

## 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.

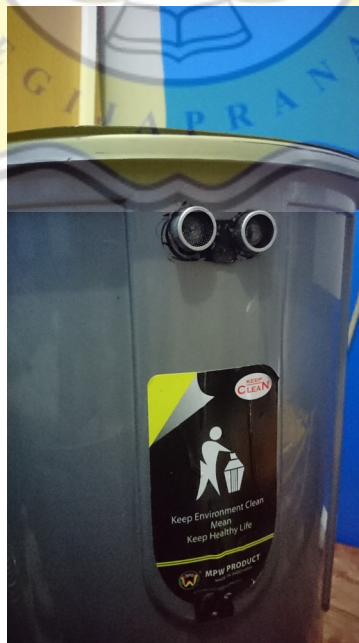


Illustration 4.1: Ultrasonic sensor location in the Trash

#### 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.

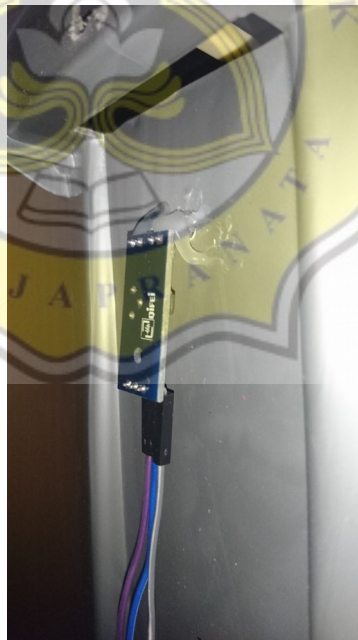


Illustration 4.2: Location of the Obstacle IR Sensor in the Trash

### 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

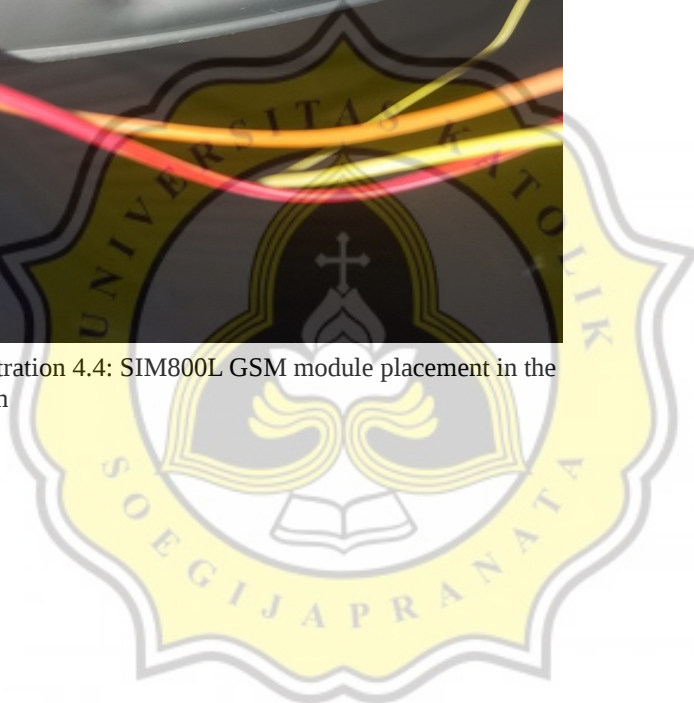
GSM SIM 800L module serves as a tool to send notifications or SMS to the destination number. The legs on the GSM SIM module 800L are:

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.

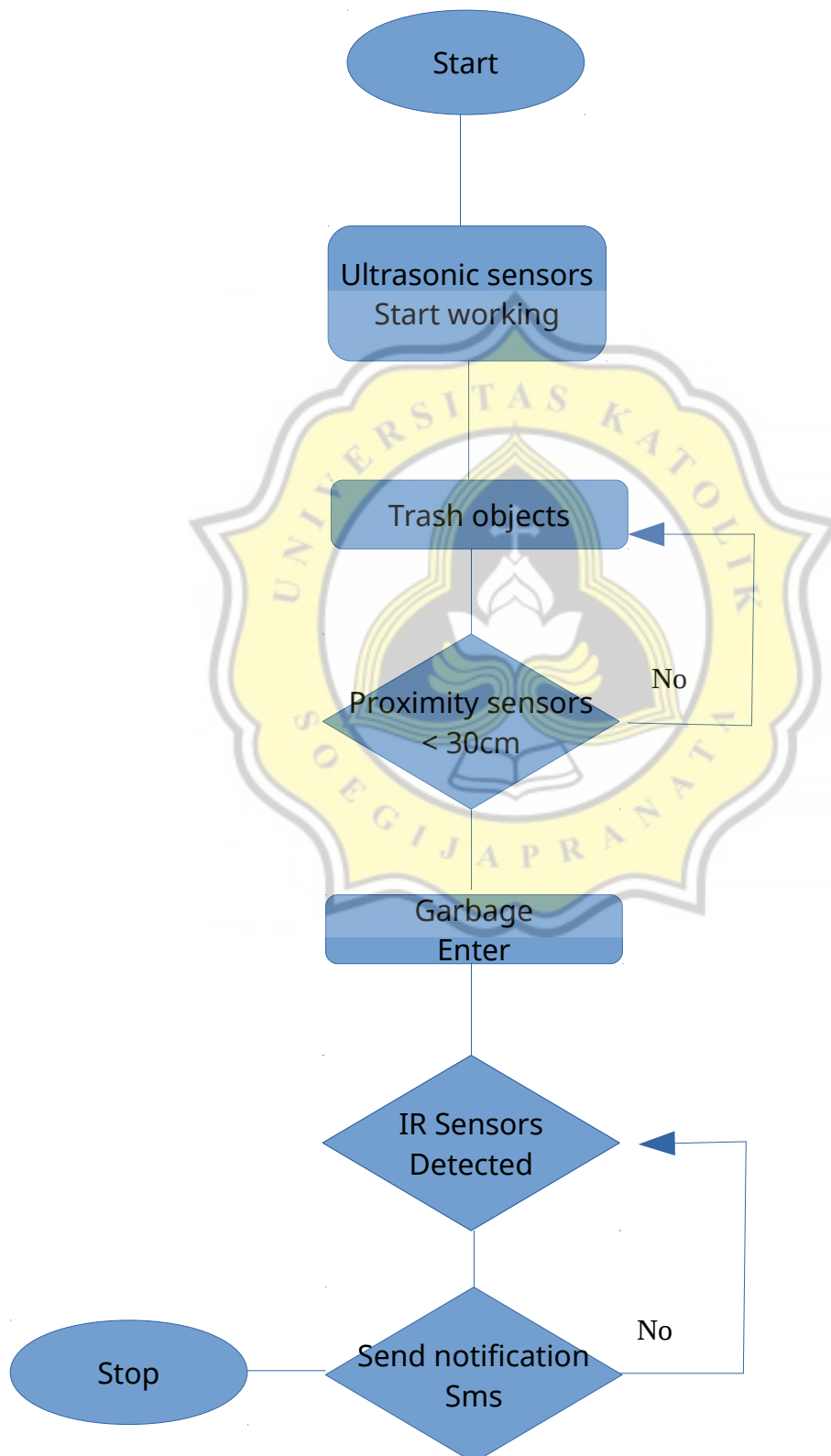


Illustration 4.4: SIM800L GSM module placement in the Trash





## 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.



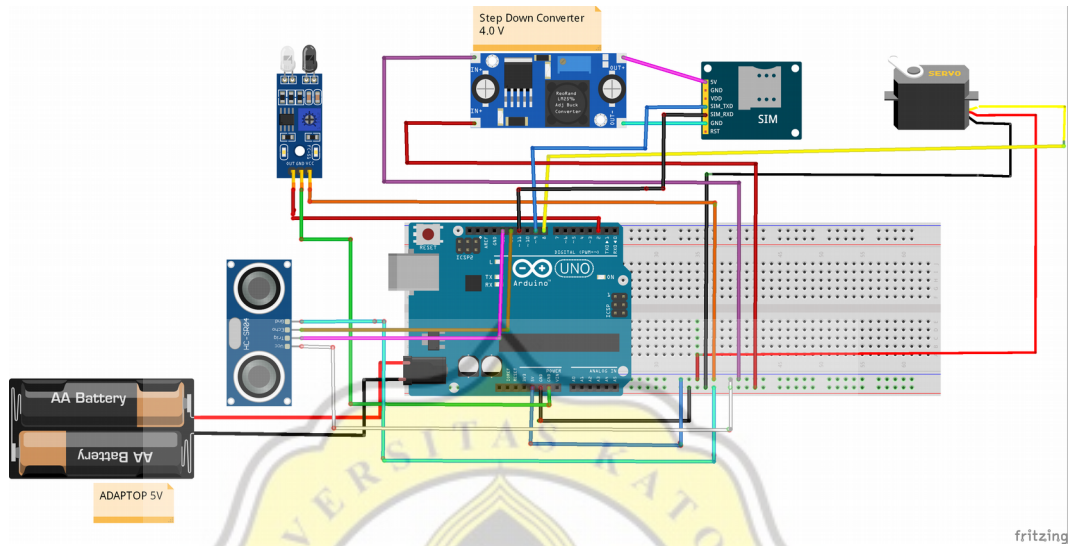


Illustration 4.6: Circuit of the prototype

