

## CHAPTER 4

### ANALYSIS AND DESIGN

#### 4.1 Analysis

This project aims to know how the robot arm works. Using the servo motor is equipped with a button to control the robot. The infrared sensor module is also added to the container to calculate the goods as a complement to the robotic arm.

The workings of servo motor and obstacle sensor infrared module is :

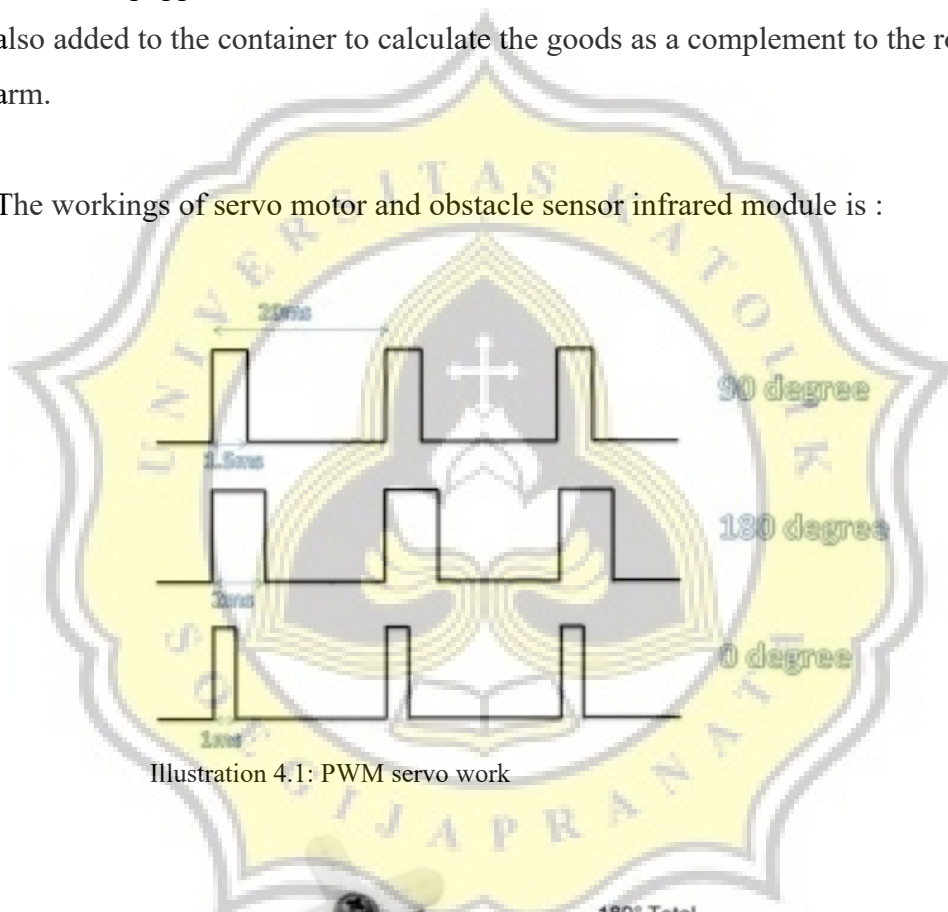


Illustration 4.1: PWM servo work

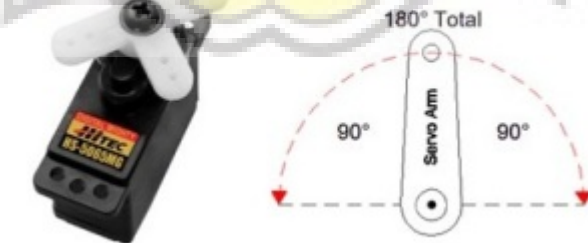
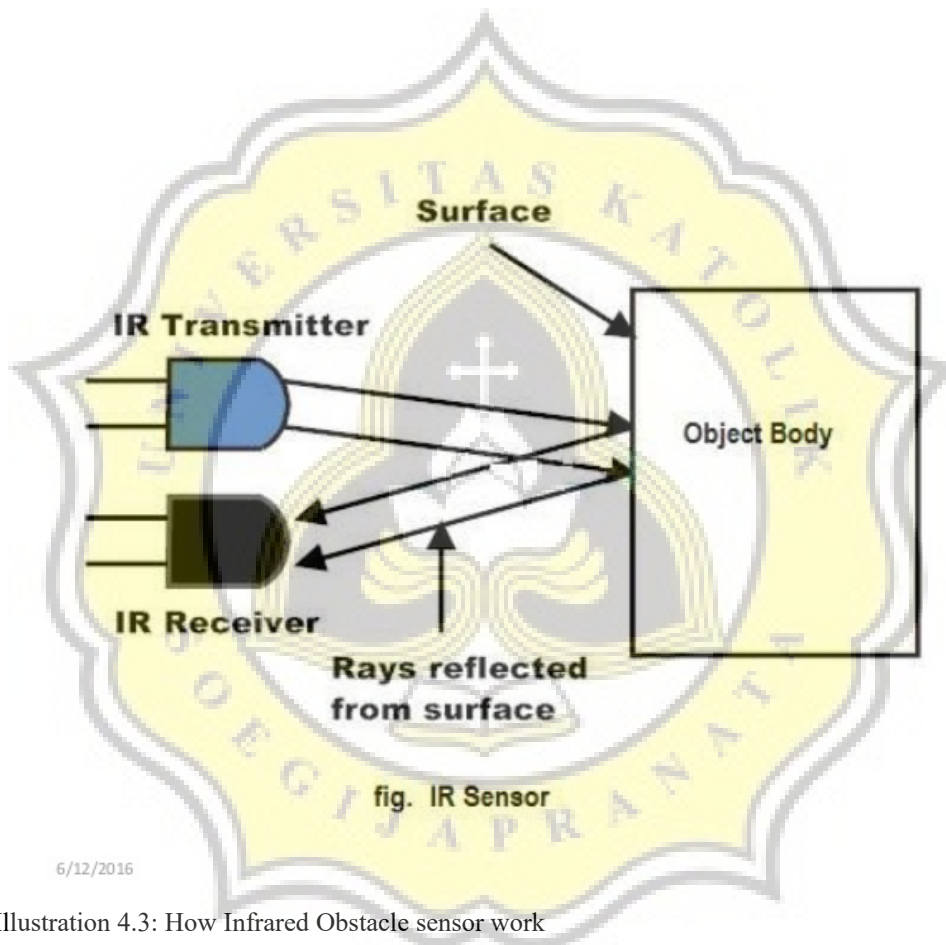


Illustration 4.2: rotation of servo

- The rotation control of servo motor is by sending the control pulses with frequency 50 Hz with period of 20 ms and duty cycle (0-255).
- Where to direct the servo motor of 90° with tons of pulses required duty cycle positive pulse 1,5 ms.
- To move of 180° a 2ms wide pulse required.



- Its main component consists of IR transmitter and IR receiver.
- When power-up, the IR transmitter will transmit invisible infrared light. Light is then reflected from the object in front of it.
- The reflected light is then received by the IR receiver. When exposed to an infrared reflection object, the IR receiver's lifetime will decrease so that the Op-Amp output becomes high / 5V and turns on the LED sensor.

## Design

### 4.2 Design Model Robot Arm

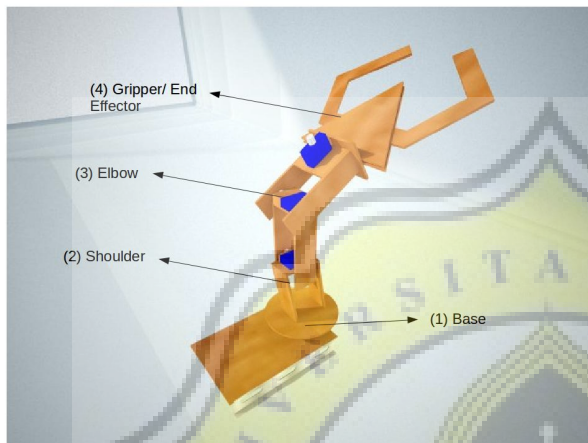


Illustration 4.4: Design model robot arm (top view)

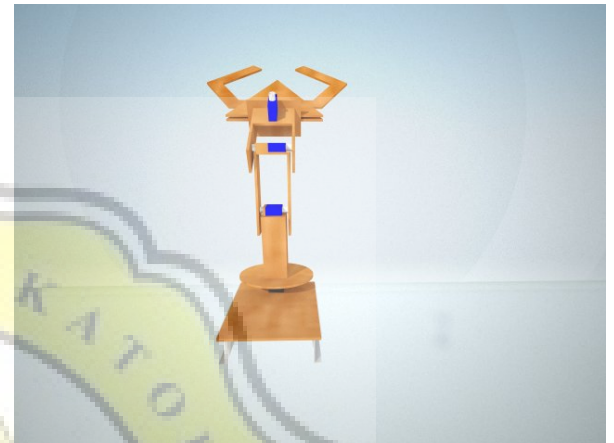


Illustration 4.5: Design model robot arm (back view)

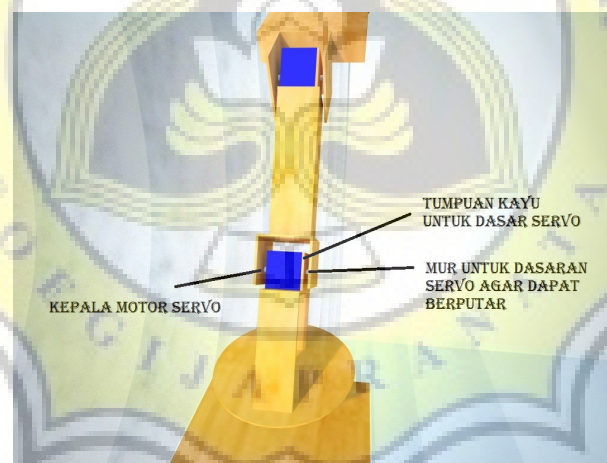
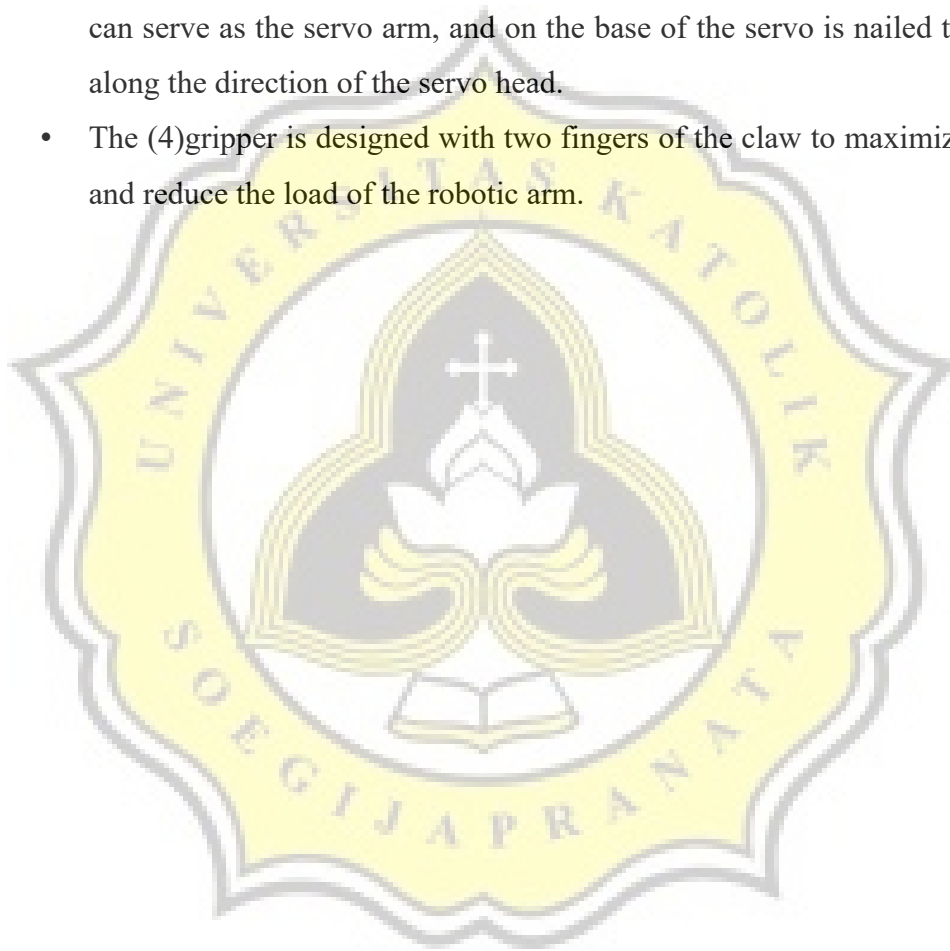


Illustration 4.6: Design model robot arm (servo place)

- The part of (1)Base robot arm uses an iron foot rail container because it is calculated tough to withstand load and does not vibrate as the servo rotates.
- Plywood is chosen as a robotic arm because it is cheap, lightweight, and strong against friction.

- The plywood on the continuous servo is circular because it corresponds to the rotation axis.
- The plywood in the (2)shoulder section is trapezoidal in order to withstand the load coming from the gripper / end effector.
- The servo head is attached to one side of the plywood so that the plywood can serve as the servo arm, and on the base of the servo is nailed to rotate along the direction of the servo head.
- The (4)gripper is designed with two fingers of the claw to maximize space and reduce the load of the robotic arm.



### 4.3 Design Flowchart Diagram

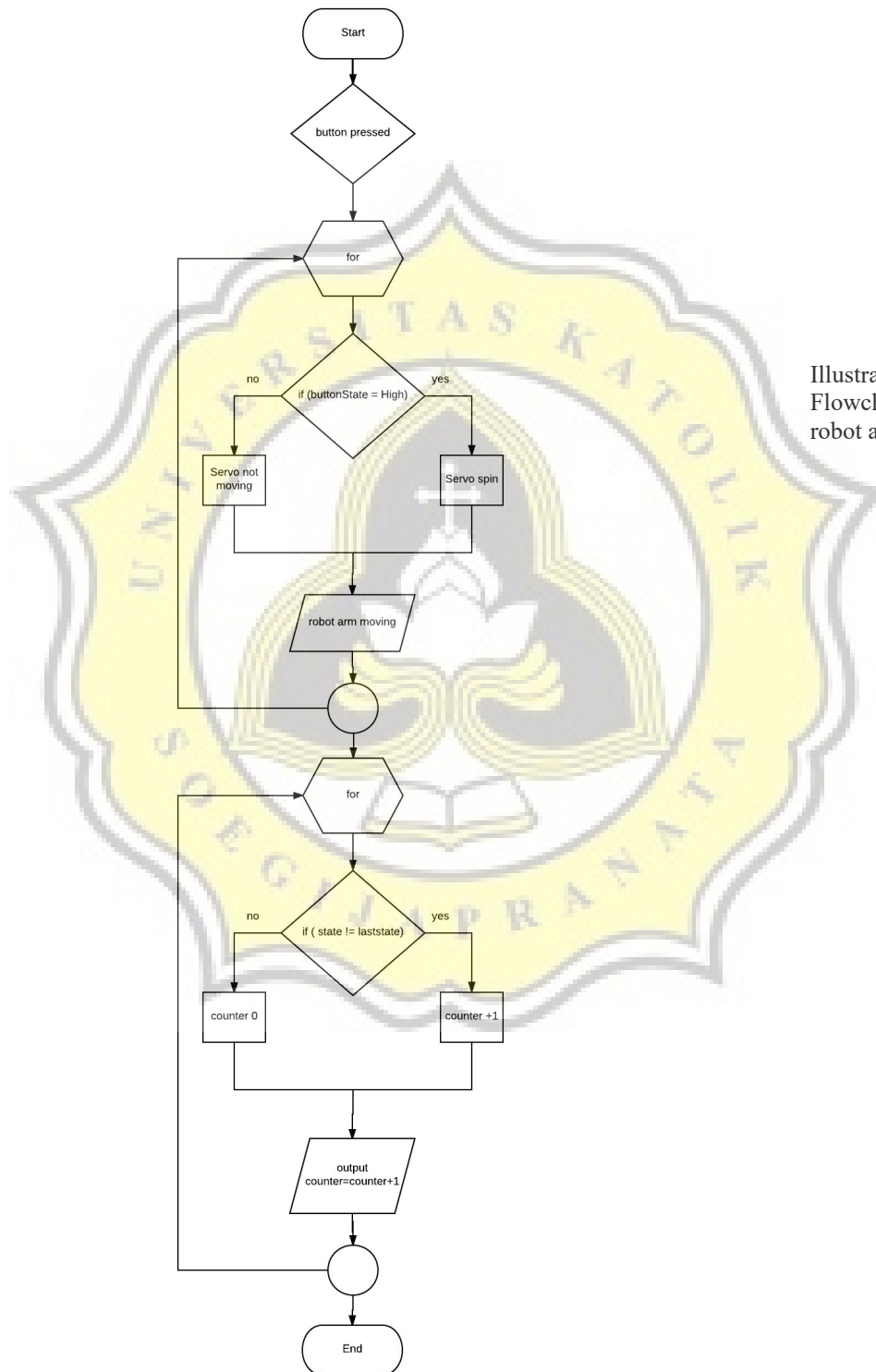


Illustration 4.7:  
Flowchart diagram  
robot arm work

When the program starts, the arduino will read the 1-5-condition button. If the condition is one of the high buttons then the arduino will execute the command to rotate the associated servo motor. If the servo motor does not rotate then repeat the keystrokes, after the spinning process will occur where the robot arm moves according to the conditions of the void (loop) method that has been made.

After completing the run command button, the robot arm can receive the command button as per other users' wishes and can be terminated by the user.

