

Automated Pet Feeder using 3D Printer with Opened Source Control System

Rizaldy Hakim Ash Shiddieqy¹, Bayu Adhi Saputro², Fatan Odhi Dandha^{1*}, Liza Rusdiyana¹

Abstract—In this paper, an automatic pet feeding machine is built using the 3D Printer machine and an opened source control system to help people with busy activities to be able to feed their pets on time. The machine is built using 3D Printer machine. The control system is built using the NodeMCU ESP8266 platform module and ultrasonic sensors. The controlling device uses a smartphone that is installed blynk application software that has the principle of the Internet of Things. The machine works by opening its valve to control the water's discharge, a servo motor to open the feed container, as well as a timer to regulate the time of feeding. The valve can be set in 4 conditions. There are 10 degrees, 20 degrees, 30 degrees and up to 40 degrees. Then for the feed distance's display it will provide information about the distance of the feed to the sensor, for a maximum distance of 9 cm in accordance with the distance sensor attached to the roof of the feed container with the sensor attached to the bottom of it. This machine can work continuously and automatically as long as there is an electricity source in the house and the owner holds the control of the blynk application software on their phone.

Keywords—Pets, Automatic, 3D printer, Control system, Software, Internet of things

I. INTRODUCTION

A hobby that many people do is having a pet at home. However, some of these people have a busy schedule that cannot be avoided. In fact, sometimes they leave their house for quite a long time and leave their pets alone. As a result, sometimes they forget to feed their pets, or even just don't have much time preparing the feed.

Cats are one of the animals that are often kept at home as a pet. Like other pets, dogs need food that must be provided by the owner regularly. When a pet is starving, it will become fierce, prone to disease, and dangerous to humans. As a result, animals may need to be taken to the doctor, or consume certain medicine thus increase the spending of their money.

Based on these problems the writer has an idea to make an automatic feeding machine. This machine uses timer to regulate the feeding time. Equipped with program using sensor and other devices to information and communication technology (ICT) system via wireless networks [1], people can feed their pets even if they are outside their house. This system called internet of things [2]. As a result, their pets can be feed on time.

There was some previous research about automatic feeding machine for pet such as smart dog feeder using wireless communication [3] or smart pet care system [4]. Both of them, the main components of the machine are the servo motor to open the food container and the solenoid valve to regulate the discharge of water from the container. But, both of them also have disadvantage. The previous research has a complicated network topology because they still need router as access point and self-program developed which not opened source program. This research is using software called blynk. Blynk is an opened source program. This program can be operated

via smartphone [5]. In the application contains two options or variable that can be changed, the valve opening angle and the display of the capacity of animal feed available in the tank. By using this, the pet will still get food even when the owner cannot prepare it.

II. METHOD

Design process, manufacturing process with 3D print and electronic control system are the focus interest from automated pet feeder. Design process consists of basic design and detailed design. Manufacturing process tells about set up the 3D print before printing.

First step is design process from the structure and the electronic control system. Basic design as the first do before making a detailed design. Basic design says output, mechanism and specification from automated pet feeder. After that, detailed design (using CAD) can draw. CAD design immediately convert to 3D printer. CAD design must as good as real.

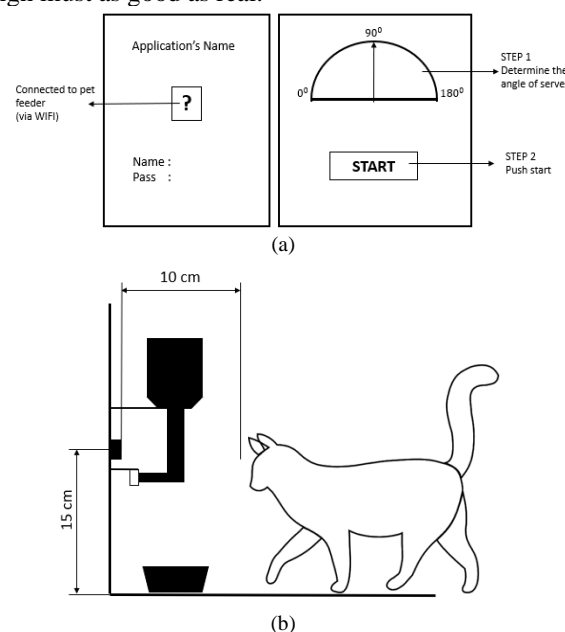


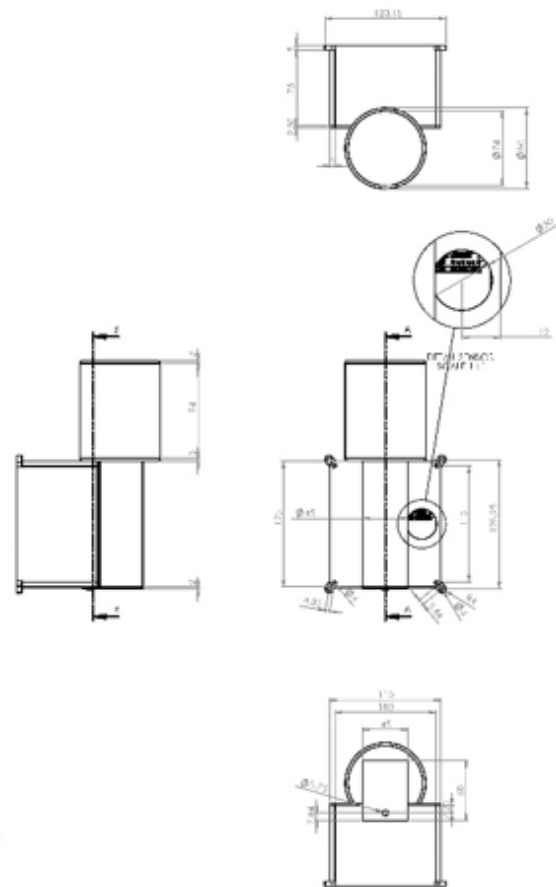
Figure 1. (a) Application interface (b) Basic concept automated pet feeder

¹ Departement of Industrial Mechanical Engineering, Institut Teknologi Sepuluh Nopember, Kampus ITS Sukolilo, Surabaya, 60111, Indonesia. E-mail: rizaldy@its.ac.id, fatan.181021@mhs.its.ac.id, liza@me.its.ac.id

² Departement of Mechanical Engineering, Institut Teknologi Sepuluh Nopember, Kampus ITS Sukolilo, Surabaya, 60111, Indonesia. E-mail: Saputro.bayuadhi@outlook.co.id



(a)



(b)

Figure 2. (a) 3D model automated pet feeder (b) Detailed design using CAD

Second step from this process, setup the CAD drawing into 3D printer software. Material, manufacture process, aesthetic value, and market demand must be aware before manufacturing something. Using 3D printer for this research because it just for rapid prototyping and then develop into a big scale production. 3D print also can accommodate some factor aware. Last section, electrical component will assemble into the structure components.

The automatic pet feeder works by using IoT principle where it could be controlled using smartphone using

bylink application. The overall design of automated pet feeder and how is it work will be explain in Figure 3 and Figure 4.

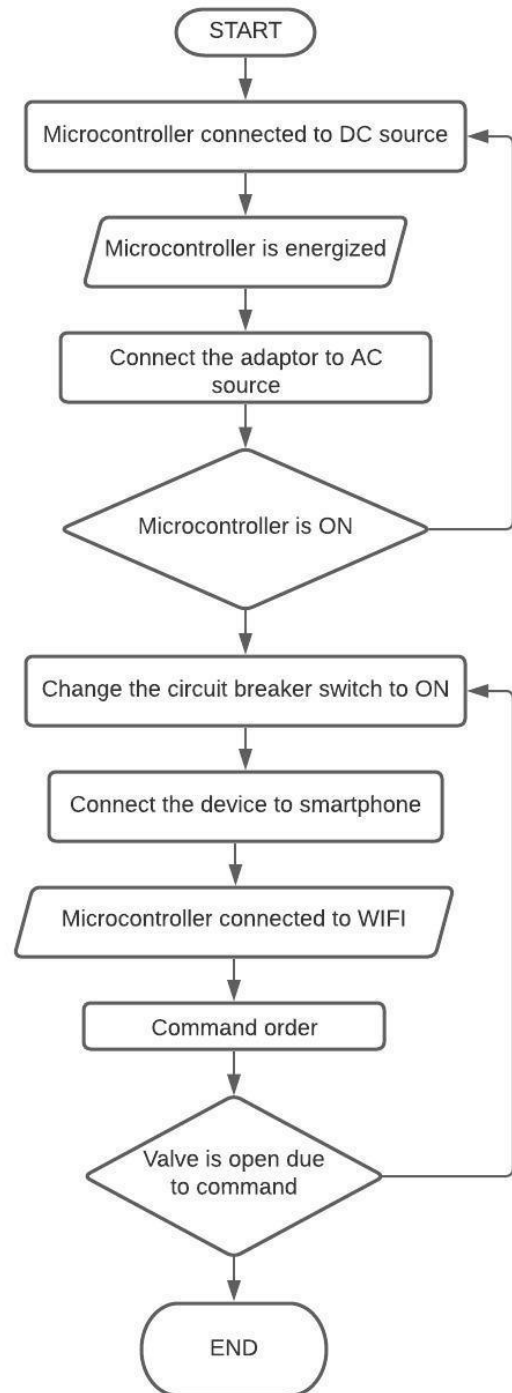


Figure 3. Flowchart process

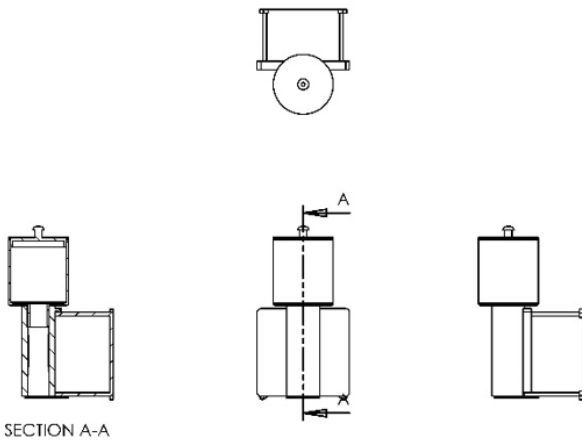


Figure 4. Overall design details

The role of microcontroller in this device is very important. The automatic pet feeder use NodeMCU ESP8266 as a microcontroller. The function of this module is almost like the Arduino platform module, the difference is that this module main function is to connect to the internet [6].

Versi NodeMCU ESP8266



Figure 5. Main component for Internet of Things modul platform

Another aspect from the automated pet feeder works is how it sense an animal in front of it. The solution of this is by using ultrasonic sensor. The ultrasonic sensor is used to sense object using ultrasonic wave [7]. This sensor uses four pins contained in it, two power supply pins for the ultrasonic sensor and two trigger pins and echo as an input and output data from the sensor to the platform module. A circuit that is used for converting high AC voltages to low DC voltages.



Figure 6. Ultrasonic sensor

Female to Female cable is used to connect electronic components that have male headers such as ultrasonic sensors which will later act as an output, while Male to Female cables have the function of connecting electronics components to platform modules.



Figure 7. Female to Female and Male to Female jumper cables

Bylink is a platform to control the NodeMCU ESP8266. Bylink isn't a physical device. It can work within the internet to control the module. For the coding in blynk software, type as follows:

```
#include <Arduino.h>
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <Servo.h>

#define BLYNK_PRINT Serial
#define TRIGGERPIN D1
#define ECHOPIN D2
char auth[] = "abQ3byWyqBDmWm6nd-
JygtNsYBlespv2";
char ssid[] = "iPhone LENOVO";
char pwr[] = "tangallahirku";

Servo servo1;
char t;
WidgetLCD lcd (V1);

void jalan(int k){
  switch (k){
    case 1 : servo1.write(70);delay(100); break;
    case 2 : servo1.write(100);delay(150); break;
    case 3 : servo1.write(130);delay(170); break;
    case 4 : servo1.write(160);delay(200); break;
    default: break;
  }
  servo1.write(20);
  delay(200);
}

void setup() {
  pinMode(D3,OUTPUT);
  pinMode(TRIGGERPIN, OUTPUT);
  pinMode(ECHOPIN, INPUT);
```

```

Serial.begin(9600);

servo1.attach(D3);
servo1.write(20);
Blynk.begin(auth,ssid,pwr);
lcd.clear(); //Use it to clear the LCD Widget
lcd.print(0, 0, " ATC KELOMPOK 4");
lcd.print(0,1,"");
delay(1000);
}

void loop() {
lcd.clear();
lcd.print(0, 0, "Jarak Pakan :"); // use: (position X: 0-
15, position Y: 0-1, "Message you want to print")
long duration, distance;
digitalWrite(TRIGGERPIN, LOW);
delayMicroseconds(3);
digitalWrite(TRIGGERPIN, HIGH);
delayMicroseconds(12);
digitalWrite(TRIGGERPIN, LOW);
duration = pulseIn(ECHOPIN, HIGH);
distance = (duration/2) / 29.1;
Serial.print(distance);
Serial.println("Cm");
lcd.print(7, 1, distance);
lcd.print(14,1,"cm");
Blynk.run();

}

BLYNK_WRITE(V3){
int val = param.asInt();
if(val==1){
jalan(1);
}

}
BLYNK_WRITE(V4){
int val = param.asInt();
if(val==1){
jalan(2);
}

}
BLYNK_WRITE(V5){
int val = param.asInt();
if(val==1){
jalan(3);
}

}
BLYNK_WRITE(V6){
int val = param.asInt();
if(val==1){
jalan(4);
}

}
}

```

III. RESULTS AND DISCUSSION

The workings of this automatic animal feeding machine uses the help of the principle of the Internet of Things, where this machine can be controlled via smartphone that has blynk application software.

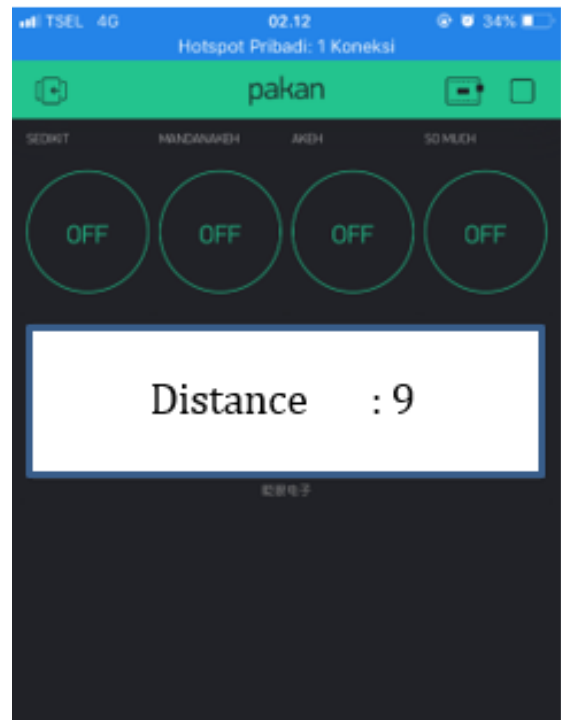


Figure 8. Blynk application interface

For the variable of valve opening angle, it can be set with 4 options ranging from the smallest 10 degrees, 20 degrees, 30 degrees, and up to 40 degrees. Then for the feed distance's display it will provide information about the distance of the feed to the sensor, for a maximum distance of 9 cm in accordance with the distance sensor attached to the roof of the tank with the sensor attached to the bottom of the tank. If what is displayed is 9 cm, it means the tank is empty or the feed is almost empty, if what is displayed is 0 cm, then the tank is already full or almost full of feed.

IV. CONCLUSION

The automated pet feeder can operate with internet of thing, using Node MCU ESP8266 as a microcontroller. It similar with Arduino, Node MCU ESP8266 can connected to internet. The module is controlling the valve to drop the pet feed. There are four conditions for open valve. There are 10^0 , 20^0 , 30^0 and up to 45^0 . For sensing the pet, the automated pet feeder is using ultrasonic sensor. Then, the automated pet feeder can be controlled via smartphone by using blynk application interface.

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