JURNAL TEKNOLOGI DAN OPEN SOURCE
Vol. 9, No. 1, June 2026, pp. 209~216
e-ISSN: 2622-1659, accredited Four Grade by Kemenristekdikti, Decree No: 152/E/KPT/2023
DOI: https://doi.org/10.36378/jtos.v9i1.5262

Automatic Fan With Ultrasonic Distance Sensor HC-Sr04

Muhammad Nuhkenda Alfasyah[1], Kemas Wahyu Hidayat[2], Dedy Haryanto[3]
[1,3]Department of Information Technology, University of Muhammadiyah Palembang, South Sumatra
[2]Information Technology Study Program, Faculty of Engineering

Article Info

Article history:

Received 01 25, 2026
Revised 03 25, 2026
Accepted 06 16, 2026

Keywords:

Self-Driving Cars,
Sensor Ultrasonic HC-SR04
Distance Detection
Arduino-Based System
Smart Fan

ABSTRACT

Increasingly sophisticated technology has a major impact on the creation of innovations in the development or creation of new electronic devices Fans are conventional electronic devices that are often used as air circulation regulators during hot weather. To overcome this problem, sensor technology can be used to detect the presence of humans and regulate the fan automatically. Using ultrasonic sensors, the fan can be set to turn on or off according to the distance or presence of people around it. A fan is considered a flexible air conditioner because it can be easily moved from one place to another. In this mode, the system works based on the ultrasonic distance sensor HC-SR04, the reading from the sensor is used as a parameter to turn the fan on or off using Adapters are devices that function to convert AC voltage to DC, meaning that alternating electric current (AC) voltage will be converted to unidirectional electric current voltage (DC). In principle the working principle of the adapter, it can be said to function as a power supply device.

Corresponding Author:

Muhammad Nuhkenda Alfasyah
Department of Information Technology
University of Muhammadiyah Palembang
South Sumatra, Indonesia
Copyright © 2026 mhdalfasya47@gmail.com

1. Introduction

Increasingly sophisticated technology has a major impact on the creation of innovations in the development or creation of new electronic devices. This innovation was developed to facilitate people's daily activities and save time and energy. Indonesia is a tropical country with two seasons, namely summer and rainy season [1]. Global warming is one of the serious problems faced by humans in various parts of the world. Currently, the condition of the earth is increasingly concerning. An erratic climate and rising sea levels are the real impacts of global warming that we can see firsthand [2]. In some cities in Indonesia, overcrowding has led to high temperatures and regular deforestation to build new settlements

The increasing global temperature has become one of the major environmental challenges affecting human life in various aspects. Rising temperatures not only influence outdoor conditions but also significantly impact indoor environments, where people spend a large portion of their daily activities. High room temperatures can reduce comfort levels, decrease productivity, and negatively affect health, particularly when individuals are in enclosed spaces with limited air circulation. The situation becomes even more uncomfortable during the dry season or in regions that experience consistently high temperatures throughout the year. As a result, maintaining a comfortable indoor environment has become an important concern for many households and workplaces.

One of the most commonly used devices to improve indoor comfort is a fan. Fans function by circulating air within a room, creating a cooling effect that helps reduce the sensation of heat experienced by occupants. Compared to air conditioners, fans are generally more affordable, energy-efficient, and portable, making them a popular choice for many families. Their ease of use and relatively low operating costs have contributed to their widespread adoption in homes, offices, classrooms, and other indoor environments. In many households, fans are used daily to provide a more comfortable atmosphere for activities such as studying, working, resting, and sleeping[3].

Despite their benefits, conventional fans are typically operated manually, requiring users to turn them on or off according to their needs. In practice, many users often forget to switch off the fan when leaving a room or moving to another location. As a result, the fan may continue operating even when there are no people present in the room. This unnecessary operation leads to inefficient energy consumption and contributes to higher electricity costs. Although the power consumption of a single fan may seem relatively small, continuous operation over extended periods can result in significant energy waste, especially when multiple fans are used within a household or building[4].

In addition to increasing electricity consumption, leaving a fan running continuously can also reduce the lifespan of the device. Electrical and mechanical components are subject to wear and tear during operation, and prolonged use may accelerate component degradation. Consequently, maintenance requirements may increase, and the likelihood of equipment failure becomes higher. From an environmental perspective, unnecessary energy usage also contributes indirectly to increased electricity demand, which may lead to greater energy production and associated environmental impacts[5].

To address these issues, there is a growing need for smart fan systems that can operate automatically based on the presence of users. By integrating sensors and automated control mechanisms, a fan can be programmed to detect whether a person is present within a certain range and adjust its operation accordingly. Such systems can help reduce energy waste by ensuring that the fan only operates when needed. Furthermore, automatic control enhances user convenience by eliminating the need for manual operation while maintaining a comfortable indoor environment[6].

Therefore, the development of an automatic fan control system represents an effective solution for improving energy efficiency, reducing operational costs, and enhancing user comfort. The implementation of sensor-based technologies can support smarter energy management practices and contribute to the broader goal of sustainable and environmentally friendly technology utilization in everyday life.

To overcome this problem, sensor technology can be used to detect the presence of humans and regulate the fan automatically. Using ultrasonic sensors, the fan can be set to turn on or off according to the distance or presence of people around it. A fan is considered a flexible air conditioner because it can be easily moved from one place to another. Running a fan for hours without a break can waste electrical energy. Electrical energy savings can be overcome by using ultrasonic sensors[3]. This makes it easier for one to time the fan turns on and off, avoiding the use of electricity This will not only save energy, but also increase comfort by avoiding the fan turning on aimlessly[7].

2. Research Method

This research was made because the climate in Indonesia is very hot, especially in the city of Palembang the temperature can reach 30 degrees and if the frequency of using the fan is usually we often forget to turn it off, therefore I use an automatic fan system using an ultrasonic sensor, this sensor will work if there is an object approaching and for the user it can save electricity[8]**.**

2.1 Data Collection Methods

Data Collection Method The data collection method is a method or way to obtain the required data. The methods used are

1. Observation A method of data collection obtained based on direct observation on the research object to obtain the necessary data and an overview of the things needed. In this case, what is observed is the difficulty of analysts in understanding the script of existing applications to support the business process reenginerring.
2. Literature Study Literature study is collecting data from books or literature that have been compiled. In general, these books contain a theoretical foundation that is systematically arranged. Literature studies are more required in design.

2.2 Design and System Implementation

This research was made because the climate in Indonesia is very hot, especially in the city of Palembang the temperature can reach 30 degrees and if the frequency of using the fan is usually we often forget to turn it off, therefore I use an automatic fan system using an ultrasonic sensor, this sensor will work if there is an object approaching and for the user it can save electricity. This block

diagram aims to show a running sketch of an automatic fan using an ultrasonic sensor, This block diagram visualizes how the flow of all components so that the ultrasonic sensor can read the distance of the object[4].

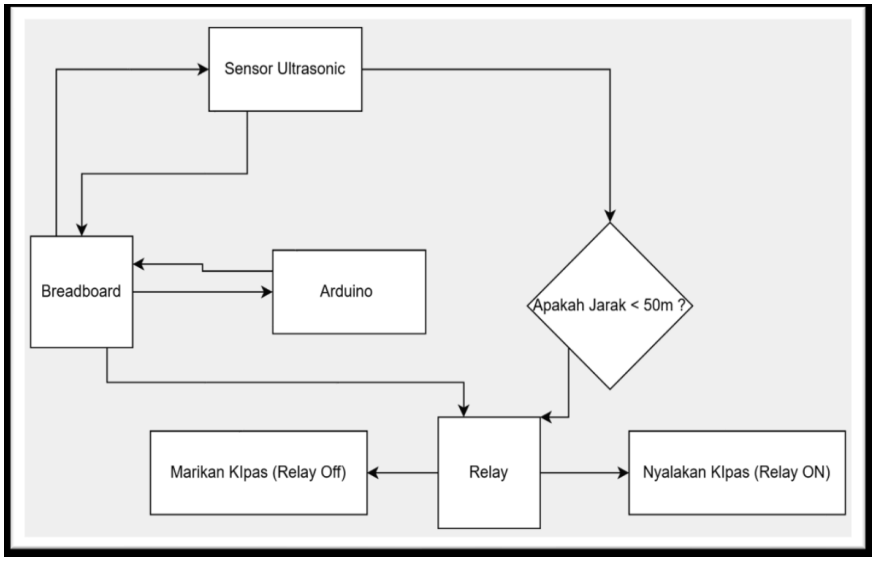

Figure 9. Block Diagram Sketch

This study was conducted to address the challenges posed by high temperatures in Indonesia, particularly in Palembang, where daily temperatures frequently exceed 30°C. Fans are commonly used to improve indoor comfort; however, users often forget to switch them off when they are no longer needed, resulting in unnecessary electricity consumption. To overcome this issue, an automatic fan control system utilizing an ultrasonic sensor was developed. The sensor detects the presence and distance of nearby objects, enabling the fan to operate only when required. The proposed block diagram illustrates the interaction between system components and demonstrates how sensor data are processed to control fan operation efficiently.

2.3 Flowchart Research

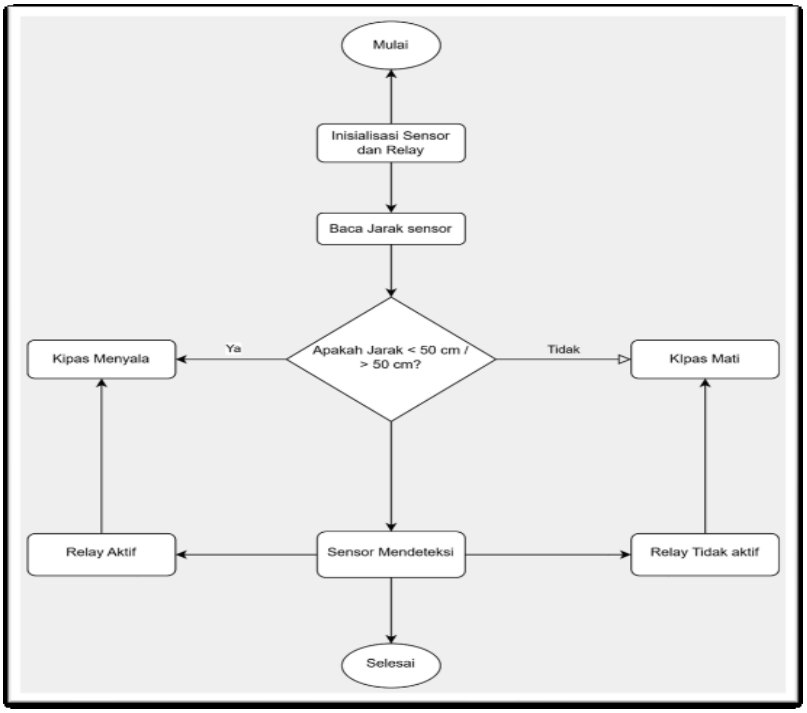

Figure 10. Flowchart Sketch

Stages of Flowchart
The following are the steps if you want to run an automatic fan using an ultrasonic sensor, namely[5]:

1. The first stage the user must set up the tool
2. The second stage of the user connecting the prepared tool
3. The third stage of the user initializing the tool system
4. The fourth stage of the user performs the ultrasonic sensor measurement
5. The fifth stage of the user should check the distance and control of the relay
6. The sixth stage of the user repeats the sensor reading

2.4 Research Methods

This research was made because the climate in Indonesia is very hot, especially in the city of Palembang the temperature can reach 30 degrees and if we use the fan often, we often forget to turn it off, therefore I use an automatic fan system using an ultrasonic sensor, this sensor will work if there is an object approaching and for the user to save Electricity[6].

2.5 Early Network

This is the Initial Series in the manufacture of automatic fans using ultrasonic sensors. This circuit is composed of components that are connected to each other to connect the electrical flow as shown in Figure 3.2. This component consists of a microtron, an inductor, and a sensor assembled according to its function.

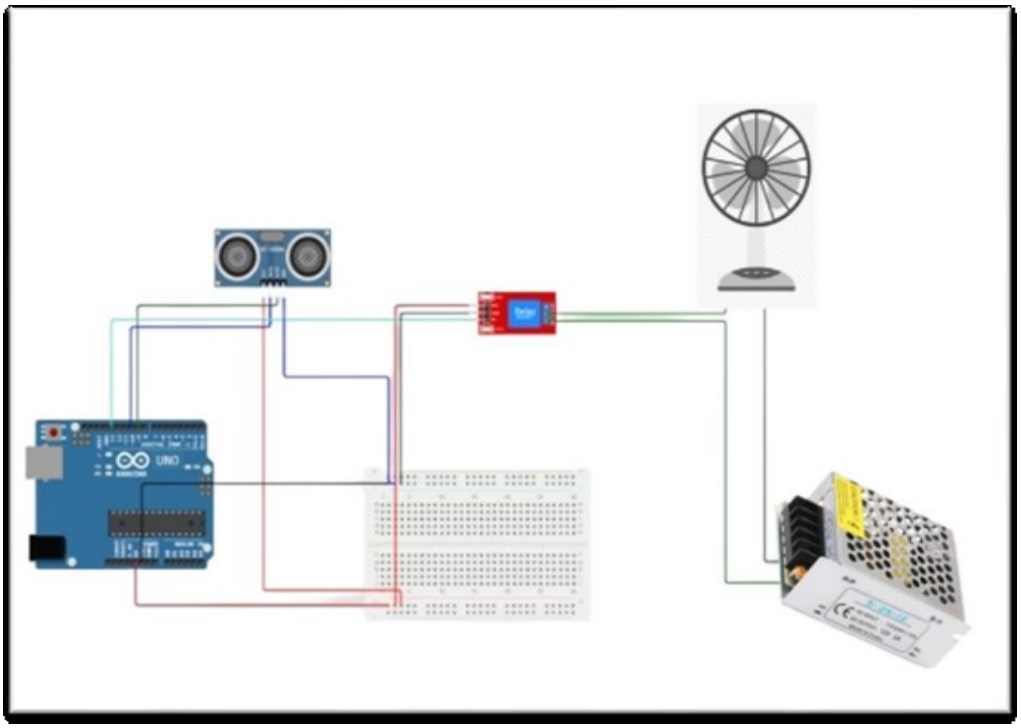

Figure 11. Sketch of the Initial Network

As shown in figure 11 above, the structure and arrangement of jumper cables are formed, here is the arrangement of jumper cables that are interconnected with each other, then a table of connected pins is made as shown below:

Table 1. Sensor Ultrasonic HC-Sr04

Pin	Connect
Vcc	5V Arduino
Gnd	Mr. Arduino
TrigPin	Pin 10
EchoPin	Pin 9

Table 2. Relay

Pin	Connect
Vcc	5V Arduino
Gnd	Mr. Arduino
In	Pin 13 Arduino

Table 3. Power Suplly

Pin	**Connect**
Positive power suplly	COM relay
Ground power suplly	Ground fan

Table 4. Fan

Pin	**Connect**
Fan Positive	NO relay
Ground fan	Ground power suplly

3. Result and Discussion

This automatic mode testing stage is carried out with the aim of finding out whether the system created is in accordance with the existing system design. Once all the parts have been assembled correctly and the program has been downloaded to Arduino Uno then the next step is to test the tool on the ultrasonic sensor. By placing an object in front of the ultrasonic sensor to detect if it is below 50cm. If the appliance is working, the fan will turn on as shown below[7].

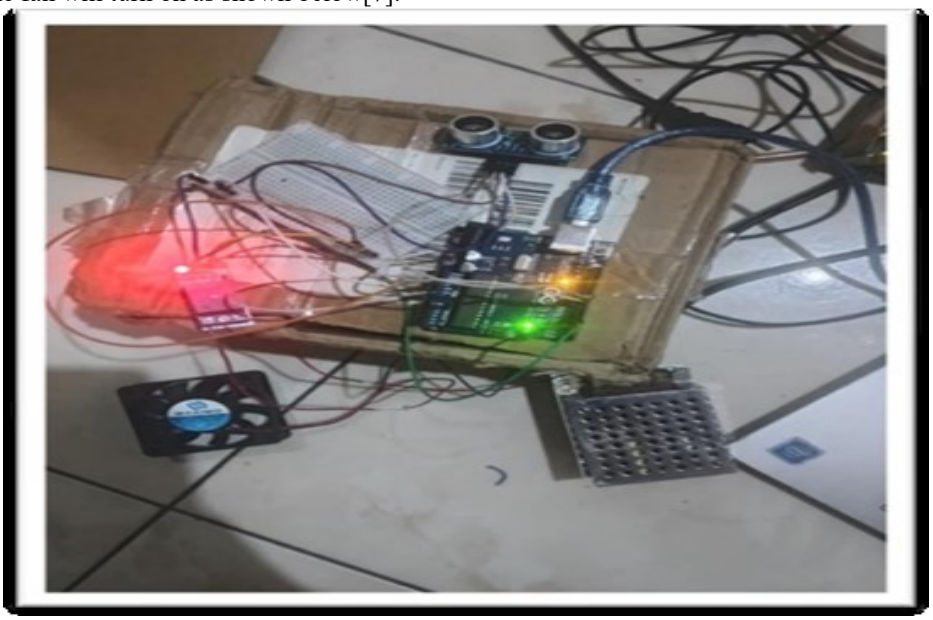

Figure 12. Tool Testing

Based on the sensor testing conducted, it was found that the ultrasonic sensor successfully detected the presence of objects placed in front of it throughout the entire testing process. The sensor was able to continuously measure the distance between the sensor and the object and transmit the data to the microcontroller without significant interruption. During the experiment, the measured values displayed on the serial monitor remained relatively stable, indicating that the sensor operated consistently under the given environmental conditions.

The test results demonstrate that the ultrasonic sensor has good performance in detecting objects and measuring distances accurately within its operating range. The readings obtained corresponded closely to the actual conditions in the room, showing that the sensor was capable of responding effectively to changes in

object position. Furthermore, no significant fluctuations or irregular readings were observed during normal operation, which indicates a reliable level of measurement precision.

The serial monitor output was used to observe and verify the sensor readings in real time. Through this monitoring process, it was possible to evaluate the responsiveness and stability of the sensor during operation. The results confirm that the ultrasonic sensor is suitable for use in the automatic fan control system, as it can accurately detect the presence of nearby objects and provide the necessary input data for controlling the fan. Figure 10 illustrates the sensor readings displayed on the serial monitor during the testing phase[8].

Figure 13. Sensor Reading Results

Next, to run this arduino board, we have to install the arduino IDE application so that when we make a program, we can directly enter it into arduino by choosing what board we use and what fort we want to use, after that we have to verify first after success we just upload the code we want to run[9].

In this program to make an automatic fan tool using sensors, it was successful. So a code is created specifically designed for the program that we create using the arduino IDE application to run the program. This is the source code created for automatic fans using the ultasonic sensor[10].

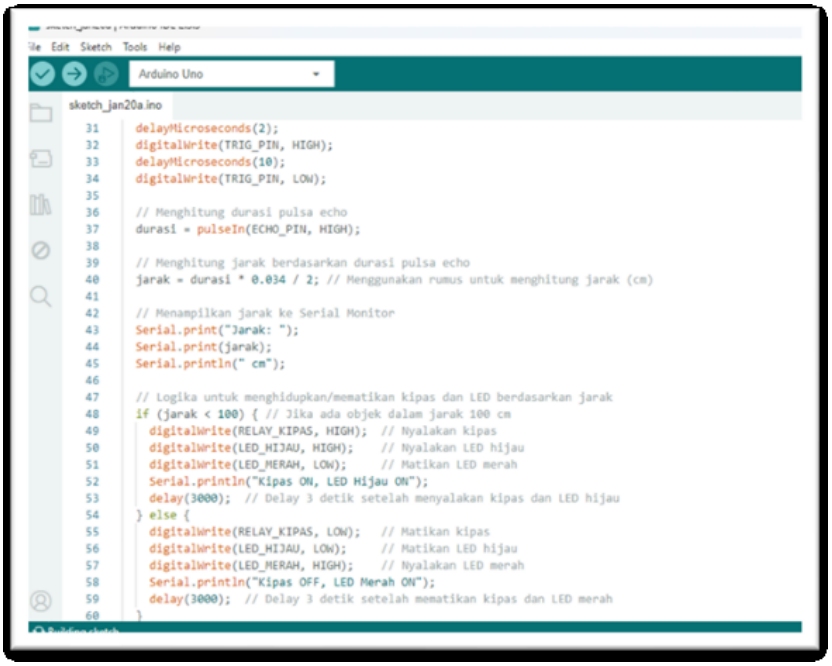

Figure 14. Source Code

4. Conclusion

With this, based on all the results above, all the conclusions that are obtained are: in the test of the automatic fan device that uses an ultrasonic sensor is successfully run and functions if there is an object that is close to or within the range of the sensor below 100cm, then the sensor will give a command to the arduino to give a command to the relay to activate the access to the electric current to the relay and the fan will turn on. On the other hand, if the sensor does not detect the presence of objects below 100cm then the sensor will not give a command to the arduino and arduino will not give a command to the relay to activate, That's the conclusion I can give. For further research this can be suggested to combine both sensors such as temperature sensors and ultrasonics, with additions such as being accessible through smartphones so that users if they feel cold can control to turn off the fan.

References

1] Azzuwa, P, et al. (2024). Enturin as an Internet of Things (IoT)-based application with Nodemcu Esp8266 and HC-Sr04 for the energy efficiency of offshore wind turbines. *Lkti Inergyc, 1(1)*, 1-12.

2] Butarbutar, R. E, & et al. (2025). Room temperature controller based on the number of people in the room based on the Internet of Things. *Journal of Information Systems Research, 2(3),* 115-120.

3] D. Nusyirwan, et al. (2021). Prototype of an Automatic Fan with LM35 Sensor as an Electricity Saving in Sdn 002 East Tanjungpinang,". *J. Informatics Vocat. Educ., Vol. 4, No. 1*, 27-40.

4] Fernanda, M. I, & Wildian, W. (2023). Design and build an automatic mist disinfection machine to save water. *Journal of Physics Unand, 12(2)*, 304-310.

5] Fernanda, M. I, & Wildian, W. (2023). Design and build an automatic mist disinfection machine to save water. *Journal of Physics Unand, 12(2)*, 304-310.

6] H. Sanjaya, J, & et al. (2021). The automatic fan uses Dht11 temperature sensor. *Seminar on Science*, 187-191.

7] Kusumah H, & Pradana R. A. . (2019). Application of Esp32-based Microcontroller and Internet of Things Interfacing Trainers in Interfacing Courses. *Journal of Stories, Vol. 5, No. 2*, 1-15.

8] Martha, R, & et al. (2019). The automatic fan uses a temperature sensor and an infrared sensor with an atmega32 microcontroller.

9] Muttaqin, I. R, & Santoso, D. B. (2021). Prototype of Arduino Uno based automatic fence with ultrasonic sensor HC-Sr04. *Je-Unisla, 6(2)*, 41-45.

10] Nadiansyah, R. R. (2018). Esp8226 Mcu Node-Based Fan Control System.Unpublished thesis. *Stmik Akakom Yogyakart*.

11] Pradana, R. W., & et al. (2024). Design and build an automatic water level monitoring system using an Arduino Uno-based ultrasonic sensor (HC-Sr04) with a Microsoft Visual Basic 6.0-based computer interface. *Journal of Engineering and Science, 3(1), 13-24.*

12] Pratiwi, D, & et al. (2020). Increase public knowledge of porous drainage which functions as a place for rainwater infiltration. *Journal Of Social Sciences And Technology For Community Service (JSSTCS), 1(2)*.

13] Putri, M. E. (2021). The design of the automatic fan control system uses Dht11 temperature sensor. *Distance sensor HC-Sr04 and Atmega 328-based PAR sensor (Doctoral Dissertation, Sriwijaya State Polytechnic).*

14] Rachman, H. I. (2020). Local Wisdom in Forest Management. Qmedia, .

15] Rosmiati, R, & et al. (2021). The prototype of the automatic fan uses Dht22 temperature sensor, Hc-Sr04 ultrasonic, and Bluetooth Hc-05 based microcontroller. *D'computare: Scientific Journal of Information Technology and Computer Science, 11(2)*, 50-56.

16] S Indarwati, et al. (2019). The power requirement of the air conditioner when there is a temperature difference. *Journal of Mechanical Technology, Vol. 15, No. 1*, 1-5.

17] Samidjo, J, & Suharso, Y. (2017). Understand global warming and climate change. *Journal of Ivet University*, 24.

18] Samidjo, J, & Suharso, Y. (2017). Understand global warming and climate change. *Online Journal Of Ivet University, 24(2)*.

19] Samsugi, S, & et al. (2020). The automatic irrigation controller system uses an Arduino Uno microcontroller. *Jtst, Vol. 01, No. 01*, 17-22.

20] Sari, I. M, & Firmawati, N. (2020). Design and build automatic temperature and water level control systems in Arduino Uno-based dairy pens. *Journal of Physics Unand, 9(4),* 558-564.

21] Sari, M. P, & et al. (2021). Designing a Library Management Information System Using the Fast Method (Framework For The Application System Thinking)(Case Study: Sman 1 Negeri Katon). *Journal of Information Technology and Systems, 2(2).*

22] Sudrajat, R, & Rofifah, F. (2023). Design and build a fan control system with temperature sensors and ultrasonic sensors based on Arduino Uno. *Remik: Research and E-Journal of Computer Informatics Management, 7(1)*, 555-564.
23] Sunandar Y, et al. (2022). Multi-feature fan design using ultrasonic sensors. *Medical Technician: J. Tek. Electromedik Indones., Vol. 4, No. 1*, 45-54.
24] Suryadi, L, & et al. (2015). The design of the automatic fan control system uses the LM35 temperature sensor based on the Atmega16 microcontroller. *Journal of Endocrinology. 2(2)*, 76-82.
25] Wijaya, I, & Arifin, M. (2017). Working principle and structure of ultrasonic sensor HC-Sr04. . *Journal of Electronics and Communication, 6(4)*, 78-85.