

## CHAPTER 4

### ANALYSIS AND DESIGN

#### 4.1 Analysis

In making of this project is performed by designing the watering, fertilizing and pest repellent rat.

##### 4.1.1 Hardware Design

Prancangan hardware is the creation of a whole so that a single system, As for the design of tools made consisting of:

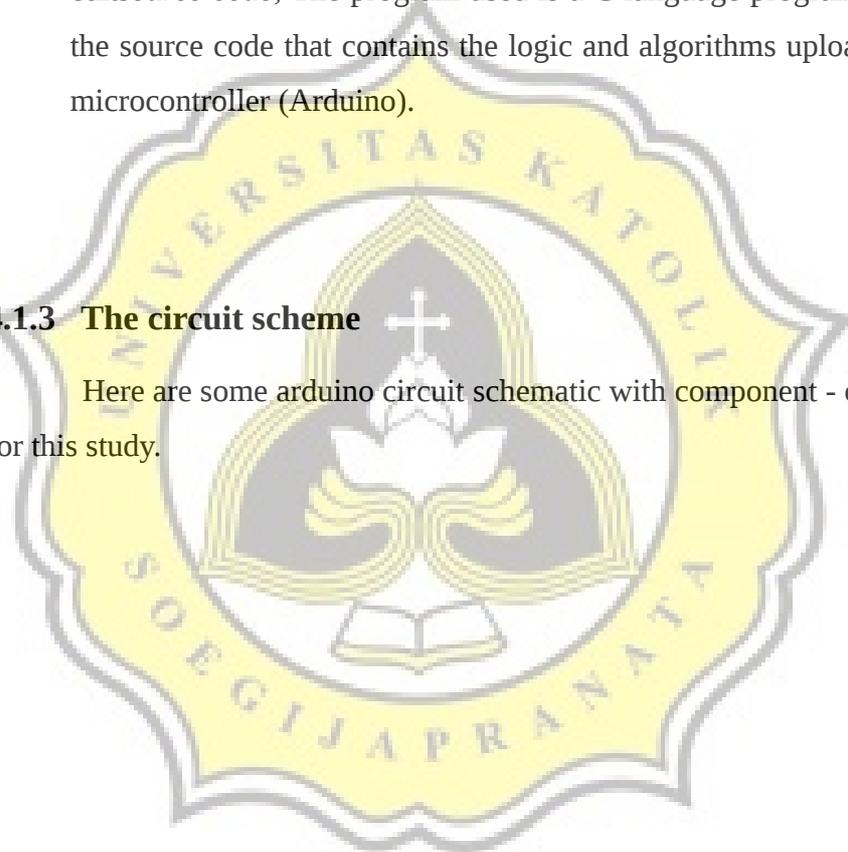
1. Arduino Ethernet Shield circuit as the main component for control watering, fertilizing and midges / rat in the garden,
2. The series with the water pump solenoid and YL-69 sensors to detect soil moisture, so the YL-69 detects the type of dry soil then the water pump ON and watering plants.
3. Circuit with the water pump for garden watering.
4. Solenoid circuit with a water pump and a manager to open the solenoid and turn on the water pump when giving fertilizer at a specified time.
5. Ultrasonic Sensor circuit Module HC-SR04 and NE555 with the help buzzer to repel rodents from the garden based on sound feared by the rat, the purpose of the use of two tools Module HC-SR04 and NE555 is to know which tool is more influential on mice.

#### 4.1.2 Design software

Software design is the creation of the overall program in this study that serves to give orders carried out by the microcontroller. In making this program required a software application built from Arduino Arduino 1.8.5. This application allows you to create, open and edit *source code*, The program used is a C language program Sketch is the source code that contains the logic and algorithms uploaded to the microcontroller (Arduino).

#### 4.1.3 The circuit scheme

Here are some arduino circuit schematic with component - component for this study.





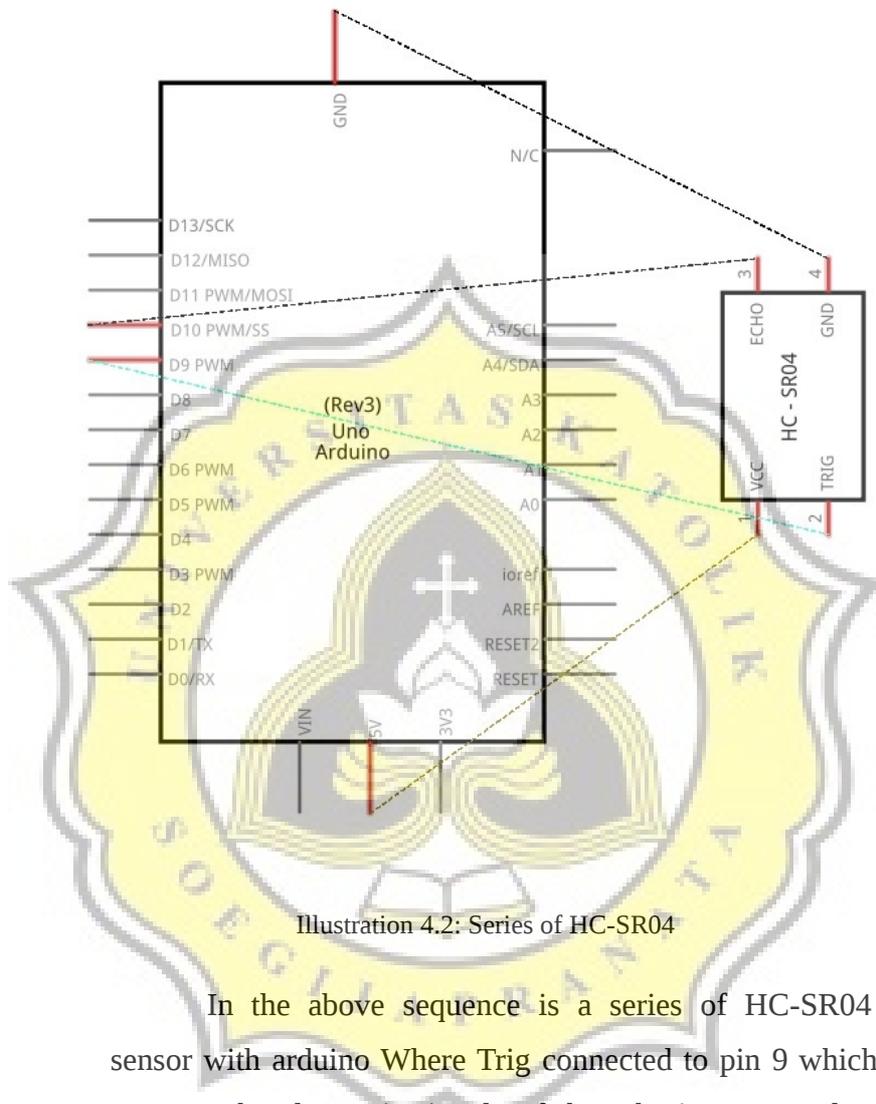


Illustration 4.2: Series of HC-SR04

In the above sequence is a series of HC-SR04 ultrasonic sensor with arduino Where Trig connected to pin 9 which is used to generate the ultrasonic signal and the echo is connected to the pin 10 is used to detect the ultrasonic signal reflections



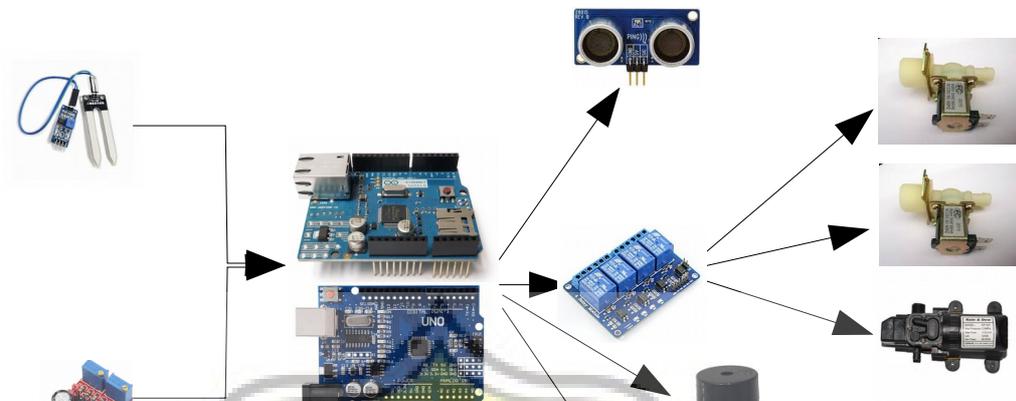


Illustration 4.4: overall design

In illustration 4.6 is the overall design of this study where soil moisture sensors and modules connected to NE555 and ethernet arduino. Then arduino and ethernet connected with HC-SR04 and the relay which relays an automatic switch that is connected with the water pumps, solenoid valve.

## 4.2 Design

### 4.2.1 Data Flow Diagrams

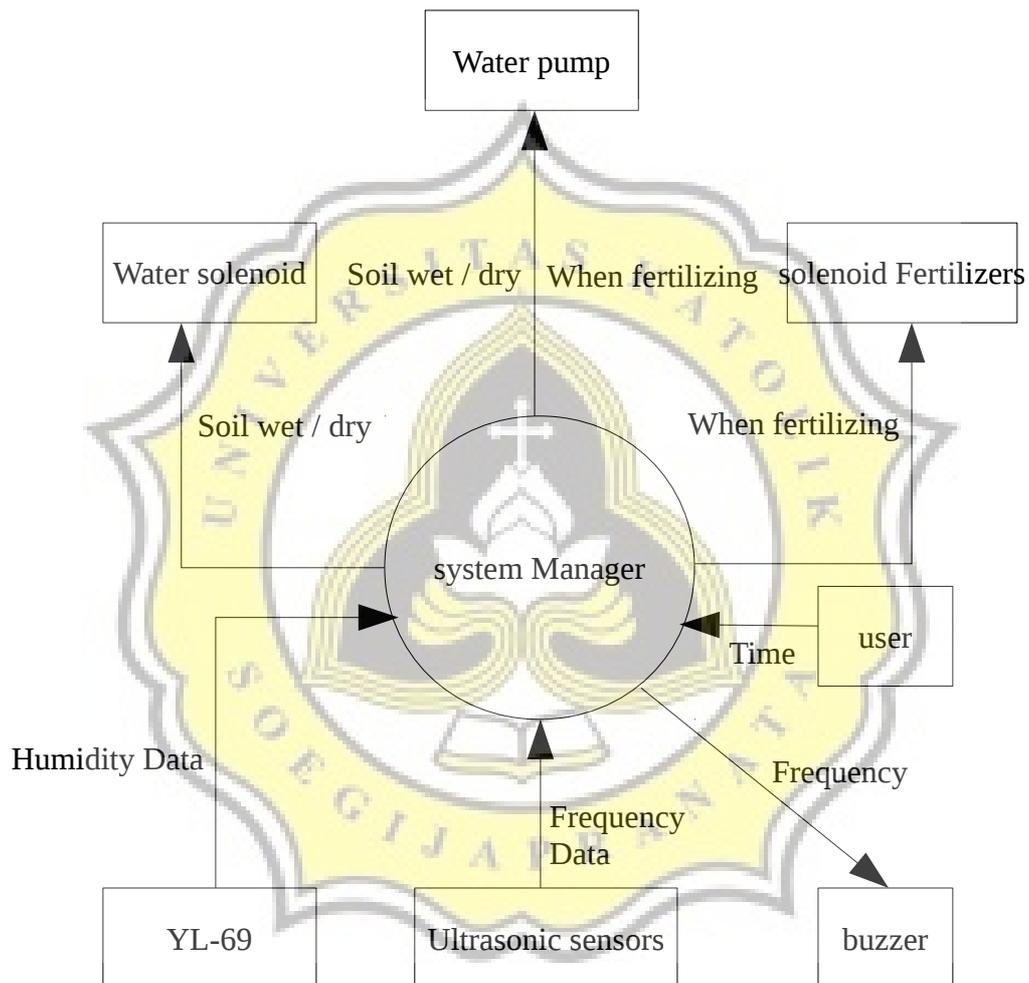


Illustration 4.5: DFD level 0

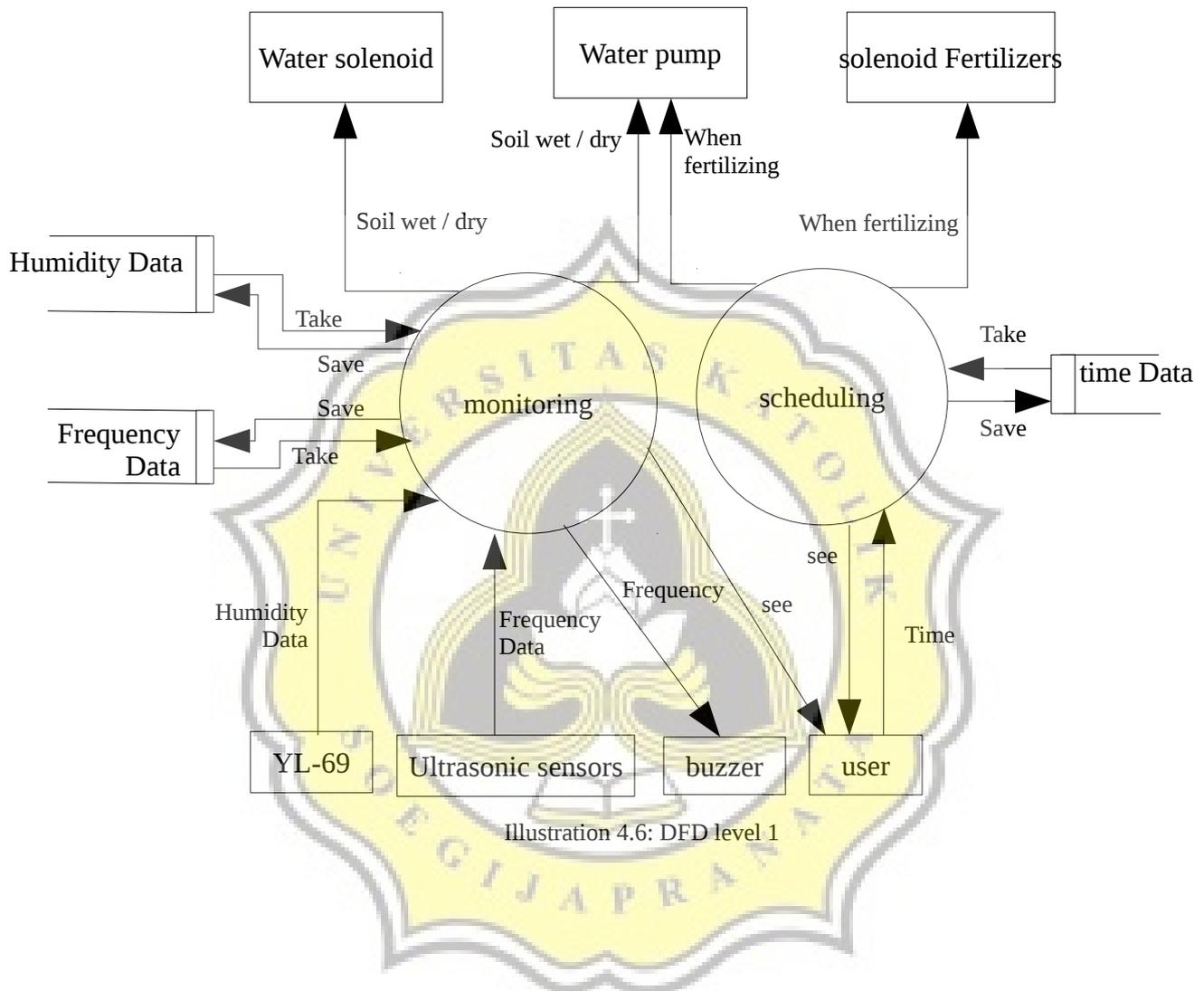


Illustration 4.6: DFD level 1

No.	Data	Explanation
1	Take	Retrieval of existing data in the data store by the process and forwarded to the user
2	Save	No data storage on a process monitoring and scheduling to the data store
3	see	View the data retrieved from the data store through the process system
4	Humidity Data	Data humidity of YL-69

5	Frequency Data	The frequency of the ultrasonic sensor data
6	Frequency	Frequency transmitted from an ultrasonic sensor through the system.
7	Time	Time spent in the input by the user to enable fertilization
8	Soil Wet / Dry	Dry soil conditions or enough water
9	Fertilization time	State of the appropriate time for fertilization

### 4.3 Testing

#### 1. Fertilization

At fertilization the author conducted several experiments to determine the content produced in fertilization.

#### 2. Sprinkling

At watering, the author conducted an experiment using two soil, that is wet soil and dry soil, in this experiment was conducted to determine whether the speaker with soil moisture sensor could function properly or not.

#### 3. Rat repellent

In rat repellent, the authors conducted experiments with HC-SR04 and NE555 + Buzzer sensors that were carried out repeatedly to find out whether the effects of these sensors worked or not.