International Journal of Software Engineering and Informatics
Vol. 1, No.1 March 2023 pp 40-48.
ISSN: xxxx xxxxx,

Design of *Prototype* Gourami Fry Counting System Based on Internet of Things (IoT) Using Infrared Sensor

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Article Info

Keywords:

Internet of Things (IoT)
Infrared Sensor
Arduino Uno
Prototype

ABSTRACT

Developing the cultivation of Gurami fish has good economic prospects if done correctly. In this cultivation, Gurami fish seeds are the key to success, where the hatchery process is considered the most important aspect as it determines the quality of the resulting fish seeds. Currently, the problem faced in selling fish seeds is that the counting of fish seeds is still done manually with simple tools such as cups or spoons. Fish seeds are collected in one place, collected in a bucket containing water, and placed on a cloth with a little water. Then, fish seeds are taken using a cup or spoon of 5 fish each count. This counting process can take up to 3-5 hours if the number of fish seeds to be counted reaches 15,000, and requires a very high level of accuracy. To overcome this problem, the author designed a prototype of a Gurami fish seed counter device based on the Internet of Things (IoT) using infrared sensors as a detector of fish seeds passing through the sensor and controlled using arduino. The Arduino Uno is used as the brain in controlling the Gurami fish seed counting device. In the prototype testing, Gurami fish seeds are placed in a seed container and then enter a pipe that has been equipped with sensors. Based on the results of the prototype testing that have been carried out, the device still shows the largest error, which is 3.65%. This is influenced by light entering from outside. It can be concluded that counting Gurami fish seeds using a designed device is more effective and efficient compared to manual counting.

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1 INTRODUCTION (10 PT)

Gourami *(osphronemus gouramy)* is a fish native to Indonesian waters that has spread to Southeast Asia and China [1]. Gourami are one of the *labyrinth fishes* and taxonomically i belong to the *family osphronemidae* [2]. Gourami also has a high content of amino acids and protein [3]. Cultivating Gourami has good economic prospects, if properly farmed [4]. One of the cultivations carried out by the community is the cultivation of fish seeds or fish seeds . This hatchery process is the most important in fish farming because here determines superior fish fry and success in the process of breeding and raising fish.

Gourami seed farmers in Indonesia, in the process of buying and selling fish fry there are problems faced. The main problem is that when counting fish fry to be sold to consumers, fish fry counting is usually done manually using simple tools such as cups or spoons. The counting of fish fry is done by collecting fish in one place, accommodated in a bucket filled with water and on top of the bucket has been covered with cloth. The fish fry are placed on a cloth that has a little water then the fish are taken using a cup or spoon, taken 5 heads each one counter is moved to the bucket Empty that has been filled with water. One consumer usually buys seeds can reach 15,000 (fifteen thousand) heads at a time and the seed count can reach 3-5 (three to five) hours. The process of counting fish fry in large numbers will take a long time [5], and requires a very high level of energy and foresight and also later can have an impact on fish breeds such as stress due to too much and also too long direct contact with human hands [6].

Overcoming the above problems, the author designed and built an *Internet Of Things-based* gourami fry counting device. *Infrared* sensor as a fish detector , when the fish passes through the infrared sensor it will be controlled using Arduino [7].

Arduino Uno as a controller or brain in controlling gourami fry counting [8]. The results of the calculation will be displayed on a 16x2 *liquid crystal display* (LCD) that has been connected to Arduino.

2 RESEARCH METHODS (10 PT)

The method used in this study is hardware and software design, namely by literature study [9]. The design of the device consists of a mechanical design and electrical components will be used in this study. Whereas the design of the software consists of block diagrams, *flowcharts* and the type of program used to generate these tools [10][11].

2.1.Block Diagram Design

The block diagram of designing tools can be seen in the figure below :

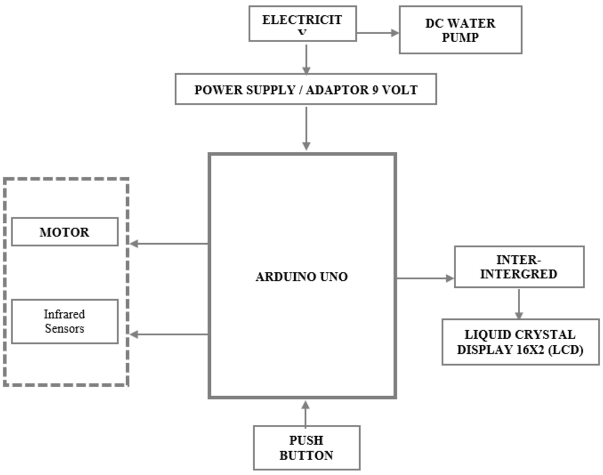


Figure 1. Block System Diagram

In the picture above explains that, the *infrared* sensor will detect if there are fish fry passing through it [12]. After the fish fry are read by the sensor, the sensor *output* will give a signal to the arduino and the servo motor will move. Furthermore, a rduino will process the data and will display the data results to a 16X2 liquid crystal display (LCD) in the form of the number of fish fry counting results. The power source used in this tool uses a 9-volt adapter. The input on the Arduino Uno microcontroller is the *infrared* sensor [13].

2.2. Tool Design

1. *Hardware Design*

In figure 2 is the design of the tool and its components:

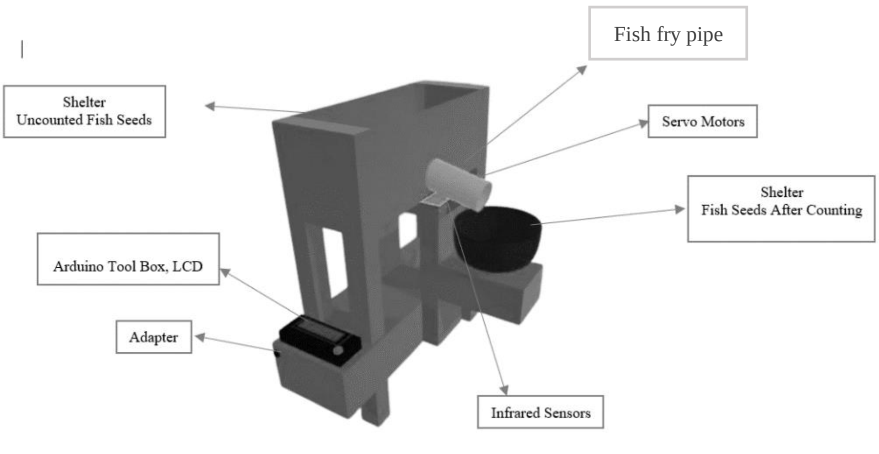


Figure 2. Designing Tools and Components

2. **Electronic Network Design**

The electronic circuit in this study displays the installation of electronic components as a whole. The electronic circuit of this tool consists of several parts, namely a sensor circuit, a 16*2 LCD, and *a push button*. For more details, the overall circuit image can be seen in figure 3 below.

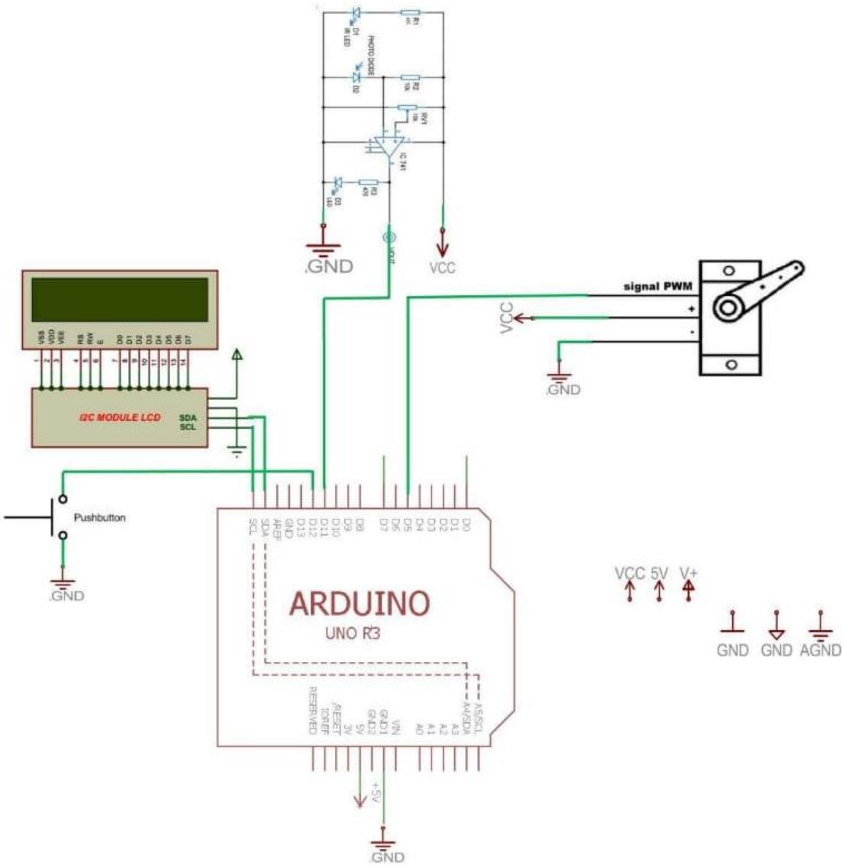


Figure 3. Electronic Circuit Design

2.3. Flowchart or Flowchart How the Tool Works

When the device is turned on, the Arduino will initialize all pins on the Arduino, as well as other devices (such as sensors, servo motors and LCDs) connected to the Arduino through the pins. Before the fish fry are put into the tub, the LCD Display is still empty. After the fish starts to enter the fish fry counting pipe , the fish fry will automatically be detected by the infrared sensor. Then the servo motor will move, and the counting process takes place continuously until the fish run out in the reservoir. The results of the fish fry calculation will be displayed on the LCD, the number will continue to increase every time the sensor detects an object, if the sensor does not detect the object then the servo motor will not move k and the number in the LCD screen still does not increase in number. Countless fish will enter the reserve trough.

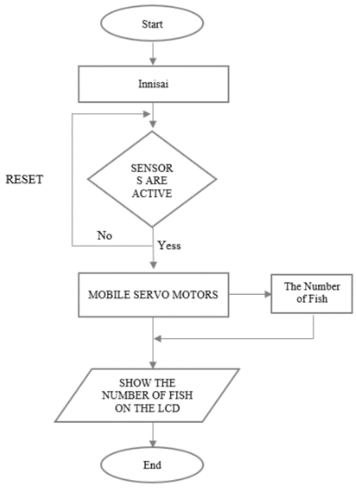


Figure 4. Flowchart or *Flowchart* How the Tool Works

3 RESULTS AND ANALYSIS

3.1. Tool Suite Testing

1. Arduino Uno Test Results

The test is carried out by providing an *input* voltage of 9 volts to the Arduino Uno and then confirming whether the Arduino Uno is functioning properly.

Figure 5 shows that when Arduino Uno is given an *input* voltage of 9 volts, the red indicator led will light up. And if given a program to indicate that the given program has successfully entered, the red led light will flash twice [14] .

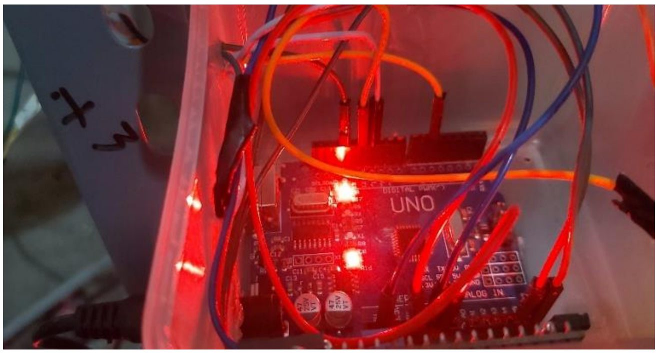


Figure 5. Arduino Uno Testing

2. FC-51 *Infrared* Sensor Test Results

The test aims to see if the FC-51 *infrared* sensos device functions as it functions. Testing isdone by responding to objects. When the FC-51 infrared sensor has no objects blocking it, only one LED on the sensor is lit.

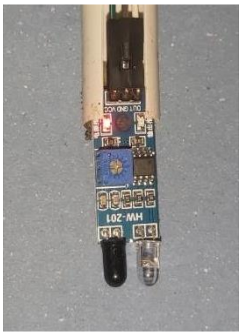


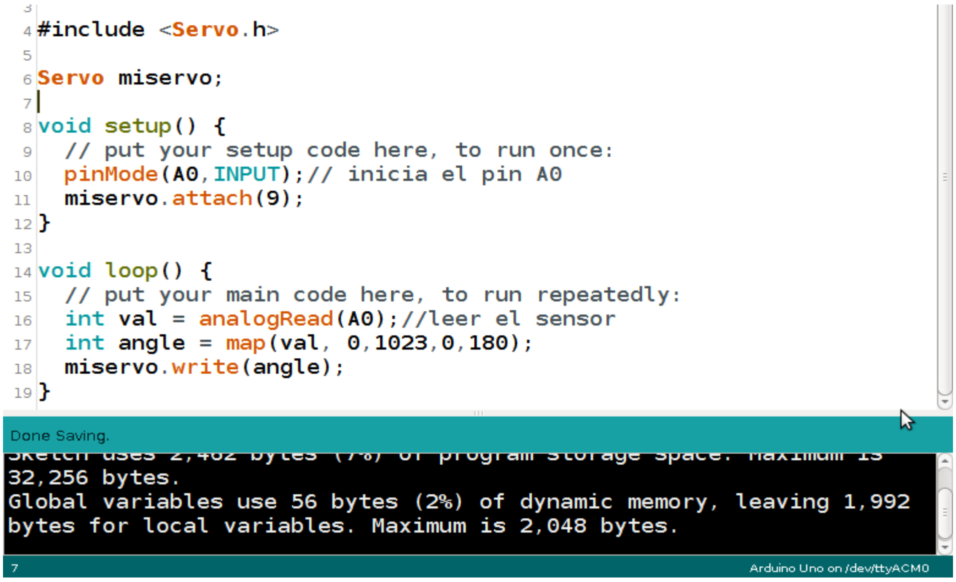
Figure 5. Sensor Testing When There Are No Objects

The next test is pthere is when the FC-51 infrared sensor has an object blocking it, then the leds contained in the sensor will light up all [15].

Figure 6. Sensor Testing When Objects Exist

3. Servo Motor Test Results

Servo motor testing is carried out to determine the servo motor can move in position at an angle of 0 and at an angle of 85 degrees.



```
#include <Servo.h>

Servo miservo;

void setup() {
  // put your setup code here, to run once:
  pinMode(A0,INPUT);// inicia el pin A0
  miservo.attach(9);
}

void loop() {
  // put your main code here, to run repeatedly:
  int val = analogRead(A0);//leer el sensor
  int angle = map(val, 0,1023,0,180);
  miservo.write(angle);
}
```

```
Done Saving.
32,256 bytes.
Global variables use 56 bytes (2%) of dynamic memory, leaving 1,992
bytes for local variables. Maximum is 2,048 bytes.
```

Figure 7. Programs for Moving *Servo Motors*

Figure 8. *Servo motor* at the moment of not moving position at an angle of 0 *degrees*

Figure 9. *Servo motor* at the time of moving position at an angle of 85 *degrees*

4. ***Liquid Crystal Display*** **16x2 (LCD)** Test Results

This LCD test serves to see whether the LCD can display data that has been processed by Arduino or not.

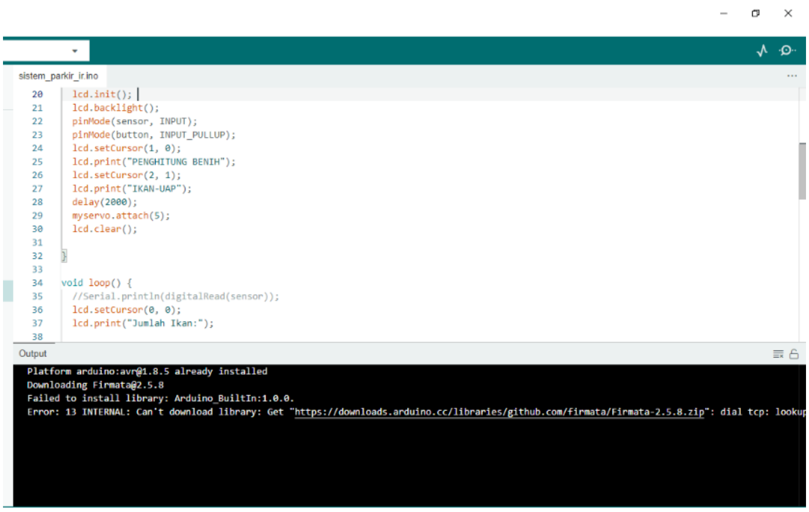


Figure 10. *Liquid Crystal Display 16X2 (LCD) Program*

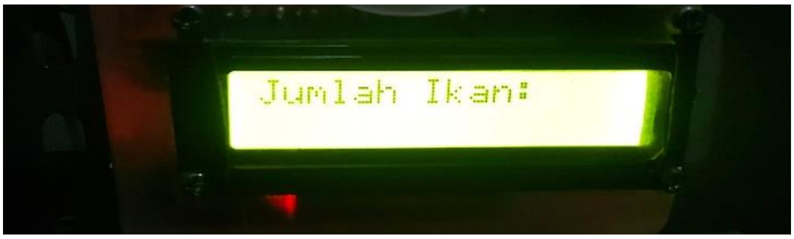


Figure 11. *Liquid crystal display* 16X2 (LCD)

3.2.Overall Testing

1. Results of ***Tool Prototype***

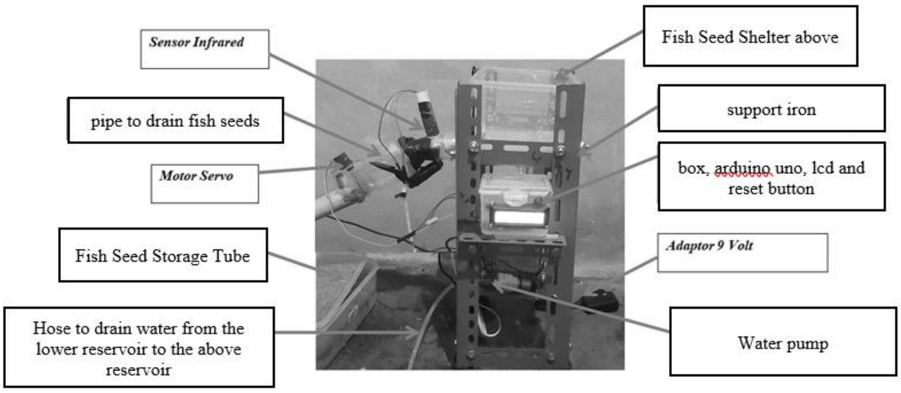


Figure 12. *Prototype* Tool

2. Overall Testing

In testing the prototype as a whole, gourami fry will be tested into fish fry reservoirs. Next, the fish fry will enter the pipe that has been installed with sensors. The test results can be seen in table 1. As follows :

Table 1. *Prototype* Testing Automatic Fish Fry Counting Tool

Attempt To-	Fish Fry Size	Number of Fish	Detected fish	Percentage Error
1	2.5 cm	10	10	0%
2	3 cm	10	10	0%
3	2.5 cm	23	23	0%
4	3 cm	30	30	0%
5	3 cm	35	35	0%
6	4 cm	52	55	3,65%
7	3.5 cm	70	72	2,85%
8	2 cm	85	84	-1,17%
9	2 cm	82	81	-1,21%
10	2.5 cm	85	86	1,17%

The results on testing the *prototype* of an *Arduino Uno-based* gourami fry counting device and *infrared sensor* show in table 1. In the first test, tests have been carried out on fish fry with a size of 2.5 cm with the number of fish as many as 10 heads, after passing the testing and calculation process, the fish that detected by sensors as many as 10 tails. The results of the second test have been tested on fish fry with a size of 3 cm with the number of fish as many as 10 heads, after passing the testing and calculation process, the fish detected by the sensor as many as 10 heads. In the second pane, the *prototype* is still running well.

In the third test carried out using fish fry with a size of 2.5 cm, the number of fish fry entered was 23 heads, the results of the calculation were still the same as the number of fish fry tested, namely 23 heads. In the fourth and fifth tests using fish fry measuring 3 cm, with a number of fish 30 and 35. The results of the calculation of the tool still show good results, which are in accordance with the input value.

The next trial is the sixth test, using fish fry with a size of 4 cm, with an input value of fish fry as much as 52 heads, the result of the calculation is *an error* of 3.65%. The calculation results detected that the fish counted as many as 55 heads, did not match the input value. In the seventh test, using fish fry measuring 3cm, with a total of 70 fish . The results of the calculation of the seventh experiment showed inappropriate results of 72 heads, in this test there was an *error* of 2.85%.

Testing was again carried out in the eighth and ninth tests, these two tests used fish fry with a size of 2 cm, with different numbers of fish in the eighth test 85 heads and the ninth testing of 82 heads. The results of both examiners show error results, the *output* value does not match the *input* value. The results of the eighth test were 84 tails with an error of -1.17%, while the results in the ninth test were 81 tails with *an error of* -1.21%. The last test was the tenth, in the tenth test this was carried out with a fish fry size of 2.5 cm. The number of fish fry tested was 85 heads, the results of the test showed an *error* result of 1.17%. The result of the *output* value does not match the input value, which is 86 heads.

4 CONCLUSION

Based on the results of *prototype* testing that has been done, the tool still shows the largest *error* of 3.65%. *The error* is affected by light coming in from outside. In general, it can be concluded that the calculation of gourami fry using tools designed is more effective and efficient than if done manually. To fix *errors* in the *prototype* of the fish fry counting device automatically, better improvements or developments can be made, namely replacing sensors that are more effective in fish fry counting.

ACKNOWLEDGMENTS

Thank you to the gourami seed farmers in the Way Jaha area, Ridge, Tanggamus Regency, who have been willing to give time and place for the author to conduct research and test *prototypes* that has been designed.

REFERENCE

[1] Azrita, *GURAMI SAGO (Osphronemus goramy Lac)*. 2020.

[2] Azhary, "Gourami Farming," Azka Press 2006, 2006.

[3]R. I. Pratama, I. Rostini, and E. Rochima, "Profile of Amino Acids, Fatty Acids and Volatile Components of Fresh Gurame Fish (Osphronemus gouramy) and Steamed," *J. Processor. Tenderloin. Fishery. Indones.* , Vol. 21, No. 2, p. 219, 2018, DOI: 10.17844/JPPHPI.V21I2.22842.

[4] H. Patmawati, E. Sumarsih, S. Wahyuningsih, M. Z. Mansyur, and R. Rahmat, "Gourami Fish Farming (Ospheronemus Gouramy) in a Round Pool at Sabilulungan Youth Group in Sindangkasih Ciamis," *Agrocreative J. Ilm. Devotion. Kpd. Masy.* , Vol. 8, No. 1, pp. 59–66, 2022, DOI: 10.29244/Agrocreative.8.1.59-66.

[5]A. Sapriyansyah, D. Triyanto, and Suhardi, "Red Tilapia Seed Scanning and Counting System Using Arduino and Website," *J. Coding, Sist. Comput. Untan*, vol. 6, no. 2, pp. 1–12, 2018.

[6] M. F. Adani, Jusak, and H. Pratikno, "Journal of Control and Network Systems," *J. Control Netw. Syst.* , Vol. 5, No. 1, pp. 119–125, 2016.

[7] C. F. Al Amri, "Design a Fish Counter to Count Catfish Seeds," *Thesis Progr. Sarj. Tech. Elektro, Univ. Islam Indones.* , 2020.

[8]M. Q. Khairuzzaman, "Arduino Uno as a controller or brain in controlling gourami fry counting instruments," vol. 4, no. 1, pp. 64–75, 2016.

[9]T. D. Wahjono, S. Karim, and B. Riyadi, "IMAGE GENERATOR SOFTWARE DESIGN AND," pp. 140–149.

[10] F. Ahmad, D. D. Nugroho, and A. Irawan, "Design and Build Microcontroller Learning Tools Based on ATmega 328 at Serang Raya University," *J. PROSISKO*, vol. 2, no. 1, pp. 10–18, 2015.

[11]F. Aldoni and R. Mukhaiyar, "Arduino-Based Automatic Fish Seed Counting Device," *Realm Res. J. Multidicsiplinary Res. Dev.* , Vol. 4, No. 2, pp. 26–34, 2022.

[12]J. Saragih, J. Prayudha, U. Fatimah, and S. Sitorus, "Implementation of Counter Technique to Count Fish Seeds by Utilizing Infrared Sensor Based on Arduino Uno Microcontroller," 2021.

[13] Aldofadilaputra, "Design Smart Hand Washing Tools Using Arduino-Based Infrared *Sensors," Electrician*, vol. 15, no. 3, pp. 224–238, 2021, doi: 10.23960/elc.v15n3.2177.

[14]D. Sasmoko, Arduino *and Sensors on Project Arduino DIY.* 2021.

[15] ALDA, "Design a microcontroller-based automatic packaging box filling machine," 2021.