CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Implementation

In this chapter described the implementation of the automatic control system making the garden

A) source Code

```
1.  if (strTopic == "onTopic")
2.  Switch1 = String ((char *) payload);
3.  if (Switch1 == "ON")
4.  Serial.println ( "Fertilizer ON");
5.  digitalWrite (Fertilizer, HIGH);
6.  digitalWrite (Pumps, HIGH);
7.  else if (Switch1 == "OFF")
8.  Serial.println ( "Fertilizer OFF");
9.  digitalWrite (Fertilizer, LOW);
10. digitalWrite (Pumps, LOW);
```

Source code above is the core of the program that connects between arduino and manager. In the 1st line of program code is a topic that connects between arduino and manager, lines 2,3 and 7 is the code to command ON / OFF of the manager, rows 4,5,6 and 8,9,10 the generated output, such as fertilizer and pump on / off.

B) designing Interfaces

The implementation is based on the design of the interface design has been done in the previous chapter.

1. display Manager

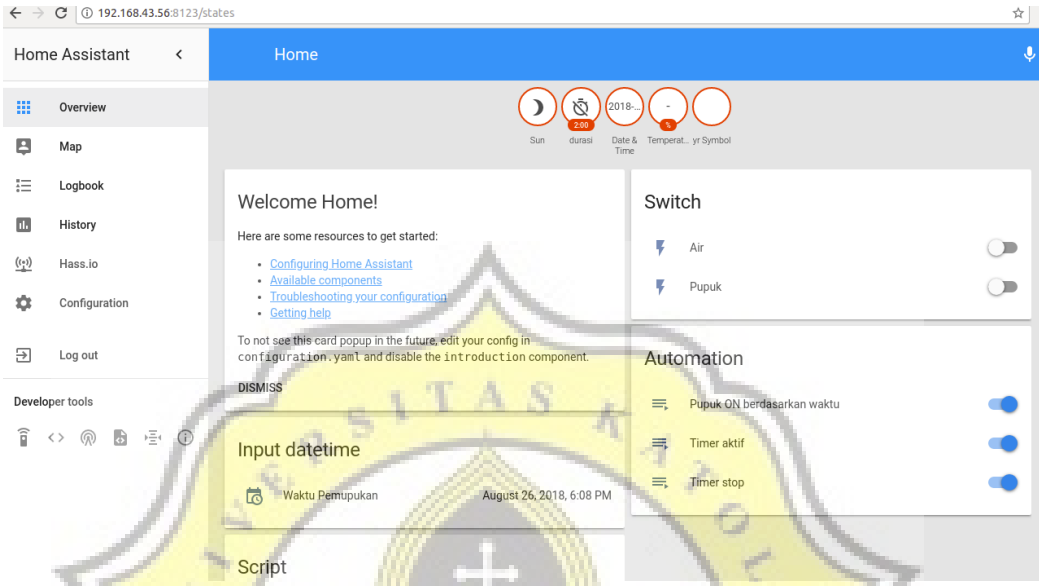

Illustration 5.1: display Manager

Can be seen in illustration 5.1 which is the view of the manager where we can monitor and control the process of watering, fertilizing and pest rodents expulsion.

2. display History

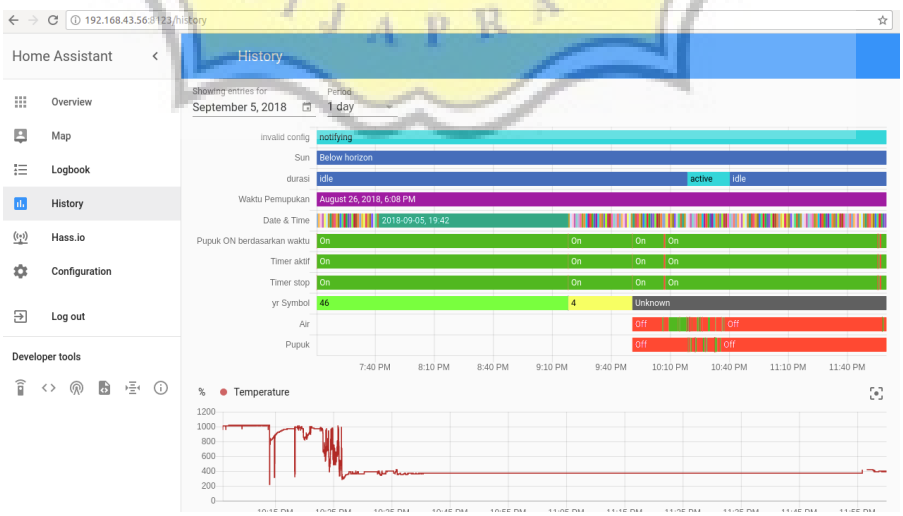

Illustration 5.2: History Display manager

At 5.2 illustration is a view of history or the history of the use of the manager, so we can see or monitor manager earlier in the day. Viewable display of temperature, water and fertilizer were living then die etc, all we can seeThe history page.

3. display Logbook

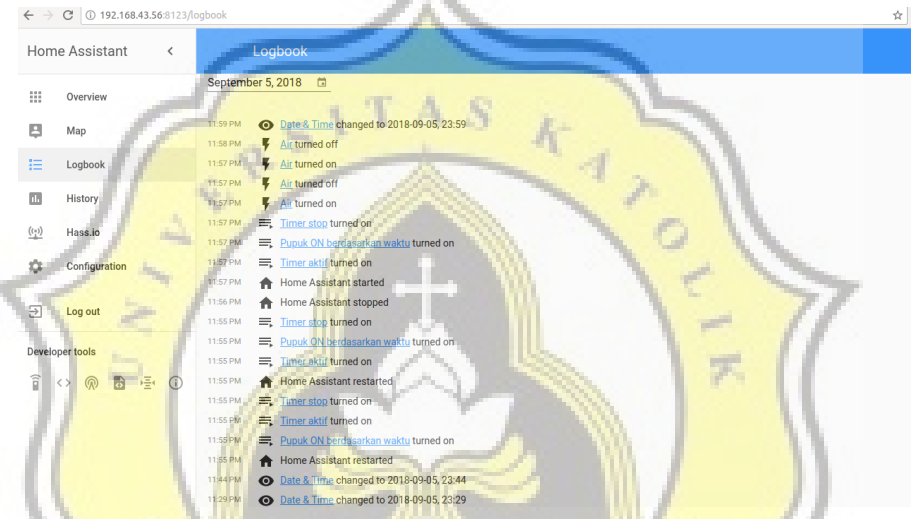

Illustration 5.3: Logbook display manager

Logbook is almost the same as history, but in the view as the latest release information note briefly generated at the manager.

4. display Configuration

```
- platform: google

# Cloud
cloud:

#mqtt
mqtt:
 broker: 192.168.43.56

#arduino
arduino:
  port: /dev/ttyACM0

#sensormoisture


#timedate
sensor 3:
  - platform: time_date
    display_options:
#       - 'time'
      - 'date_time'


input_datetime:
 wakeup_alarm:
   name: Waktu Pemupukan
   has_date: true
   has_time: true
   initial: '2018-08-26 18:08'


#sensorlembab
sensor 2:

  platform: arduino
  platform: mqtt
  state_topic: "ehTopic"
  unit_of_measurement: "%"
  name: "Temperature"
#  value_template: '{{ value_json.moisture }}'
```

Illustration 5.4: display configuration

In illustration 5.4 is a view of the configuration manager, all of which appear in the switch manager like water, fertilizer, clocks, timers, temperature and linking the manager with arduino everything is set in the configuration.

5. display Automation

```
 alias: 'Pupuk ON berdasarkan waktu'
 trigger:
  # - platform: template
 #    value_template: '{{ states.sensor.time.state == (states.input_datetime.wakeup_alarm.attributes.timestamp | int | timestamp_custom("%H:%M
)) }}'
    - platform: template
      value_template: '{{ states.sensor.date__time.state == (states.input_datetime.wakeup_alarm.attributes.timestamp | int | timestamp_custom("
%Y-%m-%d, %H:%M")) }}'

 action:
   service: switch.turn_on
   entity_id: switch.pupuk


 alias: Timer aktif
 id: 'Timerstart'
 trigger:
 - platform: state
   entity_id: switch.pupuk
   to: 'on'


 action:
 - service: timer.start
   entity_id: timer.durasi

 alias: Timer stop
 id: 'Timerstop'
 trigger:
 - platform: event
   event_type: timer.finished
   event_data:
     entity_id: timer.durasi
 action:
 - service: switch.turn_off
   entity_id: switch.pupuk


"/usr/share/hassio/homeassistant/automations.yaml" 35 lines, 881 characters
```

Illustration 5.5: display Automation

In illustration 5.5 is a display of automation which regulate the timer and alarm at fertilization in order to run automatically according to a specified time.

5.2 testing

1. Fertilization

At fertilization is required for fertilization at a specified time, to determine the content of fertilizers obtained during the testing fertilization fertilization takes place with a time of 15 seconds, 30 seconds, 1 minute and 2 minutes. Each time in the test 10 times. Here are the test results:

Table 5.1: Test 15 seconds

No	Liter
1	0.90
2	0.85
3	0.87
4	0.83
5	0.84
6	0.85
7	0.85
8	0.83
9	0.85
10	0.88

From experiments on the Table 5.1, the results of 15-second fertilization produce 0.85 liters of fertilizer.

Table 5.2: Test 30 seconds

No	Liter
1	1.75
2	1.73

3	1.75
4	1.75
5	1.70
6	1.70
7	1.75
8	1.70
9	1.75
10	1.73

From experiments on the Table 5.2, the results of 30-second fertilization produce 1.73 liters of fertilizer.

Table 5.3: Test 1 minute

No	Liter
1	3.40
2	3.40
3	3.40
4	3.40
5	3.42
6	3.40
7	3.39
8	3.43
9	3.40
10	3.45

From experiments on the Table 5.3, the results of 1-minute fertilization produce 3.41 liters of fertilizer.

Table 5.4: Test 2 minutes

No	Liter
1	6.82
2	6,80

3	6.82
4	6.82
5	6,84
6	6,80
7	6.82
8	6.82
9	6,80
10	6.82

From experiments on the Table 5.4, the results of 2-minute fertilization produce 6.82 liters of fertilizer.

In the table above can be seen fertilization in 15 seconds, 30 seconds, 1 minute and 2 minutes. With this we can set the length of time are required for the best fertilization in plants.

2. Sprinkling

At the watering is required to be able to perform automatic watering when needed. Instead, the soil moisture sensor, when the sensor detects dry land then the solenoid opens and water pump life, when the ground is wet the water pump off. To be able to know if these tools work then tested by using two soil is wet soil and dry soil. The following tests:

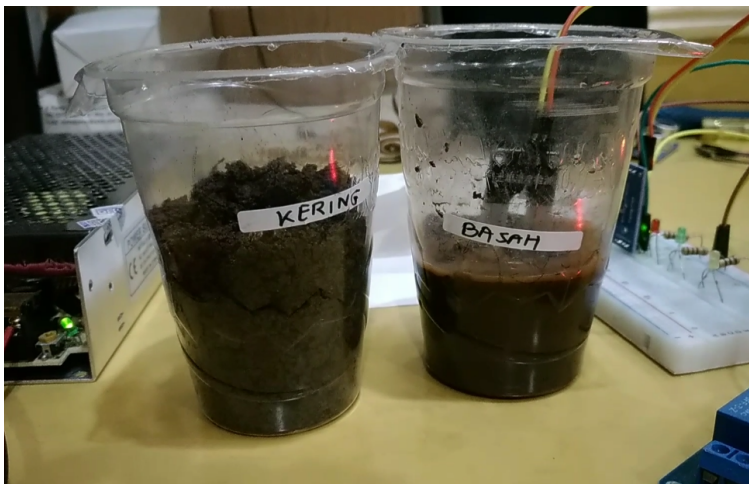

Illustration 5.6: Wet and Dry Soil Test

Illustratin can be seen in 4.1 where there is dry land and wet land, and already in the test when the sensor is placed on dry land then the water pump will live, and if a sensor is placed on the wet ground eating dead water pump.

3. Pest Repellent

In evicting rat pests, ultrasonic sensors are used. The hearing limit of rat is 5KHz - 60KHz but under certain conditions can exceed up to 100KHz. The sensor used is HC-SR04 which has a frequency of 40KHz and Module NE555 + Buzzer. To find out whether this sensor works to repel rat or not, then testing is carried out using 2 interconnected cage, where in both cages there is an ultrasonic sensor. The following is the test that the author did:

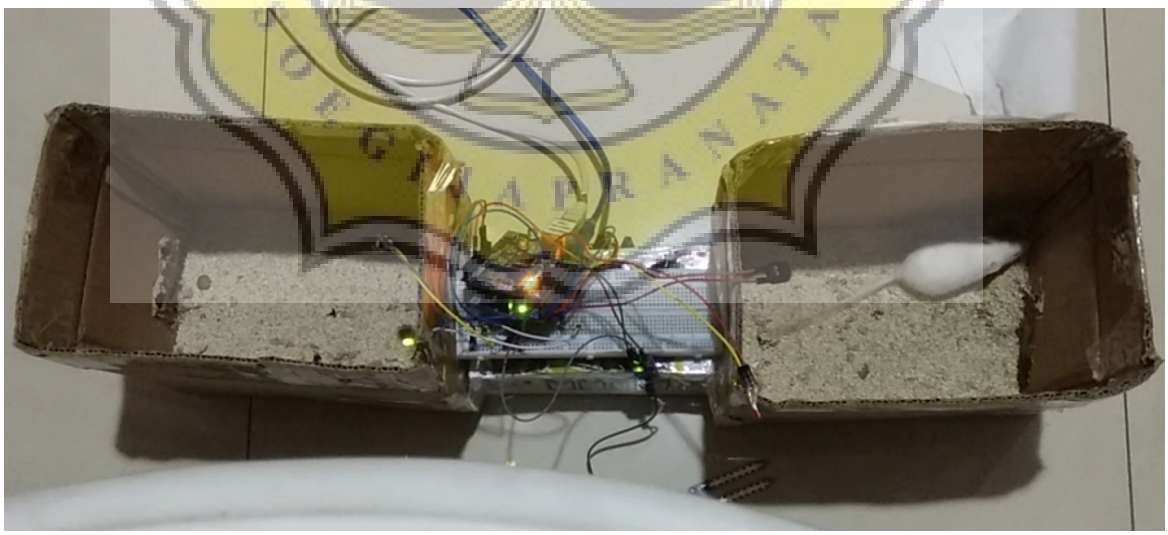

Illustration 5.7: cages

Can be seen at illustration 5.7 that both cages have ultrasonic sensor that can be turned on or off. The author uses a led on each sensor as a marker.

so when the sensors on each of them turned on then the LED will also turn on, and when the sensor turned off then the LED will also turn off.

1. Test HC-SR04 40kHz

After ten experiment with HC-SR04 in rat, it did not have an effect that could disturb rats. Can be seen on illustration 5.8, there is a light that indicates HC-SR04 is active, but the rat is not disturbed

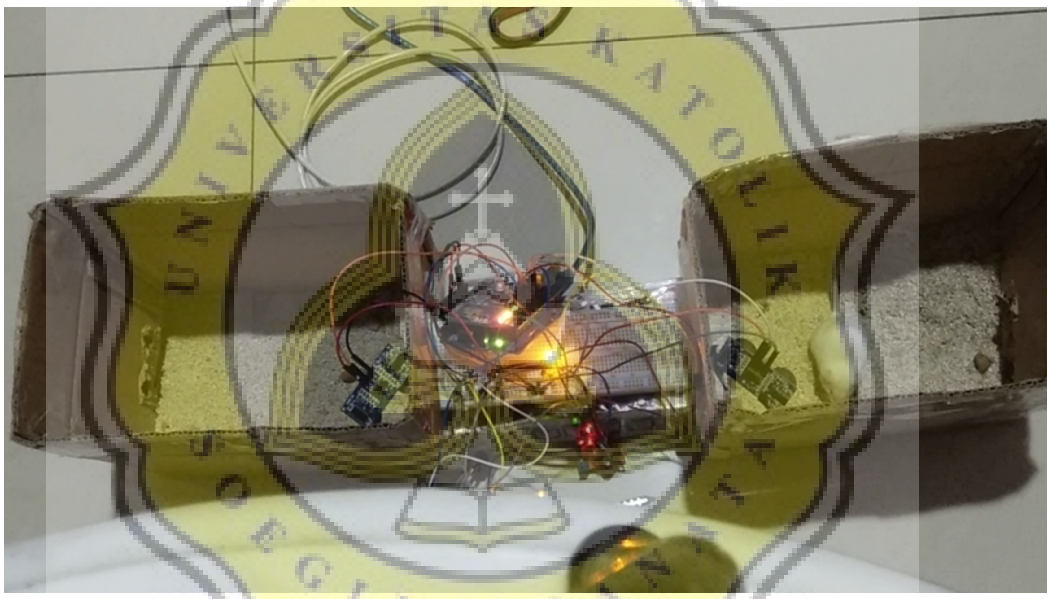

Illustration 5.8: HC-SR04

2. Test NE555 20kHz and Buzzer

After ten experiments using NE555 and Buzzer with a frequency of 20kHz, experiments with these frequencies did not affect rat. Can be seen on Illustration 5.9, rat always stay in cages with active frequency.

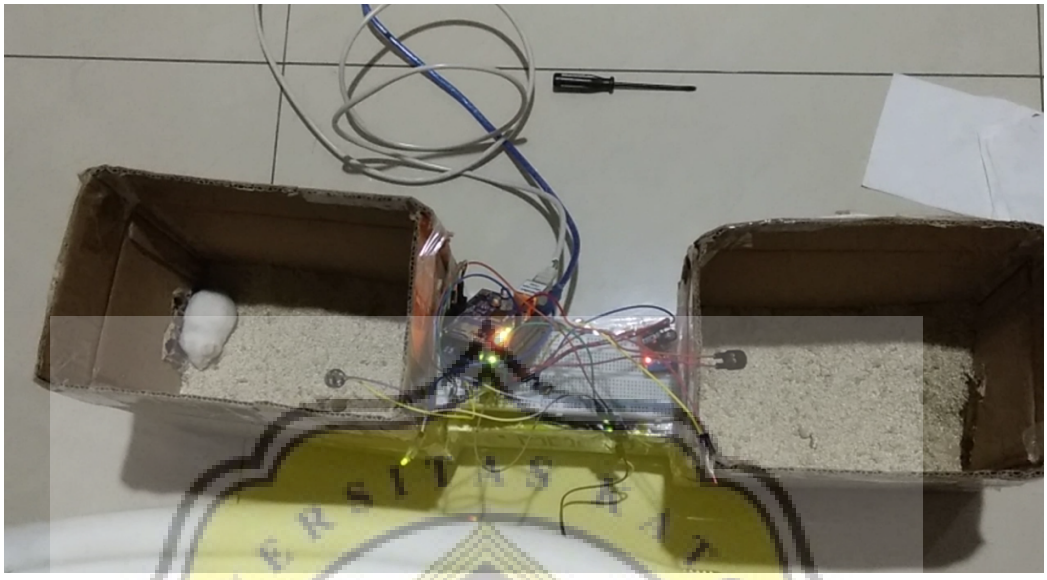

Illustration 5.9: NE555 20kHz and Buzzer

3. Test NE555 50kHz and Buzzer

Table 5.5: Test NE555 50kHz and Buzzer

Trial	behavior	Conclusion
1	-	No effect
2	-	No effect
3	Spinning around	Nervous
4	-	No effect
5	Digging, Spinning around	Confused, Nervous
6	-	No effect
7	-	No effect
8	Digging, Spinning around	Confused, Nervous
9	-	No effect
10	-	No effect

After ten experiment using NE555 and Buzzer with a frequency of 50kHz, there are three experiments that make rat disturbed.

4. Test NE555 100kHz and Buzzer

In this experiment author used a frequency of 100 khz, after ten experiments there was still no interference with rat. Can be seen in illustration 5.10, the light shows the active frequency, but the rat is not disturbed

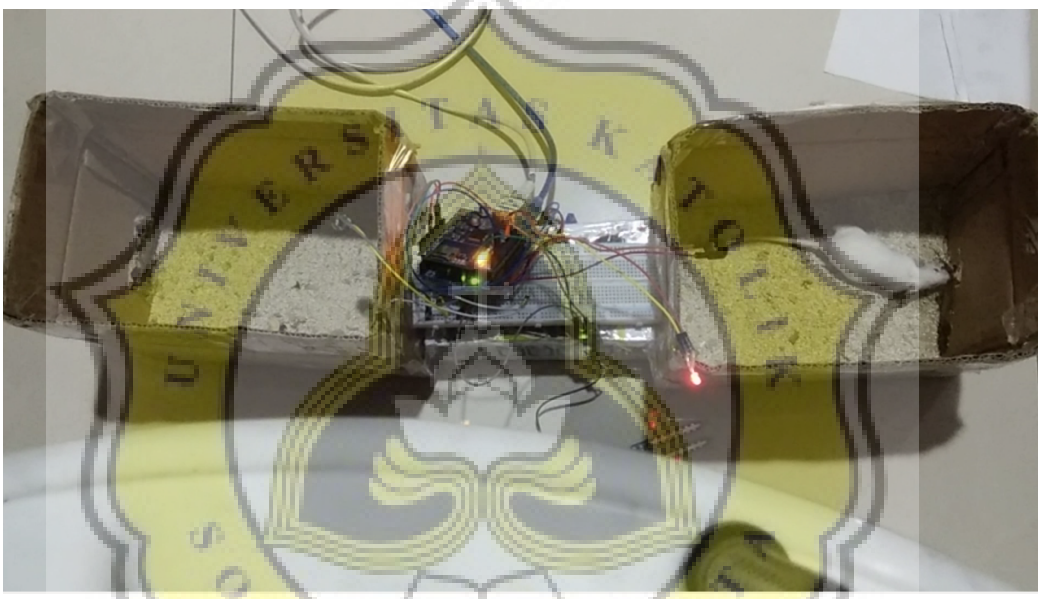

Illustration 5.10: NE555 100kHz and Buzzer

5. Test NE555 150kHz and Buzzer

At a frequency of 150kHz this experiment was also carried out 10 times, but the rat still did not feel the interference. Can be seen in illustration 5.11, the light shows the active frequency, but the rat is not disturbed

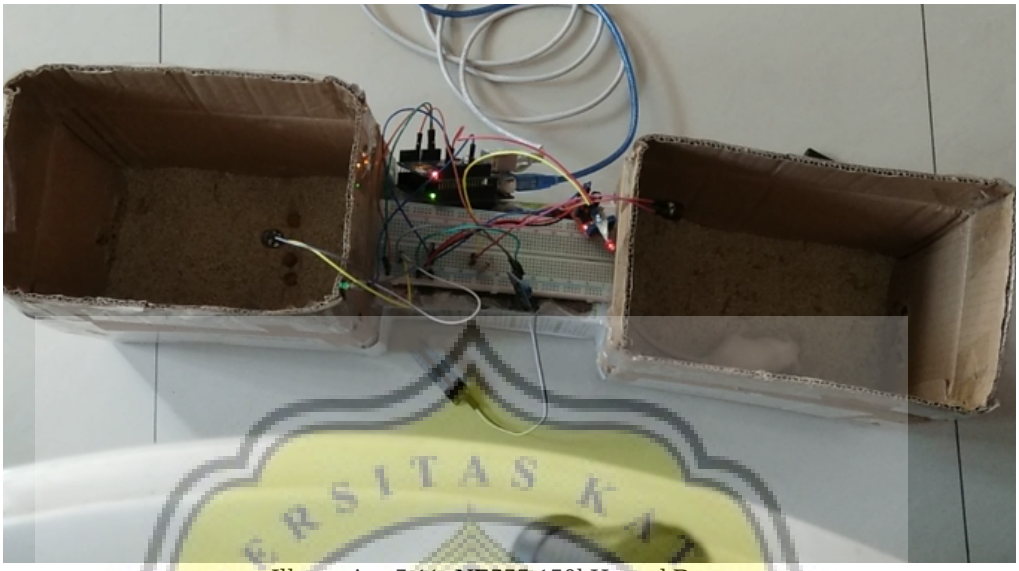

Illustration 5.11: NE555 150kHz and Buzzer