsius dan akan memunculkannya di temp
41.         //float fah = dht.readTemperature(true); //reading the temperature in
    Fahrenheit pembacaan temperatur dalam satuan fahrenheit
42.         //float heat_index = dht.computeHeatIndex(fah, hum); //Pembacaan
    heat index dalam Fahrenheit
43.          //float heat_indexC = dht.convertFtoC(heat_index); //Convert heat
    index dalam Celsius
44.          float pHVol = (float)avgValue*5.0/1024/6; //calculating the mean with
    the six remaining samples by converting this value to voltage in the variable
    pHVol. (5.0v) as the maximum output of volt. 1024 is range value of analog
    value. and 6 is the remainin data.
45.         float phValue = -5.70 * pHVol + 21.34; //using the equation that we
    have calculated with the pH reference values we convert pHVol to pHValue
46.         float distance = (float)jrk*0.0001657;
47.         if (cliente.connect(serv, 80)) { //Connecting IP address and port
```

Print (Output)

Connecting and sending values to db kaligarangIkom.

```
if (cliente.connect(serv, 80)) {

Serial.println("connected");
cliente.print("GET /data/data.php?");
cliente.print("temperatur=");
cliente.print(temp);
cliente.print("&kelembaban=");
cliente.print(hum);
cliente.print("&ph=");
cliente.print(phValue);
cliente.print("&volt=");
cliente.print(pHVol);
cliente.print("&tinggi=");
cliente.print(distance);
cliente.print("&lokasi=");
cliente.println(lokasi);

//Cetak values dalam serial monitor
Serial.print("Temperature= ");
Serial.println(temp);
Serial.print("Kelembaban= ");
Serial.println(hum);
Serial.print("ph Vol = ");
Serial.println(pHVol);
Serial.print("ph Value = ");
Serial.println(phValue);
//Serial.print("sensor avgValue = ");
//Serial.println(avgValue);
Serial.print("tinggi=" );
Serial.println(distance);
Serial.println(lokasi);

cliente.stop(); //koneksi berhenti
}
```

5.1.2 Php

```
1 <?php
2 // Parameter untuk database MySQL
3 $host = "localhost"; // Nama host atau IP server
4 $user = "root";      // Username MySQL
5 $pass = "";          // Password MySQL
6 $namedb = "kaligarangIkom";      // Nama database MySQL
7
8 // Buat koneksi ke database MySQL
9 $conn = mysqli_connect($host, $user, $pass);
10 $db = mysqli_select_db ($conn, $namedb );
11
12 ?>
```

5.2 Testing

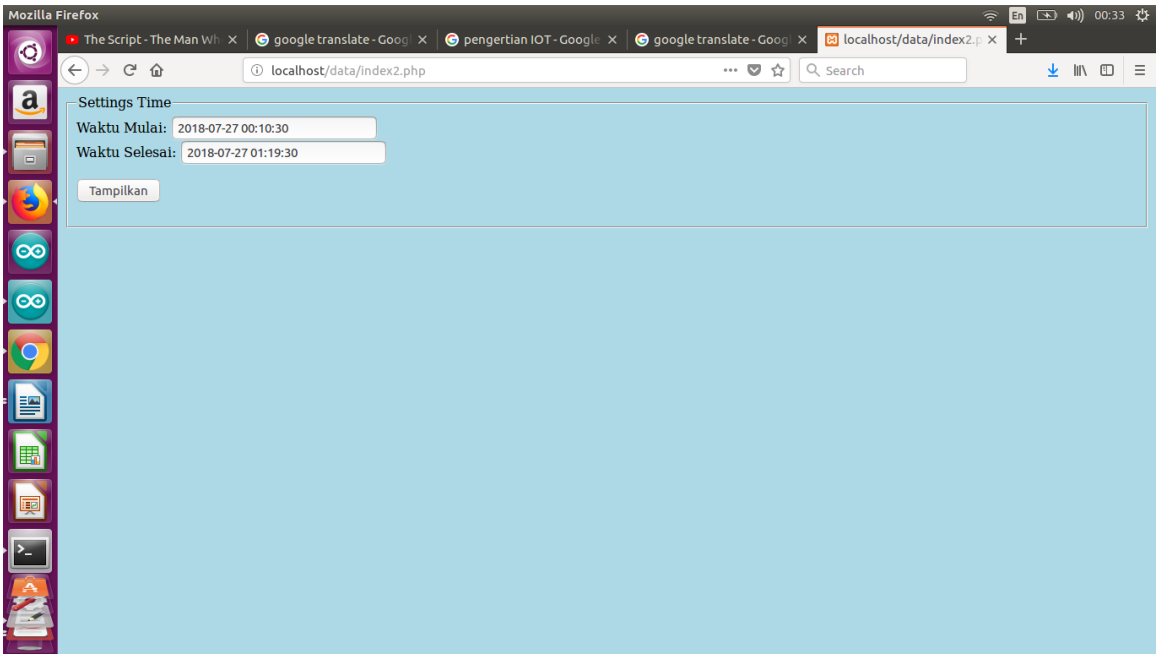

Illustration 5.1: Picture Display Time Setting

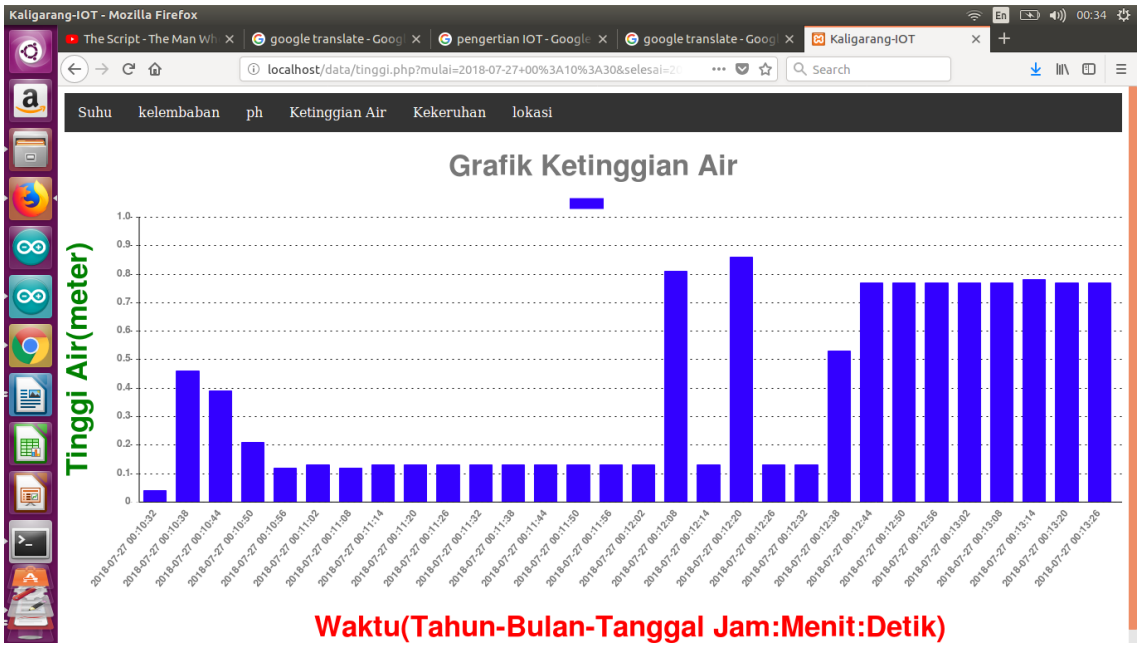

Illustration 5.2: Picture Display water level chart

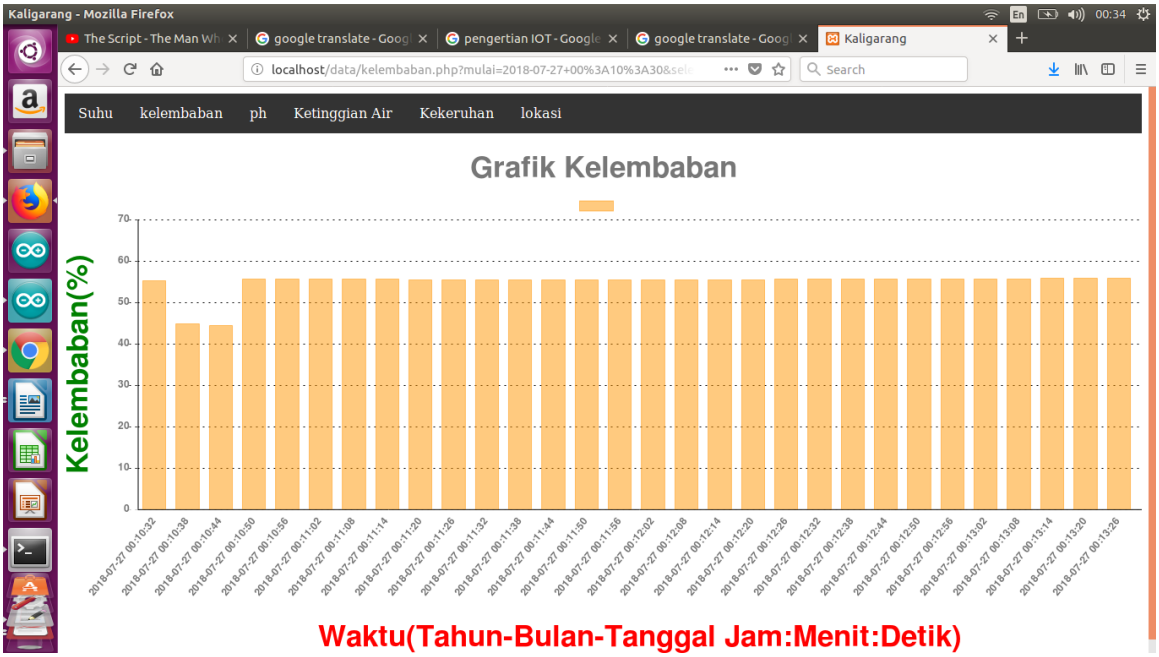

Illustration 5.3: Picture Display humidity chart

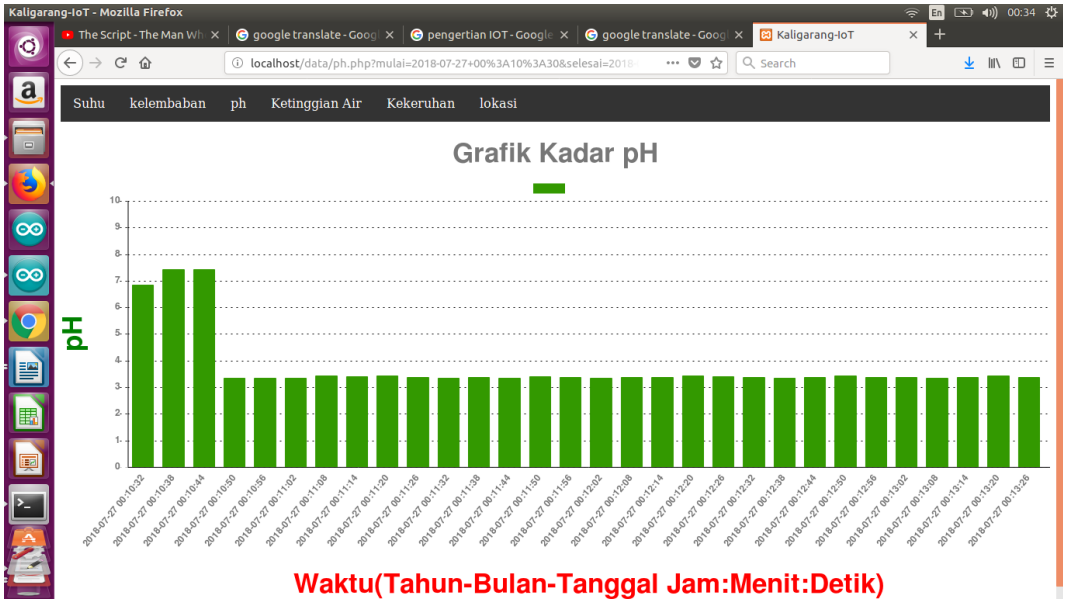

Illustration 5.4: Picture Display pH value chart

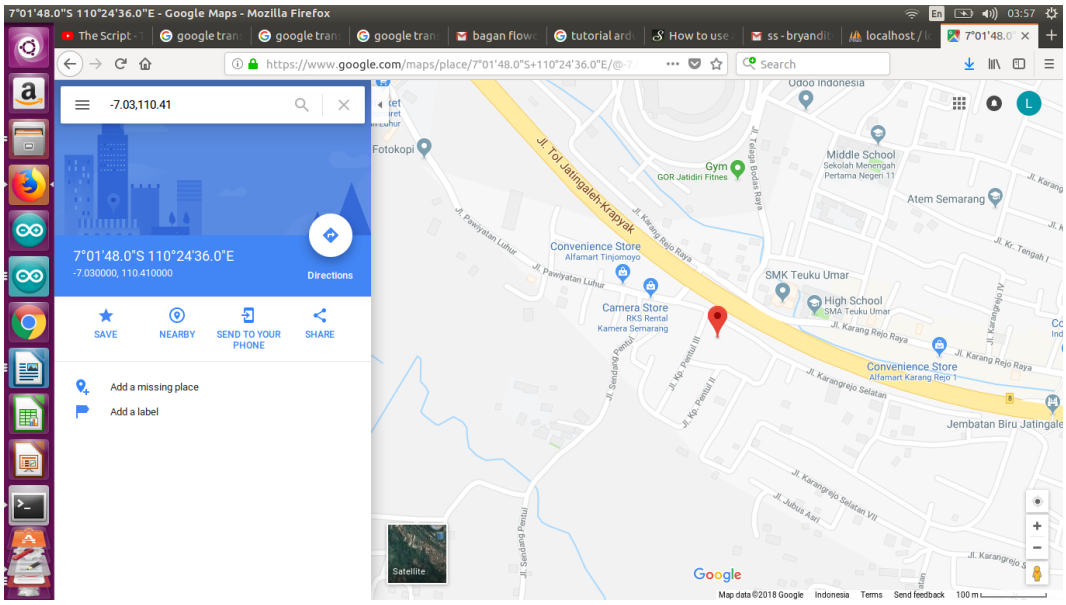

Illustration 5.4: Picture Display location

CHAPTER 6
CONCLUSION

6.1 Conclusion

Based on spot reviews, processed data, and sensor implementations. Can be concluded :

1. This research has been done using data and moisture, acidity of water using pH sensor, calculate network-based water level router, and access location using gps module.
2. The system can be monitored through the http protocol, as well as with the help of php and html to display it.
3. The more sensors installed the greater the effect on the voltage, so it must use additional supplay power. Because, each sensor has its own limitations, so it requires a stable power and quite a lot.
4. In testing was proved that wemos is not accurate enough in the use of pH, although more concise in the connection. The shortcomings can only be solved by the installation of arduino UNO and ethernet as connections. There are also limitations of Arduino namely the limited 5v output.

6.2 Suggestions

Based on the research that has been done, there will be information for better research. As:

1. Innovate the sensor.
2. In order to be routine in Ph sensor care with regular calibration.
3. For further research can create android applications and online data systems.

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APPENDIX

Arduino IDE or stands for Integrated Developtment Enviroenment, in another way to build integrated arduino microcontroller. As a place because through this software is done programming inside the microcontroller. In the arduino programming language using English. Arduino or Sketch programming languages, have simplified programmers that are easier to understand. As a helper compiler arduino and facilitate bootloader in its use.

CODING ARDUINO IDE

```
#include <SPI.h>
#include <Ethernet.h>
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include "DHT.h"
#define DHTPIN 9
#define DHTTYPE DHT22
DHT dht(DHTPIN, DHTTYPE);


SoftwareSerial serial_gps(4,3);
TinyGPSPlus gps;


byte mac[] = { 0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xED };//mac addrs
byte ip[] = {192, 168, 1, 64 }; //ip ethernet
byte serv[] = {192, 168, 1, 9} ; //ip pc
EthernetClient cliente;
```

```
const int analogInPin = A0;
int sensorValue = 0;
int buf[10],temp;
unsigned long int avgValue;
const int trigger=7;
const int echo=8;
float jrk;
float b;
float latitude, longitude;



//SETUP----------------------------------
void setup() {
Serial.begin(9600); //setting the baud rate: 9600
serial_gps.begin(9600);
Ethernet.begin(mac, ip);
dht.begin();
pinMode(trigger,OUTPUT);
pinMode(echo,INPUT);
}
```

```
 //LOOP---------------------------------------
  void loop() {
    for(int i=0;i<10;i++)
{
 buf[i]=analogRead(analogInPin);
 delay(10);
}
for(int i=0;i<9;i++)
{
 for(int j=i+1;j<10;j++)
 {
  if(buf[i]>buf[j])
  {
   temp=buf[i];
   buf[i]=buf[j];
   buf[j]=temp;
  }
 }
}
avgValue=0;
for(int i=2;i<8;i++)
avgValue+=buf[i];
```

```
digitalWrite(trigger,LOW);
delayMicroseconds(5);
digitalWrite(trigger,HIGH);
delayMicroseconds(10);
digitalWrite(trigger,LOW);
jrk = pulseIn(echo,HIGH);

while(serial_gps.available())
  {
  gps.encode(serial_gps.read());
  }
 if(gps.location.isUpdated())
  {
    latitude = gps.location.lat();
    longitude = gps.location.lng();
  }
 String lokasi = String(latitude) + "," + String(longitude);

    float hum = dht.readHumidity(); //Pembacan humidity dan akan memunculakan di hum
  float temp = dht.readTemperature(); //Pembacaan temperatur dalam celsius dan akan memunculkannya di temp
    //float fah = dht.readTemperature(true); //reading the temperature in Fahrenheit pembacaan temperatur dalam satuan fahrenheit
```

```
//float heat_index = dht.computeHeatIndex(fah, hum); //Pembacaan heat index dalam Fahrenheit
//float heat_indexC = dht.convertFtoC(heat_index); //Convert heat index dalam Celsius

float pHVol = (float)avgValue*5.0/1024/6;
float phValue = -5.70 * pHVol + 21.34;

float distance = (float)jrk*0.0001657;

if (cliente.connect(serv, 80)) { //Connecting IP address and port

Serial.println("connected");
cliente.print("GET /data/data.php?"); //Menghubungkan dan mengirim values ke db Kaligarang ikom
cliente.print("temperatur=");
cliente.print(temp);
cliente.print("&kelembaban=");
cliente.print(hum);
cliente.print("&ph=");
cliente.print(phValue);
cliente.print("&volt=");
cliente.print(pHVol);
cliente.print("&tinggi=");
```

```
cliente.print(distance);
cliente.print("&lokasi=");
cliente.println(lokasi);

//Cetak values dalam serial monitor
Serial.print("Temperature= ");
Serial.println(temp);
Serial.print("Kelembaban= ");
Serial.println(hum);
Serial.print("ph Vol = ");
Serial.println(pHVol);
Serial.print("ph Value = ");
Serial.println(phValue);
//Serial.print("sensor avgValue = ");
//Serial.println(avgValue);
Serial.print("tinggi=" );
Serial.println(distance);
Serial.println(lokasi);

cliente.stop(); //koneksi berhenti
}
else {
```

Serial.println("connection failed");// connection failed akan muncul ketika tidak mendapatkan koneksi

}

delay(5000);

}

CONNECTION.PHP

```
<?php
// Parameter untuk database MySQL
$host = "localhost"; // Nama host atau IP server
$user = "root";      // Username MySQL
$pass = "";          // Password MySQL
$namedb = "kaligarangIkom";      // Nama database MySQL

// Buat koneksi ke database MySQL
$conn = mysqli_connect($host, $user, $pass);
$db = mysqli_select_db ($conn, $namedb );

?>
```

DATA.PHP

```
   <?php
    include ('connection.php');
     $sql_insert = "INSERT INTO data (temperatur, kelembaban, ph,
volt, tinggi, lokasi, teg, ntu) VALUES ('".$_GET["temperatur"]."',
'".$_GET["kelembaban"]."', '".$_GET["ph"]."', '".$_GET["volt"]."',
'".$_GET["tinggi"]."',  '".$_GET["lokasi"]."',  '".$_GET["teg"]."',
'".$_GET["ntu"]."')";
    if(mysqli_query($conn,$sql_insert))
    {
    echo "Done";
    mysqli_close($conn);
    }
    else
    {
    echo "error is ".mysqli_error($conn );
    }
    ?>
```

INDEX.PHP

```
<?php
$koneksi            =   mysqli_connect("localhost",   "root",   "",
"kaligarangIkom");
```

```
$event          = mysqli_query($koneksi, "SELECT event FROM data
order by id desc limit 30");
//$suhu  =  mysqli_query($koneksi,  "SELECT  temperatur  FROM  data
order by id desc limit 30");
?>

<fieldset>
    <legend>Settings Time</legend>
<form action="http://localhost/data/suhu.php"method="get">
    <div>
        <label for="muali">Waktu Mulai:</label>
        <input type="datetime-local" id="mulai"
               name="mulai" value="2018-07-27 00:10:30"
               min="2018-07-23 00:00:00" max="2018-07-28 00:00:00"
/>
    </div>
 <div>
        <label for="selesai">Waktu Selesai:</label>
        <input type="datetime-local" id="selesai"
               name="selesai" value="2018-07-27 01:19:30"
               min="2018-07-23 00:00:00" max="2018-07-28 00:00:00"
/>
    </div>

   <p><input type = "submit" value = "Tampilkan" /></p>

</form>
</fieldset>
<script>
legend {
    background-color: #000;
    color: #fff;
    padding: 3px 6px;
}

.output {
    font: 1rem 'Fira Sans', sans-serif;
}

input,
select {
    margin: .4rem;
}

label {
    display: inline-block;
    text-align: right;
    width: 30%;
}
</script>
<html>
<head>
<style>
body {
```

```
    background-color: lightblue;
}
</style>
</head>
<body>

</body>
</html>
```

PH.PHP

```
<?php
$mulai=$_GET["mulai"];
$selesai=$_GET["selesai"];
//echo "$mulai";

//echo "$selesai";


$koneksi            =   mysqli_connect("localhost",   "root",   "",
"kaligarangIkom");
$event          = mysqli_query($koneksi, "SELECT event FROM data
where event between '$mulai' and '$selesai' order by id asc limit
30");
$PH = mysqli_query($koneksi, "SELECT ph FROM data order by id asc
limit 30");

?>
<html>
    <head>
        <title>Kaligarang-IoT</title>
        <script src="Chart.bundle.js"></script>

        <style type="text/css">
            .container {
            width: 100%;
                height:600px;
                margin: 15px auto;
            }
ul {
    list-style-type: none;
    margin: 0;
    padding: 0;
    overflow: hidden;
    background-color: #333;
}

li {
    float: left;
}

li a {
    display: block;
    color: white;
```

```
    text-align: center;
    padding: 14px 16px;
    text-decoration: none;
}

li a:hover {
    background-color: #111;
}
        </style>
    </head>
    <body>
<ul>
<li><a href="index.php">Suhu</a><li></li>
<li><a href="index2.php">kelembaban</a></li>
<li><a href="index3.php">ph</a></li>
<li><a href="index4.php">Ketinggian Air</a></li>
<li><a href="index5.php">Kekeruhan</a></li>
<li><a href="lokasi.php">lokasi</a></li>
</ul>
        <div class="container">
                                    <canvas   id="myChart"   width="100"
height="100"></canvas>
        </div>
        <script>
            var ctx = document.getElementById("myChart");
            var myChart = new Chart(ctx, {
                type: 'bar',
                data: {
                                          labels:  [<?php  while  ($e  =
mysqli_fetch_array($event)) { echo '"' . $e['event'] . '",';}?>],
                    datasets: [{
                            label: '',
                                              data:  [<?php  while  ($p  =
mysqli_fetch_array($PH)) { echo '"' . $p['ph'] . '",';}?>],
                            backgroundColor:'#339900',
                            borderColor:'#339900',
                            borderWidth: 1,
                       maxBarThickness:10,
                         }]
                },
                options: {responsive:true,
                  maintainAspectRatio: false,
                  title: {
                        display: true,
                        text: 'Grafik Kadar pH',
                  fontSize: 35,
                  //legend:{display:false},
                  //tooltips:{label: function(tooltipItem){
                        //return tooltipItem.Label;}}
                  },
                   scales: {
```

```
xAxes: [{
      gridLines: {
        display: false,
        color: "black"
      },
      scaleLabel: {
        display: true,
        labelString: "Waktu(Tahun-Bulan-Tanggal Jam:Menit:Detik)",
        fontColor: "red",
      fontSize: 35
      }
    }],
    yAxes: [{ticks: {
      beginAtZero: true,
      steps: 10,
      stepValue: 5,
      max: 10
      },

      gridLines: {
        color: "black",
        borderDash: [2, 5],

},

      scaleLabel: {
        display: true,
        labelString: "pH",
        fontColor: "green",
      fontSize: 35


      }

    }]
  }
                }
            });
        </script>
    </body>
</html>
```