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Design and Build of a Blynk-Based Automatic Cat Food and Drinking Water Dispenser

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Abstract — **There are many people who like to keep cats. When keeping cats, the things you need to pay attention to are eating and drinking so that the cat's health is maintained. As it should be, food and drinking water must be given according to the dosage. However, if the cat owner is outside the house, it will make it difficult for the owner to feed and drink it. Through this final project, cats can eat and drink at any time by implementing the Internet of Things called an automatic dispenser. Automatic food and drinking water dispenser uses *NodeMCU8266, 2 servo motors, 2 ultrasonic sensors, HX711 load cell and Blynk software*. The Blynk software functions to display the on/off switch, the distance the cat is approaching, the amount of food and drinking water available in the cat food and drinking water dispenser which is connected via *nodeMCU8266* which can be accessed on the cat owner's smartphone. If the food and drinking water is less than capacity, a notification will immediately appear on the cat owner's smartphone and email.**

***Keywords*— CAT, *Ultrasonic Sensor, Servo Motor, Load Cell HX711, NodeMCU8266, Blynk, IOT*.**

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I. INTRODUCTION

In Indonesia, many people already have cats as pets. This is common in all levels of society. Cats are popular pets because they are easy to care for, cute, reduce stress and reduce feelings of loneliness at home[1]. Animals also need nutrition from their food, including pets. The focus of raising animals, especially cats, is to feed them twice a day, morning and evening.

Although many are interested in keeping cats, some owners have jobs that require them to be out of the house for longer periods of time. However, this does not make it difficult for them to keep cats. Not being home often often makes them late or even forget to feed their cats. Cats need to eat and drink to live. Regular feeding is important for a cat's health. Irregular feeding can impact a cat's digestion and health[2].

Cat owners often entrust their animals to pet shops at high costs for convenience[3]. Pet Shop is a pet and food sales company that also offers feeding for pets. However, the problem is the incorrect feed dosage. The problem faced by pet shops when the number of pets entrusted to them increases is that they require additional employees to care for and feed the animals. This requires large costs in one day of care. Cat owners cannot take their pets to the pet shop.

The author will design a tool to control pet eating and drinking remotely via IoT. Implementation of an IoT-based

automatic pet fideer that makes it easier for cat owners to provide food and drinking water according to the daily dose. The Blynk application will provide notifications if food and drinking water have run out.

II. METHODS AND MATERIALS

A. Method

In this research, the cat's instinctive testing method for approaching proper eating and drinking was used to determine the suitability of the system's work with the simulation that will be made. And electronic components are needed, namely an MCU 8266 node, servo motor, HX711 load cell and ultrasonic sensor.

B. Material

1. Arduino IDE

Arduino IDE is open-source software used to write C and C++ programming languages. Used to create programs on NodeMCU ESP8266. Creation in NodeMCU ESP8266 is called sketch. The Arduino IDE has a black message box for status display. In this software, at the bottom right it will display the board that has been configured with the COM ports used. Its purpose is to check syntax errors in the sketch that has been created. If there are no syntax errors, it will be compiled into the language. Upload is a function to send a compiled program to the Arduino module.[2]

Figure 1. Arduino IDE

2. NODEMCU 2866

NodeMCU is an open-source IoT platform. NodeMCU is a board that combines the ESP8266 with microcontroller features, Wi-Fi access, and a USB to serial chip. For programming, you only need to use the same USB data cable as the Android charger. Some of NodeMCU's features include open source, low cost, smart, interactive, and Wi-Fi active.[4]

Figure 2. NodeMCU esp8266

3. Ultrasonic sensor

Ultrasonic sensors convert sound into electrical quantities or vice versa using ultrasonic waves of up to 20 frequencies. The working principle of an ultrasonic sensor is to measure the time the wave travels from the transmitter to the receiver with a frequency of 000 Hz.[5]

Figure 3. Ultrasonic Sensor

4. HX711 load cells

The function of the load cell sensor is a sensor that reads the weight of objects, this sensor is usually used for scales. In the process of reading the load cell sensor, there is a calibration process which functions to check the level of accuracy of the load cell sensor reading.

Figure 4. HX711 load cells

5. Servo motors

Servo motors are a type of DC motor with a feedback system and consist of a DC motor, gear, control and potentiometer. The servo motor does not stand alone, but is supported by other components in one package. Servo motors are used in making robots, especially as leg drivers because they have large power and torque to move heavy loads. The servo motors commonly used on robots are usually 180º servo motors.[6]

Figure 5.Servo Motors

6. Blynk Software

Blynk is a platform for controlling Arduino, Wemos D1, NodeMCU 8266, Raspberry Pi, and similar devices via applications on iOS and Android with an internet connection[7]. With this application, users can control remotely without time limits as long as they are connected to the internet.[2]

Figure 6.Blynk Software

C. Block diagram

This research has a block diagram shown in the image below:

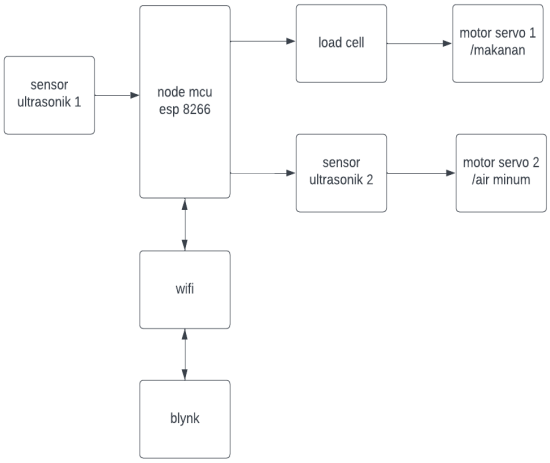

Figure 7. Block diagram

The block diagram above explains the design and construction system that uses software*Blynk*and two sensors. The two sensors are the distance sensor and the weight sensor. The distance sensor used is an ultrasonic sensor and the weight sensor used is a load cell with an HX711 module. Both sensors function to provide notifications to the Blynk software when the food and drinking water in the place has run out and see how many grams of food and drinking water are left. When the notification appears, it will activate the program on the NodeMCU and will become a link to the Blynk application. Then the servo motor will act as a driver which will open and close the dispenser for the cat to eat and drink

D. Image Design

The main components in the cat food and water dispenser system are NodeMCU esp 8266, HC-SR04 ultrasonic sensor, and HX711 load cell, servo motor. An ultrasonic sensor is placed in front of the cat's food and drink container as a device that measures the distance the cat approaches the dispenser. Meanwhile, under the food and drink containers, a load cell is also placed to measure the availability of food and drinking water. And the servo motor is placed under the food supply funnel and on the drinking water tap.

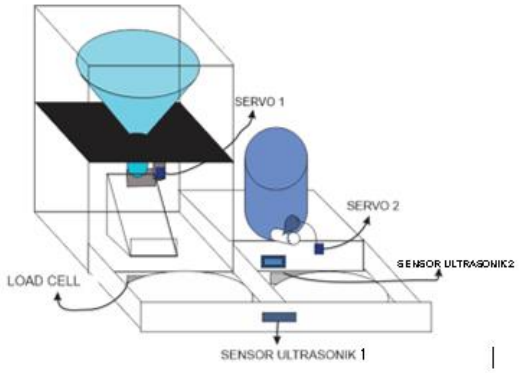

Figure 8. Design

E. Network design

To provide a clearer picture of the automatic cat feeding and drinking system circuit, you can see the picture

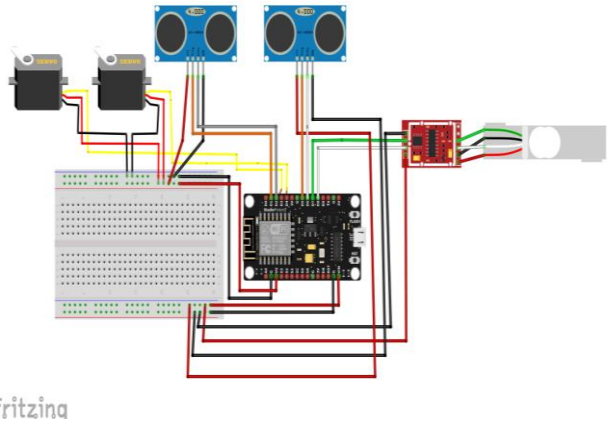

Figure 9. Automatic Cat Feeding Schematic

Table 1. Pin component connection

No	NodeMCu	Motor servo1	Motor servo2	ultrasconic Sensor1	load cell 1	ultrasonic sensor2
1	vcc 5V	vcc	vcc	vcc	vcc	vcc
2	gnd	gnd	gnd	gnd	gnd	gnd
3	d1	signal control				
4	d2		signal control			
5	d3			Triger		
6	d4			echo		
7	d5					triger
8	d6					echo
9	d7				DT	

F.Flow chart

In this research there is a flowchart of how the tool works in the image below:

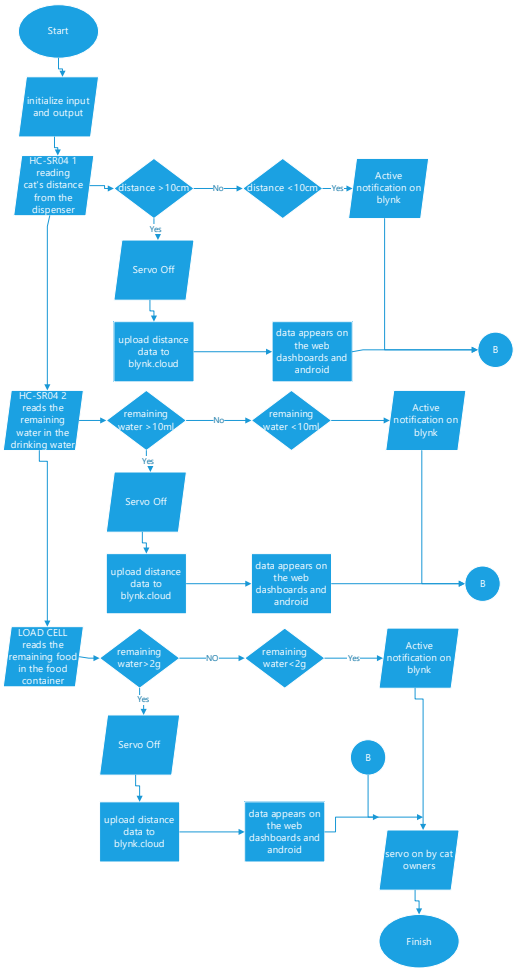

Figure 10. Flow chart

III. RESULTS AND DISCUSSION

A. *Load Cell Testing*

The cat food system is run by utilizing a load cell sensor to weigh the load on the available food capacity, data obtained by the NodeMCU 8266 Cat drinking water system. Load cell testing is carried out by comparing the readability of the scales on the Arduino Ide serial monitor. Data collection was carried out by weighing the weight by comparing the error.

Table 2.Comparison and percentage of load cell errors

NO	Digital scales (grams)	Load cell (gram)	Error (%)
1	30	30.12	0.4
2	12	12.13	1
3	1	1.11	1
4	0	0.11	1

The load cell sensor is capable of weighing loads quite well with the error range that occurs based on research being from 0.4% to 1%. System testing is carried out by setting several load conditions to facilitate the system testing process. From the results obtained, when the detected load weight is 30 grams and 12 grams, there is no scaleFood notification.

B. *Ultrasonic Sensor Testing 1*

The livestock drinking water system is run by utilizing the HC-SR04 ultrasonic sensor as a tool that detects the volume of water in the cat's drinking water container.

Table 3. Comparison and percentage of ultrasonic sensor error 1

No	Measuring Glass (ml)	Sensor Utrasonic (ml)	Error (%)
1	150	150	0
2	120	123	2.5
3	88	88.6	0.6
4	19	19.7	3

From the table it can be seen that the HC-SR04 ultrasonic sensor is capable of measuring and detecting distance quite well with the error range that occurs based on research being from 0% to 3%.

C. *Ultrasonic Sensor Testing 2*

The livestock drinking water system is run by utilizing the HC-SR04 ultrasonic sensor as a tool that detects the water level in the water tank and cat drinking water containers.

Table 4. Comparison and percentage error of ultrasonic sensors 2

No	Ruler Measurement (cm)	Sensor Utrasonic (cm)	Error (%)
1	14	14.88	6.2
2	12	12.88	7.3

So from comparing the results measured by the sensor and the calculations, it can be seen that the sensor can read the distance well so that the system can run well.

D. *Cat Food System*

The cat food system can be seen on the web dashboard and Android application on the cat owner's smartphone.

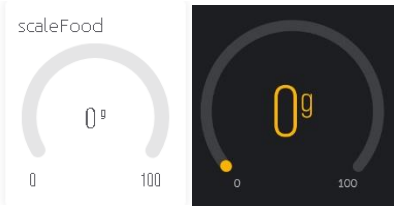

Figure 11. Dashboard on the blynk application

The system that has been created is also able to provide a warning to the cat owner's smartphone when the food available

in the container is less than 3 grams in capacity. This warning is given via notification on the cat owner's smartphone.

Figure 12. Food Notifications

When the notification arrives on the cat owner's smartphone, the cat owner can immediately open the smartphone application to click ON in the Food section and click OFF again if the food has reached the weight of the cat's food dose.

E. Cat Drinking Water System

The cat's drinking water system can be seen on the web dashboard and Android application on the cat owner's smartphone.

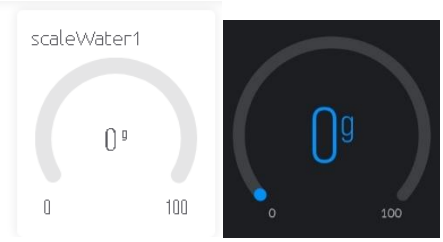

Figure 13. Dashboard on the Blynk Android application

The system that has been created is also able to provide a warning to the cat owner's smartphone when the water available in the container is less than 20ml capacity. This warning is given via notification on the cat owner's smartphone.

Figure 14. Android blynk application notifications

When the notification arrives on the cat owner's smartphone, the cat owner can immediately open the smartphone application to click ON on the water section and click OFF again if the water has reached the volume of the cat's drinking dose.

F. Cat Distance System

The cat distance system can be seen on the web dashboard and Android application on the cat owner's smartphone.

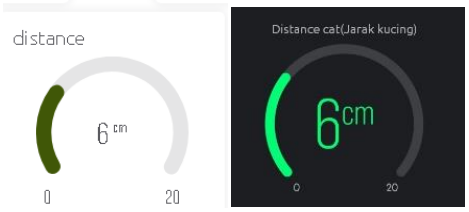

Figure 15.blynk dashboard on android

The system that has been created is also able to provide a warning to the smartphone of the cat owner approaching the dispenser less than 10cm away. This warning is given via notification on the cat owner's smartphone.

Figure 16. Notification of cat approaching

When the notification arrives on the cat owner's smartphone, the cat owner can immediately open the smartphone application to check whether the cat's food and drinking water supplies are still available or not. If one of the food or drink supplies is not available, the cat owner can click ON on the food and water section and vice versa.

IV. CONCLUSION

Based on the results and discussion of the system that has been created, the following conclusions are obtained:

1. A food and drinking water monitoring system to determine the availability of cat food and drinking water can be designed and built by utilizing the NodeMCU module as a device that processes input from the servo motor, HC-SR04 ultrasonic sensor, load cell sensor in the system by sending data to the Blynk platform for connection. with the internet and the cat owner's smartphone.
2. The communication process between the microcontroller and the internet network by utilizing the NodeMCU 8266 module, the WiFi network is used to communicate with the internet, in this case a smartphone, website or localhost using internet protocols such as TLS and HTTP.

3. Servo motor for opening and closing system for cat food and drinking water. And in the blynk servo application it is implemented in the form of an ON and OFF switch to automatically open the cat's food and drink. Load cell sensor for weighing cat food left in the food container. Two HC-SR04 ultrasonic sensors are implemented in the system. monitoring and controlling the availability of drinking water in the cat's drinking container and detecting the distance of the cat approaching the dispenser.

THANK-YOU NOTE

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