



PROJECT REPORT
DESIGNING THE AUTOMATED SMART
ARDUINO UNO-BASED AUTOMATIC TRASH
ANALYSIS AND MONITORING SYSTEM

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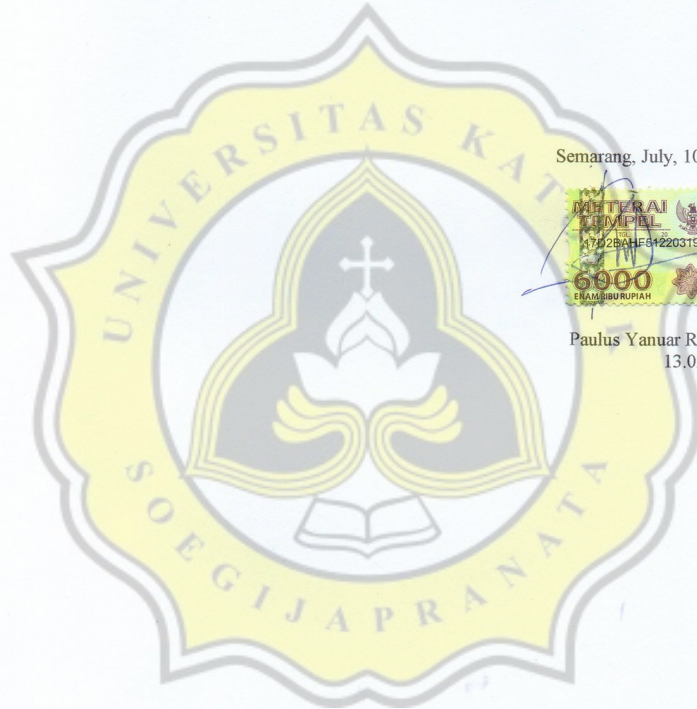
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ABSTRACT

Most of the lack of public awareness of the cleanliness of a location or place has become an issue that needs special attention. Due to the many we can see garbage scattered everywhere resulting in piles of garbage in the gutters, rivers and oceans which can cause damage to the ecosystem in the environment. So the design of this system is expected to help cleaning staff or the community in the efficiency of time and energy.

People nowadays often throw trash out of their place for various reasons such as lazy to throw rubbish in their place because the location of the garbage bin is far from the location of the activity, there is also because there are various piles of used or plastic items in one location and many people are prejudiced that the location it is a place to take out the trash. It is also often the garbage disposal officer who has difficulty in predicting the right time to transport and dispose of waste due to uncertain capacity or volume of waste every day. Therefore, the authors devised an automatic smart trash can with an Arduino Uno control system. People today often throw trash out of their place for various reasons such as lazy to throw rubbish in its place because the location of the rubbish bin is far from the location of the activity, there is also because there are various piles of goods used or plastic in one location and many people are prejudiced that the location is a place to dispose of garbage. It is also often the garbage disposal officer who has difficulty in predicting the right time to transport and dispose of waste due to uncertain capacity or volume of waste every day. Therefore, the authors designed an automatic smart trash bin with Arduino control system and some hardware such as Ultrasonic sensors, IR Obstacle sensors, GSM SIM 8001 Module and servo motors as well as a trash can that can open and close automatically which detects interactions with an objects with a certain distance and can send a notification via the janitor's cellphone or smartphone where this can help make it easier for janitors to know when the time is right by receiving a notification from the prototype of the smart trash can to come to the location and transport or dispose of waste at a location with which can help make it easier for janitors to know when the right time by receiving a notification from the prototype of the smart trash can to come to the location and transport or dispose of garbage at a location with efficient time and energy

The result of this research is a smart trash system that can operate with contact with an object and will send an information about the capacity of the trash can via mobile phones or smartphones to be immediately discarded and cleaned.

Keyword: *Arduino UNO, Automatic Smart Trash Can, GSM SIM Module*

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CHAPTER 1

INTRODUCTION

1.1 Background

Research on automatic smart bins is done because there are still many and often we meet people who are still fond of throwing trash in any place. The design of this Arduino Uno-based smart trash can requires several materials such as hardware and software. The hardware used includes Ultrasonic Sensor, Infra Red Sensor, Breadboard, Jumper Cable, Arduino Uno, Servo Motor and SIM800 GSM Module, trash bins, tools needed as assistive devices and Arduino IDE as software.

The first in conducting this research is to test the ultrasonic sensor and servo motor which is used as a parameter to open and close the trash can with a distance that has been determined on the ultrasonic sensor. After that, testing the IR sensor that detects the entry of an item into the trash and as a parameter if the trash can is full with a certain distance for a few seconds. Then the next step is checking the electrical power on the breadboard and devices that have been installed with a multimeter. The breadboard is placed under the trash can, the ultrasonic sensor is in front of the trash bin to facilitate access and the IR sensor is in the middle of the trash can. After all sensors and servo have been installed in the trash, the overall test is done well.

In testing the GSM Module SIM 800L is done by using GSM SIM 3. In addition, so that the module can provide or send sms to the officer number required a pulse with a minimum amount with the cost of the procedure in accordance with the respective GSM provider. In installation and testing of the 800L GSM Module required electrical power with a maximum voltage of 5 volts, because if it exceeds the power it can damage the GSM SIM 800L Module A trial

of the GSM SIM 800L module is carried out and successfully sends a message to the destination number.

With this Arduino Uno-based automatic trash can can be useful to protect the ecosystem in the environment and is expected to help the community cleaners in managing cleanliness more efficiently in terms of time and energy.

1.2 Problem Formulation

1. How to cope with garbage that is scattered in the streets or in the sewers
2. How to help the Janitor to manage the trash well

1.3 Scope

In this study where using the GSM SIM 800l module as a notification sender to the officers, it is necessary to have enough credit to send an SMS to the janitor's smartphone

1.4 Objective

By utilizing IoT in the trash can analysis and monitoring system, it can be easier for cleaning staff to handle and manage waste when it is full by receiving a message or notification that the garbage volume is full. Then with this research, many people are made aware that it is important to dispose of garbage in its place for good and health

CHAPTER 2

LITERATURE STUDY

[1]Zafira, Filda Amalia, Dodi Zulherman, and Herryawann Pujiharsono. "Analysis and Design of IOT-Based Trash Monitoring System Using the MQTT Protocol."

The author explains that the creation of a smart environment will support the comfort of the community and improve public health, also help control the cleanliness of the trash can in the environment of one of its people with Smart Environment supported by the concept of IoT. Researchers use a design system for the hardware and software aspects of the MQTT protocol. Their research focuses on accuracy in sending data sent by prototype trash cans. This research is useful for the research topic that I am working on because it discusses sending data from the trash. The limitation in this study is the amount of data sent by the sensor using the MQTT protocol is lower than other protocols. Data exchange using the MQTT protocol has a large delay and a small throughput value that is not standard but even so, the accuracy of sending data remains 100%. This research article is not the basis of my research, but there are some things that can be a reference and additional information in the research that I write. The difference between this research journal and my research lies in the hardware and methodology, where the research that I am working on does not use the MQTT protocol, but uses the GSM Module as a garbage bin data sender.

[2]Azmi, Fadhillah, et al. "Design of Smart Trash Can Using Fuzzy Logic Algorithm Based on Arduino." JITE (JOURNAL OF INFORMATICS AND TELECOMMUNICATION ENGINEERING) 3.1 (2019): 150-154.

The author explains that people nowadays often throw garbage in any place due to various factors such as the lack of available trash facilities so that

people prefer to litter instead of having to look for trash even though a little distance away. The researcher uses the Fuzzy Logic method and the researcher also tests the results obtained from the sensors and the resulting output data to monitor the volume of the trash. Researchers focus on PIR sensors and ultrasonic sensors that play an important role as objects and mechanisms of trash bins detection. This research article is almost the same as the research I made but there are differences in the types of sensors I use, namely ultrasonic sensors and sensors IR obstacle and also several other tools. The limitation of this research is the detection of incomplete waste volume and there are still many delays, therefore it is necessary to increase the sensitivity of the sensor by making the body / casing bin and placing sensors more concise so that it can save space and the size of the trash. This research will be an additional piece of information for my research in the case of a garbage bin monitoring system.

The difference between this research journal and my research lies in the sensor used, where I use the IR obstacle sensor as a parameter in the volume of waste.

[3]Antoni, Rizki, Mas Sarwoko Suraatmadja, and Unang Sunarya. "Analisis Dan Implementasi Sistem Sensor Pada Tempat Sampah Otomatis Dengan Metode Fuzzy Berbasis Mikrokontroler." *eProceedings of Engineering 2.3 (2015)* The author explains that waste is a residual material that comes from human activities. With low awareness the community about disposing of trash, this has become something that is feared by the community with quite adverse impacts community life. Using Fuzzyfication method or fuzzy logic as a dielectric control with the aim to separate garbage type function between Anorganic or Organic. The core limitations in this article is how the system can sort objects and get into containers that are supposed to be of the type.

[4]Azmi, Fadhillah,et al. “Design of Smart Trash Can Using Fuzzy Logic Algorithm Based on Arduino.” JITE (JOURNAL OF INFORMATICS AND TELECOMMUNICATION ENGINEERING) 3.1 (2010): 150-154. Design In this article the author explains that people now have a sense of laziness to maintain environmental cleanliness. Feeling lazy caused by various factors such as lack of trash facilities and conditions of trash that are dirty and smelly many trash bins are full and people choose to litter. In detecting altitude garbage, the trash can uses ultrasonic sensors which will then be processed by Arduino. After being executed, Arduino will Fuzzyfication of the height of the waste that will determine the indicator lights and alarms in the trash. To get the results it is necessary to test the process several times with fuzzy logic in order to produce a record height of waste.

[5] Setyawan, M.Yusril Helmi, “Prototipe Smart Trash Bin Berbasis TCP/IP.” Competitive 10.1 (2015): 79-86. The author explains that the increase in waste cannot be avoided in line with the increasing population. Writer too population data which states that there is an imbalance between waste production and infrastructure provision garbage collection and transportation. The author proposes an alternative solution for waste management through monitoring waste production and the capacity of the garbage bin capacity. Researchers use the HC-SR04 sensor as a conduit of data to the microcontroller through Arduino and Arduino, the client-server communication mechanism is possible. There is a Block Diagram. The use system includes php programming data to a web server, ethernet shield, user interface used to meet needs client in monitoring the growth of waste in trash bin installed by sensors. This article focuses on producing resultstrash bin by utilizing sensors and databases via TCP / IP to improve the quality of garbage handling.

[6]Mukhtar, H., Perdana, D., Sukaro, P., and Mulyana, A. (2020). “Pemantauan Kapasitas Sampah Berbasis IoT (SiKaSiT) Untuk Pencegahan Banjir di Wilayah Sungai Citarum Bojongsoang Kabupaten Bandung”. Jurnal

Teknologi Lingkungan, 21(1), 56-67. This article the author discusses efforts to prevent flooding due to the habit of people who throw garbage into rivers through waste management system innovation using the IoT approach and application. The author develops a place capacity monitoring system garbage using ultrasonic sensors, microcontrollers and sending data using wifi. Data collection is done with using MQTT as the protocol. The author observes the time delay in sending data after the sensor detects the condition garbage until the data is sent and received by users through the android application. The author focuses on the data received from the results monitoring the capacity of the trash can through the android application which is done within a certain period of time. The limitation in this article is sending data and the appearance of the results on the user's smartphone android application.

[7]Chaware, Sandeep M., Shriram Dighe, Akshay Joshi, Namrata Bajare, and Rohini Korke. "Smart Garbage Monitoring System Using Internet of Things (IoT)." *Ijireeice* 5, no.1 (2017): 74-77. The author explains that with smart lifestyle, cleanliness is needed, and cleanliness is begins with Garbage Bin will helps to eradicate or minimize the garbage disposal problem. The author uses a transformer and regulator that is connected to Arduino and provides data in the trash to the WiFi modem the regulator and sends data to the web server, then the data is received by the user and then sent to the officer via SMS media using GSM Module. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. The developed system provides improved database for garbage collection time and waste amount at each location. In this research study requires sufficient costs and GSM modules provided by sim using cellular services.

[8]Mabrur, Muhammad Mukrim Al proposed a journal titled "Rancang Bangun Sistem Smart Trash Can Berbasis Android." Diss. Universitas Islam Negeri Alauddin Makassar, 2016. In this journal explains that waste is a complex problem both for developing countries as well as developed countries in the world

and with a lack of awareness and population growth has such negative impacts increasing slums. By designing an Android-based smart trash can system, the authors hope to be able help government programs to create a clean environment. With the prototype method the writer analyzes the data variables, Trash can and data officers then check the status of the trash, when full, the status of the garbage data is sent to the web server and the web after the web server receives it is then forwarded to the clerk. The researcher focuses on the interface design process because it is related with using sensor ultrasonic and the appearance and user interaction with the application.

[9]Ariessanti, Hani Dewi, Martono Martono, and Joko Widiarto proposed a journal titled "Sistem Pembuangan Sampah Otomatis Berbasis IOT Menggunakan Mikrokontroler pada SMAN 14 Kab. Tangerang." Creative Communication and Innovative Technology Journal 12.2: 229-240. In this journal explains sistem pengumpulan sampah yang dilakukan dengan jadwal tertentu menyebabkan penumpukan yang cepat. Lihatlah perkembangan teknologi dalam bentuk konektivitas internet dari berbagai perangkat elektronik, maka penerapan konsep IoT diharapkan menjadi solusi untuk penanganan masalah. Penulis menggunakan linear actuator sebagai media penampungan serta motor servo untuk menggerakkan tempat sampah agar dapat membuat pekerjaan petugas lebih efisien karena sudah menggunakan kontrol otomatis. Pada sistem ini penulis berfokus pada sistem kontrol dengan metode MQTT guna proses pengiriman dan penerimaan data antara mikrokontroler. User atau pengguna harus memiliki data selular atau sinyal internet agar dapat menerima notifikasi dan agar sistem berjalan dengan baik.

CHAPTER 3

RESEARCH METHODOLOGY

In making this project, it takes several steps such as preparing software,, testing sensors and hardware, the Arduino program, making a prototype container, and try to sending SMS to handphone as a notification.

3.1 Preparing Software

Before we test the sensors, we need to prepare the software. Arduino IDE software is used as software that contains coding for compiling and running sensors and building this project.

3.2 Testing Sensors and Hardware

The sensors used in building this project are the ultrasonic sensor and the Obstacle IR sensor which are run using the Arduino IDE. GSM SIM 800L module, Servo Motor and step down converter.

3.3 Preparing Programs

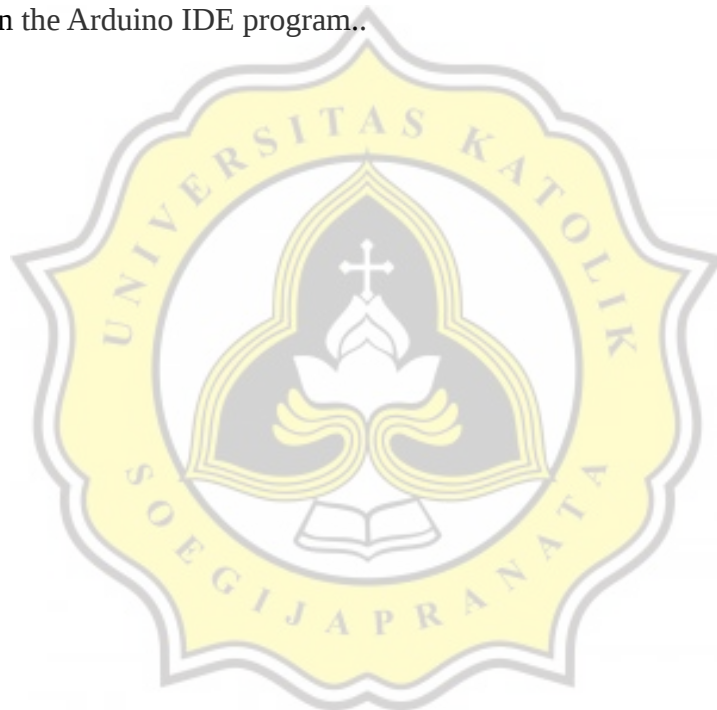
After completing testing all the sensors and some hardware needed, the merging of the entire program from each sensor program and each hardware device that is used as a mechanism is made into 1 program

3.4 Making a Prototype Container

After the program is set up, it is now for making prototype containers. By using a plastic trash can as a container and make 2 holes in the front for the ultrasonic sensor placement sensor and the back of the trash for the Obstacle IR sensor. To close the trash can use fine fibers to facilitate the opening and closing mechanism that is driven by a servo motor. Placement of the GSM module, antenna module, Breadboard and Step Down Buck Converter is at the bottom of the trash.

3.5 Try to sending SMS to Handphone

To send the notification of the trash through the GSM SIM 800L module to the cellphone, a SIM card and pulse network is required. An SMS will be sent when the contents of the trash are full and the IR Obstacle sensor continues and incoming SMS messages on mobile phones in the form of text messages that have been set in the Arduino IDE program..



CHAPTER 4

ANALYSIS AND DESIGN

4.1 Analysis

In building this tool it is necessary that some devices such as software and hardware where the software is used as a system designer that is done using a computer and hardware as a tool to realize all the designs that have been designed with the software.

1. Software
 - Arduino IDE
2. Hardware

Table 4.1. Hardware Requirements

NO	Device Name	Amount
1	Arduino UNO	1
2	Ultrasonic Sensor	1
3	IR Sensor Obstacle	1
4	Jumper Cable Male-Male	1 set
5	Servo Motor	1
6	Module GSM SIM 800L	1
7	Trash Can	1
8.	Breadboard	1
9	Iron	1
10	Fine Fiber	1
11	Jumper Cable Male-Female	1 set
12	Jumper Cable Female-Female	1 set

4.1.1. Ultrasonic Sensor

This ultrasonic Sensor is connected to an Arduino Uno which has several legs, among others:

1. VCC as a power or a positive power Arduino
2. TRIG function as input on Arduino
3. ECHO function as output on Arduino
4. GND function as a negative power on the Arduino

The ultrasonic sensor working system is detecting an object both objects and humans through a movement by removing the output power by 5 volts, but if no object is detected by the ultrasonic sensor then the output power is 0 volts. The signal distance that can be detected by the ultrasonic sensor can be different, this is because the sensor's sensitivity is sufficiently high and can be set in such a way between the ultrasonic sensor distance with the object but the researcher devise a distance of 30cm as the maximum distance limit.

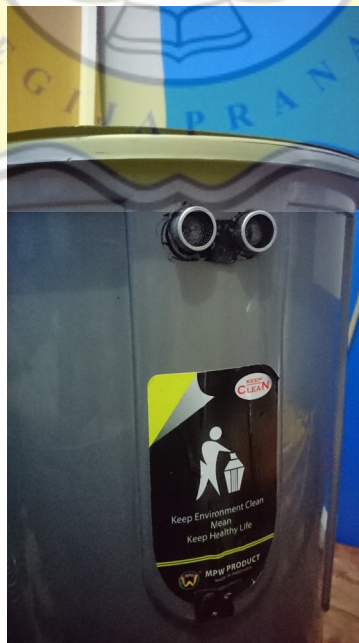


Illustration 4.1: Ultrasonic sensor location in the Trash

4.1.2 IR Sensor Obstacle

The Obstacle IR Sensor serves as an detector for goods that go into the trash. The legs on the sensor IR Obstacle among others:

1. OUT function as a connected detector on the Arduino Pin
2. GND function as a negative power
3. VCC serves as a positive power

Working system IR Sensor Obstacle here is to detect the existence of objects entering the trash through the Sensor Obstacle IR, where if there is an entry object will be detected with a value of 1 whereas when there is no object that passes through the IR Sensor Obstacle then the value of the number 0.

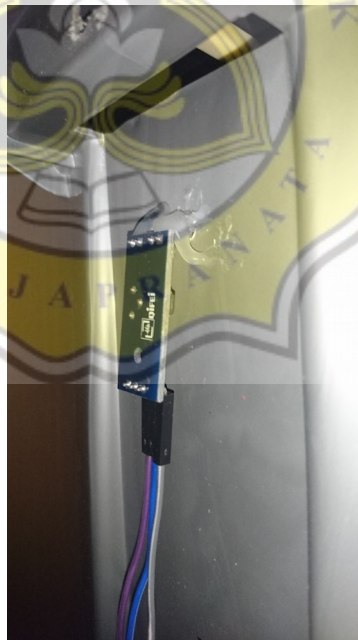


Illustration 4.2: Location of the Obstacle IR Sensor in the Trash

4.1.3 Motor Servo

The servo motor serves as a tool that operates for the opening and closing mechanism of the trash that is associated with an object that can pull the garbage cover to work. Servo motors can be rotated with 4 positions of 0°, 90°, 180°, and 360°

The servo motor has 3 parts, among others:

1. VCC function as positive power (red colored)
2. GND function as negative power (brown or black)
3. Data function as data sender (orange colored)

The servo motor work system in the study is as a motor or the driver of the garbage cover to open and close connected to the ultrasonic sensor with a predefined distance into the Arduino system.



Illustration 4.3: Servo Motor placement in the Trash

4.1.4 Module GSM SIM 800L

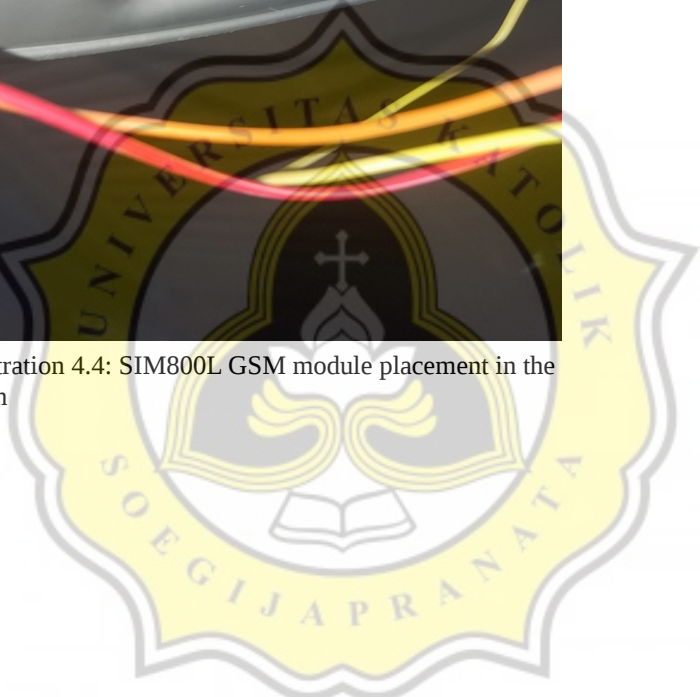
GSM SIM 800L module serves as a tool to send notifications or SMS to the destination number. The legs on the GSM SIM module 800L are:

1. NET function as an antenna
2. VCC serves as a positive power
3. RST serves as reset
4. RXD serves as a serial Rx Data
5. TXD serves as Tx Data serial
6. GND function as a negative power
7. RING function when a phone is have a called
8. DTR
9. MICP function as a microphone +
10. MICN function as a microphone -
11. SPKP function as speaker +
12. SPKN function as speaker -
13. Micro Sim Slot as the container for the GSM card used

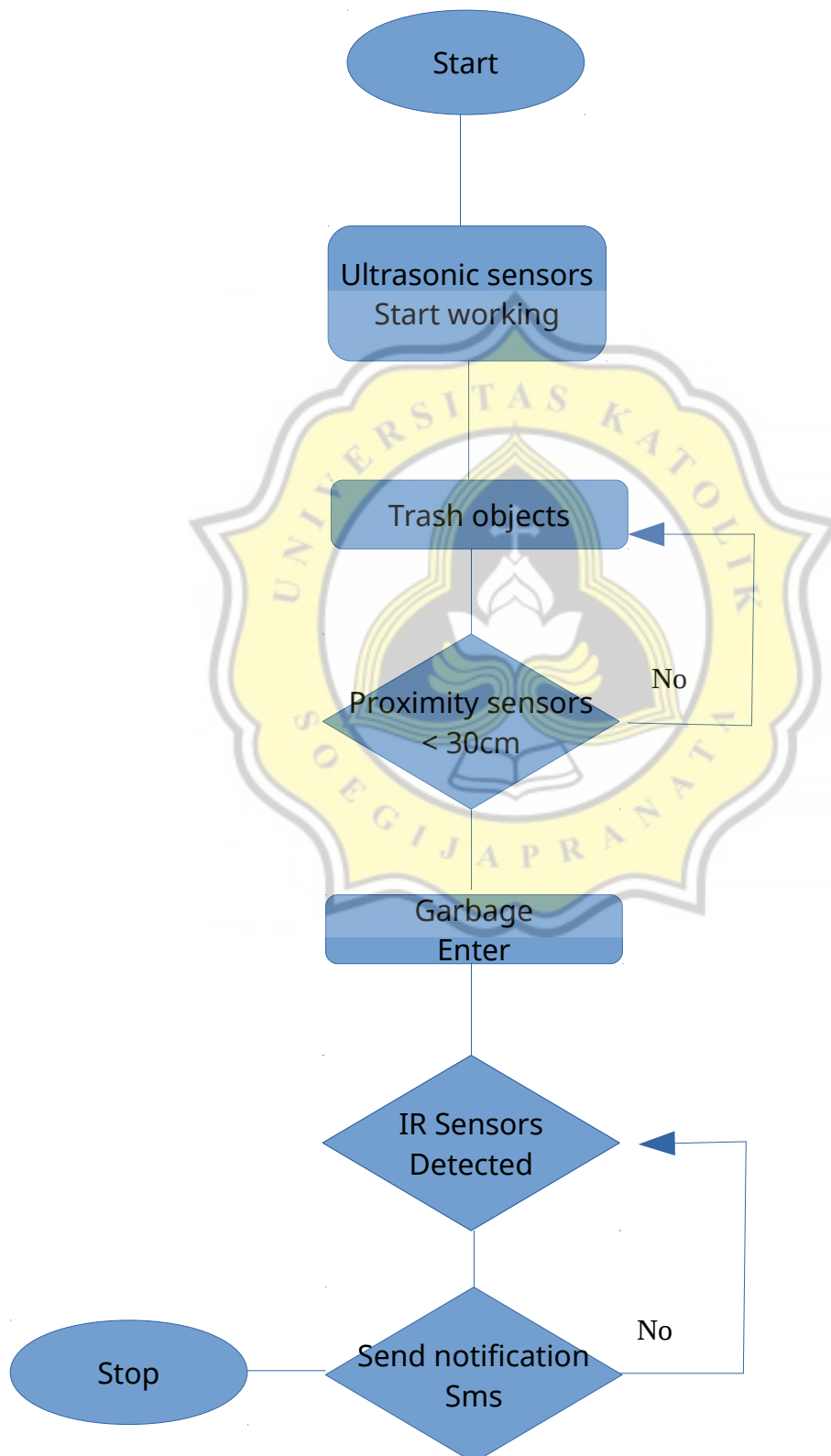
System Module SIM 800L in this research is as a medium to provide or send messages to cleaning officers if the waste capacity is full. Of course, to be able to send a message or the required norification of GSM SIM card and credit and researchers use Network 3 in this research.



Illustration 4.4: SIM800L GSM module placement in the Trash



4.2 Design



The flowchart explains how prototypes work where the system initially initializing the inner parts of the smart trash system first. Once the sensor starts working then the interaction between an object and the trash can begin with a certain distance. Then initialize in the trash that states the full trash or not. If the dustbin condition is full then the system will record the trash can data to be sent to Handphone. The Data received on the handphone is text content that tells that the trash condition is full to the cleaning officers.



Illustration 4.5: Prototype from behind

In this 4.5 illustration, there is a breadboard and a series of jumper wires and servo motors attached to the bottom of the trash and also the GSM SIM 800L module to send notifications to the phone.

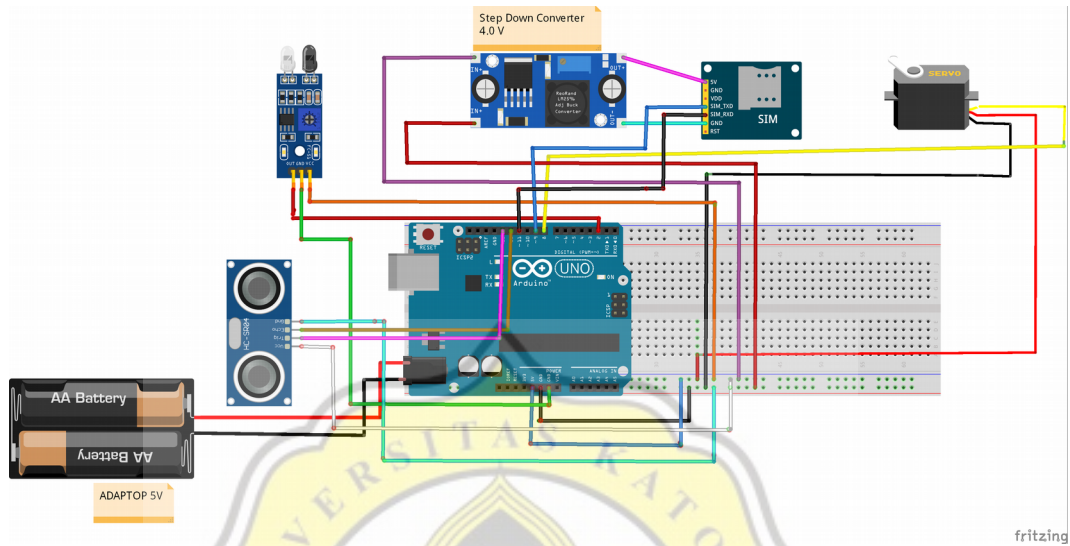
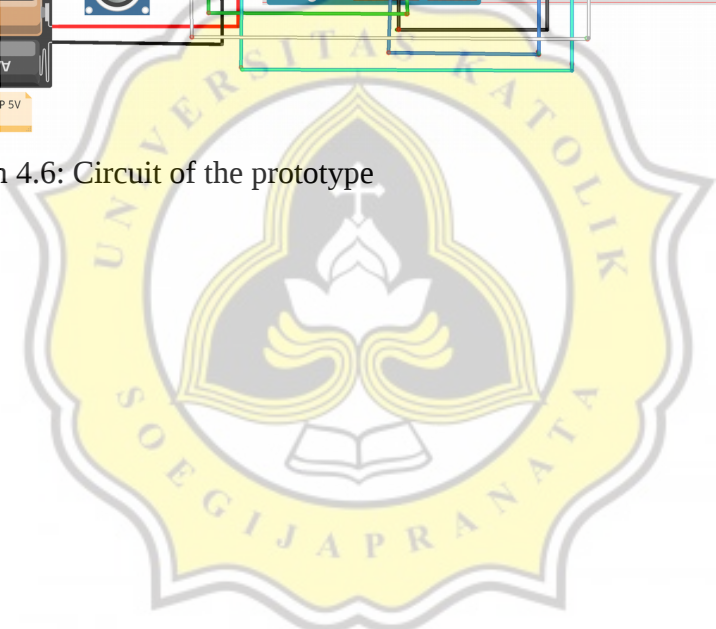


Illustration 4.6: Circuit of the prototype



CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation

```
1. void loop() {
2.   digitalWrite(trigPin, LOW);
3.   delayMicroseconds(2);
4.   digitalWrite(trigPin, HIGH);
5.   delayMicroseconds(10);
6.   digitalWrite(trigPin, LOW);
7.   int hasil = digitalRead(2);
8.   duration = pulseIn(echoPin, HIGH);
9.   distance= duration*0.034/2;
10.    Serial.print("Distance: ");
11.    Serial.println(distance);
12.    delay(10);
13.    if(distance<30)
14.    {
15.      servo.write(180);
16.      delay(1000);
17.    }
18.    else
19.    {
20.      servo.write(0);
21.    }
22.    if (digitalRead(2) == HIGH)
23.    {
24.      if(delay>threshold){
25.        SIM800L.write("AT+CMGS=\"082322758702\"\\r\\n");
26.        SIM800L.write("SAMPAH PENUH GAES");
27.        Serial.println("SMS Selesai Dikirim!");
28.      }
29.    }
    else
```

```
30.      {  
31.      Serial.println("Sampah Belum Penuh!");  
32.      }
```

This is the code for the ultrasonic sensors and the Obstacle IR sensor, where the distance functions as a determining distance parameter to open and close the trash when detected objects and ' int hasil (2) ' is OUT of the Obstacle IR sensor to detect if the garbage contents have been detected sensors and are declared full.

```
SIM800L.write("AT+CMGS=\"082322758702\"\\r\\n");  
SIM800L.write("SAMPAH PENUH GAES");  
Serial.println("SMS Selesai Dikirim!");
```

This code serves to send SMS in the form of text content with GSM SIM 800L module to the HP number that has been set as the destination number.



5.2 Testing

The overall system test was done when the Arduino UNO was active. All devices installed on the Arduino UNO are tested starting from the sensors used to some hardware that help to run this prototype. The proximity sensor and Obstacle IR sensors become the main sensors as the full or no-trash parameters. Then the GSM SIM module 800L sends an SMS as a notification of the condition of garbage contents when the trash is full.



Illustration 5.1: The Prototype

To conduct an experiment it takes interaction with an ultrasonic sensor in order to calculate the distance detected by the ultrasonic sensor.

• Tabel 5.1: Testing Sensor Ultrasonic

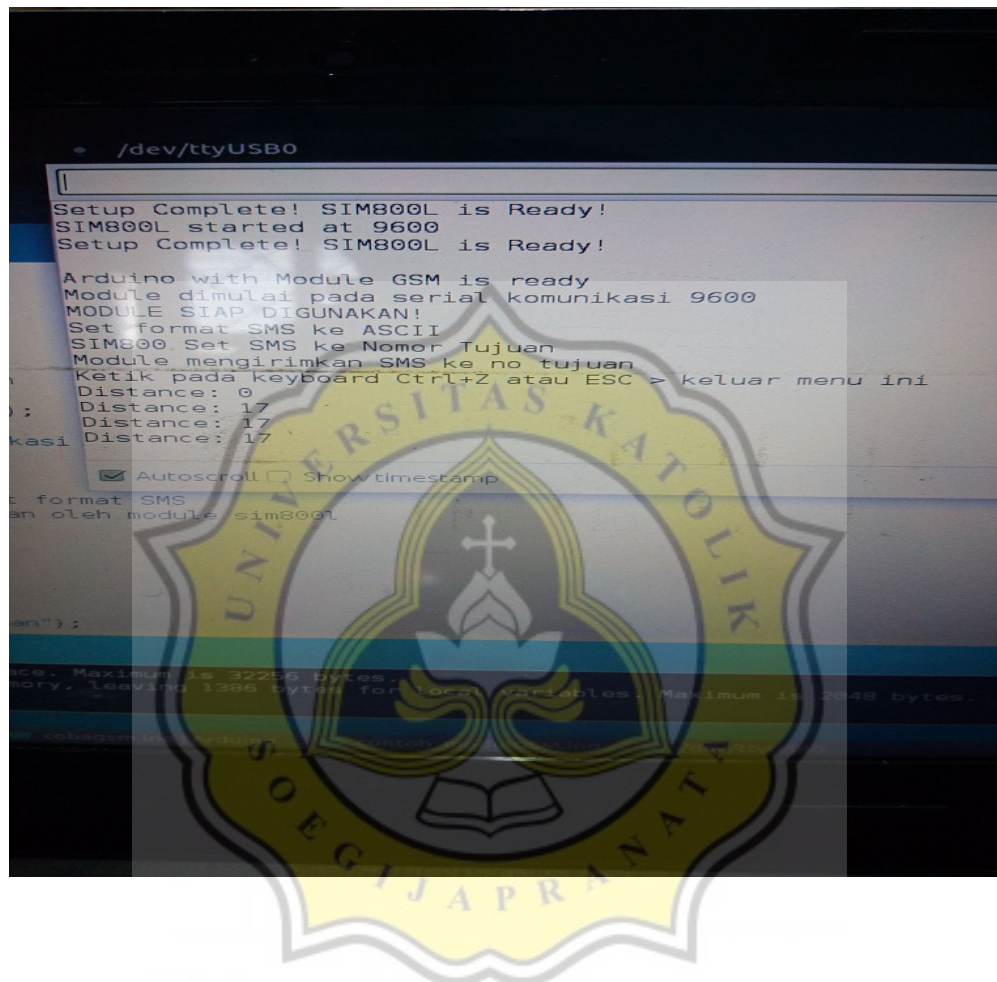
No	Manual (cm)	Sensor (cm)	Description
1	20 cm	21 cm	Inappropriate distance
2	15 cm	14 cm	Inappropriate distance
3	24 cm	24 cm	Appropriate
4	8 cm	8 cm	Appropriate
5	58 cm	57 cm	Inappropriate distance
6	72 cm	73 cm	Inappropriate distance
7	60 cm	62 cm	Inappropriate distance
8	40 cm	41 cm	Inappropriate distance
9	78 cm	78 cm	Appropriate
10	8 cm	8 cm	Appropriate
11	32 cm	32 cm	Appropriate
12	11 cm	11 cm	Appropriate
13	87 cm	86 cm	Inappropriate distance
14	95 cm	95 cm	Appropriate
15	Atap	299 cm	

So for accuracy results with multiple attempts between objects with ultrasonic sensors is 99.0476%

For module can send SMS data as notification need interaction between objects with IR sensor Obstacle.

Tabel 5.2: Testing Sensor IR Obstacle

No	Manual (cm)	Infra Red Data	Description
1	10 cm	0	Trash not yet full
2	7 cm	0	Trash not yet full
3	5 cm	0	Trash not yet full
4	2 cm	1	Full Trash
5	3 cm	1	Full Trash
6	9 cm	0	Trash not yet full
7	12 cm	0	Trash not yet full
8	15 cm	0	Trash not yet full
9	4 cm	0	Trash not yet full
10	3.5 cm	1	Full Trash



```
• /dev/ttyUSB0
Setup Complete! SIM800L is Ready!
SIM800L started at 9600
Setup Complete! SIM800L is Ready!

Arduino with Module GSM is ready
Module dimulai pada serial komunikasi 9600
MODULE SIAP DIGUNAKAN!
Set format SMS ke ASCII
SIM800 Set SMS ke Nomor Tujuan
Module mengirimkan SMS ke no tujuan
Ketik pada keyboard Ctrl+Z atau ESC > keluar menu ini
Distance: 0
Distance: 17
Distance: 17
Distance: 17

 Autoscroll  Show timestamp
t format SMS
an oleh module sim800l

);
ce. Maximum is 32256 bytes.
ory, leaving 1386 bytes for local variables. Maximum is 2048 bytes.
```

Illustration 5.2: Screenshots of interactions between object distances and ultrasonic sensors

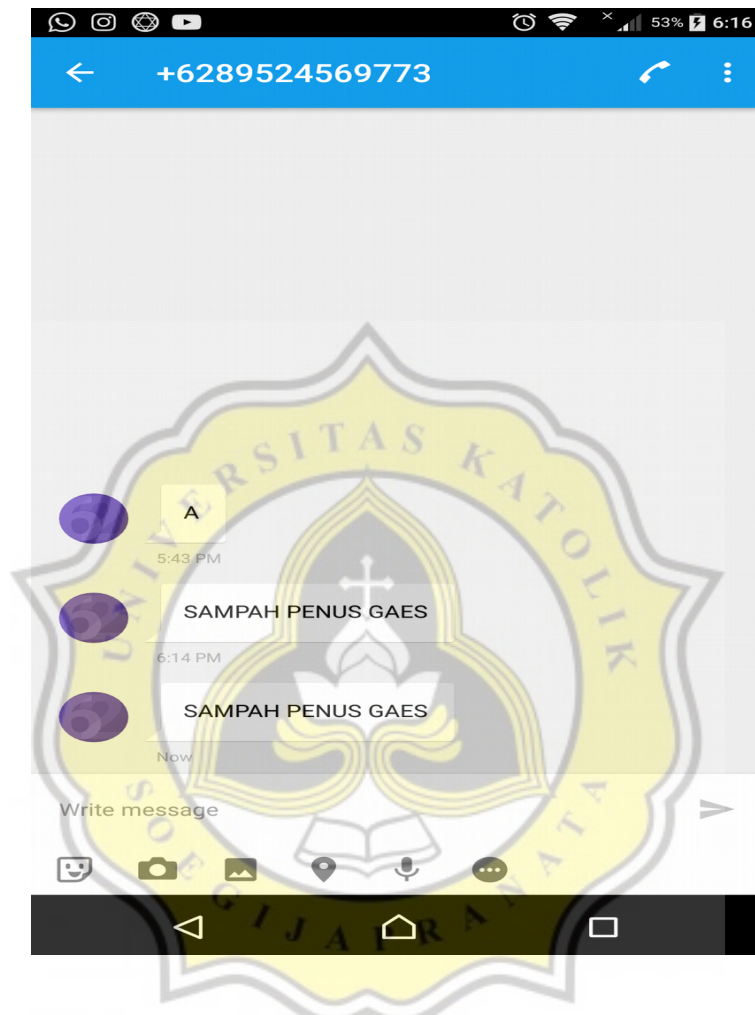


Illustration 5.3: Screenshot of SMS result sent to Handphone when trash object is full and detected by IR sensor Obstacle

So the result of the illustration above stated that the sensor works well and the module successfully sends the notification to the destination number of the phone SMS.

CHAPTER 6

CONCLUSION

Result of the design and manufacture of Arduino control system Tools on Trash cans use Obstacle IR sensors and ultrasonic sensors can be concluded some conclusions are :

1. By using GSM SIM module 800l facilitate the officer to know the state of the Trash with energy efficient and time.
2. With this automatic trash can increase the interest of people to dispose of garbage in its place due to the unique garbage system and different from the trash in general.

Based on research that authors do on the Trash control system this automated, the authors provide advice aimed at building better development for further studies.

- a) For further development is expected to supply electrical current voltage using Powerbank where power can be rechargeable, with the aim to reduce electricity consumption continuously.
- b) Adding LCD in the trash with the purpose of the community to know how full the volume of the trash is filled.

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APPENDIX

```
#include <Servo.h> //library dari Motor Servo

#include <SoftwareSerial.h> //library dari Module GSM SIM800L

Servo servo;

#define SIM800_TX_PIN 9

#define SIM800_RX_PIN 11

SoftwareSerial serialSIM800(SIM800_TX_PIN,SIM800_RX_PIN);

int angle = 10;

// defines pins numbers
const int trigPin = 5;
const int echoPin = 6;

// defines variables
long duration;
int distance;

const int IRSensor= 2;

int inputVal = 0;

const int threshold = 2000; //To determine how many seconds are
classified as a full barrel

void setup() {

  servo.attach(8);

  servo.write(angle);

  pinMode(IRSensor,INPUT); //Pin 2 is connected to the output of
infrared sensor

  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
```

```

pinMode(echoPin, INPUT); // Sets the echoPin as an Input

Serial.begin(9600);

while(!Serial);

Serial.println("Inisialisasi modul SIM800L");

serialSIM800.begin(9600);

delay(1000);

Serial.println("Kirim SMS..."); //Set text mode for SMS sending
serialSIM800.write("AT+CMGF=1\r\n");
delay(1000);
Serial.begin(9600); // Starts the serial communication
while(!Serial);
}
void loop() {
// Clears the trigPin
digitalWrite(trigPin, LOW);
delayMicroseconds(2); //Sets the trigPin on HIGH state for 10
micro seconds

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

delay(1000); // Reads the echoPin, returns the sound wave travel time in
microseconds

duration = pulseIn(echoPin, HIGH);

// Calculating the distance

```

```
distance= duration*0.034/2;

// Prints the distance on the Serial Monitor

Serial.print("Distance: ");

Serial.println(distance);

delay(10);

if(distance<30)

{

servo.write(180);

delay(1000);

}

else

{

servo.write(0);

}

if (digitalRead(2) == HIGH)

{

serialSIM800.write("AT+CMGS=\"082322758702\"\r\n");

delay(1000);

serialSIM800.write("SAMPAH PENUH GAES");

delay(1000);

serialSIM800.write((char)26); //CTRL-Z

delay(1000);

Serial.println("SMS Terkirim!");

}

}
```



```
else  
{  
  Serial.println("Sampah Belum Penuh!");  
}  
}
```





2.39% PLAGIARISM
APPROXIMATELY

2.43% IN QUOTES

Report #11011338

CHAPTER 1 Introduction Background Research on automatic smart bins is done because there are still many and often we meet people who are still fond of throwing trash in any place. The design of this Arduino Uno-based smart trash can requires several materials such as hardware and software. The hardware used includes Ultrasonic Sensor, Infra Red Sensor, Breadboard, Jumper Cable, Arduino Uno, Servo Motor and SIM800 GSM Module, trash bins, tools needed as assistive devices and Arduino IDE as software. The first in conducting this research is to test the ultrasonic sensor and servo motor which is used as a parameter to open and close the trash can with a distance that has been determined on the ultrasonic sensor. After that, testing the IR sensor that detects the entry of an item into the trash and as a parameter if the trash can is full with a certain distance for a few seconds. Then the next step is checking the electrical power on the breadboard and devices that have been installed with a multimeter. The breadboard is placed under the trash can, the ultrasonic sensor is in front of the trash bin to facilitate access and the IR sensor is in the middle of the trash can. After all sensors and servo have been installed in the trash, the overall test is done well. In testing the GSM Module SIM 800L is done by using GSM SIM 3. In addition, so that the module can provide or send sms to the