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PROTOTYPE OF A MEDICAL STERILIZATION DEVICE USING DUAL-MODE UV-C AND OZONE INTEGRATED ON AN ARDUINO-BASED SYSTEM

Farras Rafi Fatha[1], Rinda Nur Hidayati[1], and Atika Hendryani[1]
[1,]Electromedical Engineering, Health Polytechnic of the Ministry of Health, Jakarta 2, Indonesia.

Corresponding author: Farras Rafi Fatha (e-mail: P22030121017@poltekkesjkt2.ac.id).

ABSTRACT Medical Sterilization Tool Prototype with Dual-Mode UV-C Lightwave and Ozone Integration Based on Arduino Atmega328p and Nextion. This tool also uses a Nextion LCD as a display of test results. In the sterilization process, this tool uses Ozone (O3) and UV-C, with two upper and lower chambers. The upper chamber uses ozone, and the lower uses UV-C, which can be used for sterile detection and storage. The sterilization process of medical equipment, such as KN95 masks made of gauze and plastic, can use ozone, while medical equipment such as tweezers made of metal and glass can use UV-C. The primary purpose of making a medical equipment sterilizer is to keep instruments safe, organized, and protected from damage or contamination. The design of this tool uses several components: a UV-C lamp with 8 watts of power, a DIY ozone generator, an Arduino Uno ATmega 328p, and a solenoid door lock. The timer test results show an accuracy of 98.79%. Ozone testing is performed at a fixed concentration of 50 ppm. Testing the intensity of UV-C lamps varies by watt. For UV-C, 8 watts has an intensity of 1200 µW/cm2, UV-C 16 watts has an intensity of 2400 µW/cm2, and UV-C 24 watts has an intensity of 3200 µW/cm2. Testing the sterilization results showed a 96.67% reduction in E. coli bacteria after ozone exposure and a 100% reduction after UV-C exposure, with each exposure lasting 20 minutes on Endo Agar media. The value of 94% of bacterial colonies on KN95 masks was reduced after exposure to ozone for 20 minutes, and 98.91% of bacterial colonies on tweezers were reduced after exposure to 24 watts of UV-C for 20 minutes. Ozone and UV-C can kill bacteria with the appropriate exposure time.

INDEX TERMS Ozone, UV-C Lamp, Sterilization, Microorganism, Arduino

I. INTRODUCTION

Hospitals must ensure the sterility of equipment used and maintain sufficient storage space for equipment to ensure patient safety [1]. In the use of repeated medical devices, equipment sterilization is required to keep the equipment clean and free of microorganisms that can infect the tool [2]. In hospitals, sterilization using autoclaves with water vapor at high temperatures [3] can cause moisture and water droplets on the tool. Moist tools exposed to water can cause corrosion, and after the autoclave process is complete, surgical tools that remain in semi-dry conditions need to be manually dried with a cloth or towel, which can allow them to become contaminated with bacteria again. The CSSD room is considered sterile, but the risk of bacteria entering cannot be eliminated. A sterile storage cabinet that sterilizes and stores surgical tools is required. Sterile storage cabinets can basically store and maintain the sterilization of surgical instruments by inhibiting bacterial growth using ultraviolet light. As technology advances, sterilization systems are also advancing effectively and safely. Ozone is suitable for tools made from stainless steel, metal, glass, and cloth. In its gas form, ozone is highly effective and can oxidize, efficiently reducing the number of microorganisms in medical equipment, fruits, and vegetables [4].

In a 2022 study by Tomy Abuzairi and colleagues titled "The Effectiveness of Sterilization with Ozone (O3) on Laboratory Equipment as an Effort to Assure Quality," sterilizing medical devices can be achieved using low ozone concentrations, environmental temperatures, and small amounts of water[5]. A 2019 study by Bayu Agung Sutopo, entitled "UV Lamp Box Sterilizer with Remote Control Delay," found that a 7-second delay with a blower results in 100% sterilization accuracy. Furthermore, the results showed that data collection for 1 minute achieved an accuracy of 99.55%, and for 3 minutes, an accuracy of 99.85% [6]. In this study, the authors designed a medical sterilizer using two modes of ozone (O3) and UV-C to detect and sterilize.

II. RESEARCH METHODS

A. RESEARCH DESIGN

Sterilization of medical devices kills microorganisms, making them sterile and safe for patient use. Sterilization has two physical and chemical methods that can destroy all forms of microorganisms, spores, and viruses on an object [7]. This research focuses on developing a prototype of a medical sterilization tool with DualMode UV-C Lightwave and Ozone Integration, based on an Arduino Atmega328p and a Nextion display. The following design is designed using this tool:

1. Has two chambers: the upper part, using ozone, can detect and sterilize, and the lower part, using UV-C, disinfects and sterilizes storage.
2. This tool system uses an Arduino Uno ATmega 328P microcontroller, an infrared sensor to detect objects, a Nextion display to interface the tool with the user, and a 12V relay to control the UV-C lamp and ozone generator.
3. Safety features with the system are equipped with a buzzer and safety door lock to provide a warning if the tool door has not been closed tightly, so that sterilization cannot be started and ensure safety during the sterilization process, so that it cannot be opened or closed manually, equipped with a timer for the sterilization process time indicator.
4. The power supply uses AC to ensure the stability of components such as UV-C lamps and ozone generators. Using DC to ensure the stability of components such as the Arduino Uno, relays, Nextion, MOSFETs, and a buzzer.

This research aims to test the accuracy and effectiveness of UV-C and ozone in killing microorganisms found in medical devices, with a focus on ease of use for medical personnel. Tests and measurements include the accuracy of time settings, UV-C intensity, ozone gas concentration, and safety door lock features.

B. CONCEPTUAL FRAMEWORK

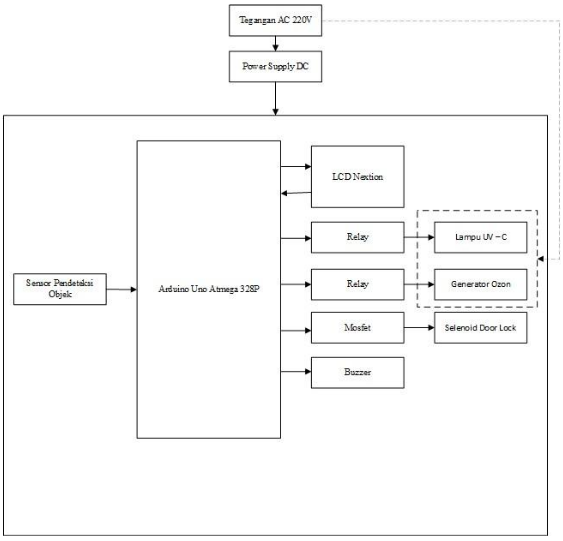


Figure 1. A block diagram of a medical device sterilization system with two modes of UV-C and ozone, based on Arduino ATmega 328P, illustrates the main components with their connections, by integrating an Arduino Uno microcontroller, an object detection sensor, a Nextion, a relay, an MOSFET, a buzzer, an ozone generator, a UV-C lamp, and a solenoid door lock. Each of these components is given AC or DC power.

Based on Fig. 1, the following explains the block diagram. When the power supply is connected to a PLN source and the on/off switch is pressed to the ON position, the 220V AC from PLN enters the power supply, is converted to 12V DC, and then is stepped down to 5V DC. The LCD Nextion will then display the initialization screen and show the "Mode" menu, where the user will be given a choice of Mode 1 "UV-C", Mode 2 "Ozone and UV-C", or Mode 3 "Ozone". Next, the "Method" field will display the mode, with a choice of "Automatic" and "Manual". For modes 1 and 2, the UV-C levels will be given a choice of "low", "medium", and "high".

If you choose "Automatic", you will be given a choice of 5, 10, 15, or 20 minutes. Select the desired time, then go to the display and press "Start". The timer will be displayed on the LCD in counting-up mode. It will display the time for both ozone and UV-C sterilization. In count-up mode, the microcontroller will send data to activate the ozone generator and UV-C lamp. During the sterilization process, the infrared sensor first detects whether the door has closed by reading the object in front of the sensor. If the door is closed, the door lock solenoid will automatically lock the door. When the LCD indicates the counting-up time is complete, the ozone generator and UV-C lamp will turn off, the buzzer will sound, and the solenoid door lock will automatically open, indicating that the sterilization process is complete.

For the "Manual" method, the tool will work continuously without any time limit. The solenoid door lock can be opened during the sterilization process by pressing "Stop"; then the door will open, and sterilization will stop.

C. DATA COLLECTION TECHNIQUES

The next step is testing to ensure the functionality and accuracy of the designed tools. This test ensures that deviations in each measurement remain within tolerance limits, thereby ensuring the tool's accuracy and compliance with performance standards. The following data collection process includes:

1. Designing a prototype medical sterilization device with Dual-Mode UV-C Lightwave and Ozone Integration Based on Arduino Atmega328p and Nextion.
2. Test and analyze the tool's accuracy with time parameters using a stopwatch.
3. Test and analyze the accuracy of the safety door lock system.
4. Test and analyze the accuracy of the ozone concentration produced by the ozone generator using the Air Quality Monitor.
5. Test and analyze the accuracy of the UV-C intensity readings from a UV-C Light Meter.
6. Test and analyze the bacterial count before and after sterilization using the Total Plate Count (TPC) method.

The following is the data collection procedure to determine the stages in data collection from each test, which will be carried out as follows:

1. Time testing is carried out based on the time already on the tool, namely 5, 10, 15, and 20 minutes, using a stopwatch as a comparison tool, with a total of six measurements repeated.
2. Safety door lock testing, including buzzers and infrared sensors, is conducted under various door conditions: wide open, not closed tightly, and closed tightly, with a total of 6 measurements repeated.
3. Safety door lock testing, including buzzers and infrared sensors, is conducted under various door conditions: wide open, not closed tightly, and closed tightly, with a total of 6 measurements repeated.
4. Ozone gas concentration testing was conducted at each time point (5, 10, 15, and 20 minutes) using the Air Quality Monitor tool as the measuring instrument, with a total of 6 measurements.
5. Testing the intensity of UV-C lamps with each intensity of 8, 16, and 24 watt minutes, using a UV-C light meter as a measuring instrument, with a total of six measurements repeated.
6. The test determines the reduction in the number of microorganisms using Escherichia coli and bacteria on medical devices using the TPC method at 5, 10, 15, and 20 minutes.

The use of good tools and methods, along with systematic intervals, ensures consistent data collection and provides a good framework for evaluating the performance of each component of the device, ensuring that the device meets the desired safety and effectiveness standards for sterilization.

D. DATA ANALYSIS TECHNIQUES AND METHODS OF DATA PRESENTATION

Data analysis techniques are used to analyze data collected from the testing process, using statistical formulas to evaluate the accuracy, error, and consistency of the tool's performance. The following techniques were used:

1) Average Value

Mean is the average value of data obtained by summing all data values of a sample group, then dividing by the number of samples. The sample average can be formulated as in (1).

$$\bar{x} = \frac{x1 + x2 + x3 + \ldots + Xn}{N} \quad (1)$$

Where,
$\bar{x}$ = Average measurement value (mean)
$x1 + x2 + x3 + \ldots + Xn$ =Number of data values
N = number of data taken

2) Error value

The error value is calculated by calculating the difference between the measurement value and the actual value. The error value is calculated as in (2).

$$|\text{error}| = |\bar{x} - \text{setting } Value| \quad (2)$$

Where,
Setting Value = Setting Value
$\bar{x}$ = Average measurement value

3) Percentage Error

The percentage error is calculated to determine how much the measurement error rate or error value differs from the actual/standard value. The percentage error is calculated as in (3).

$$\text{Percentage Error} = \frac{|\text{error}|}{\text{setting value}}\ x\ 100\% \quad (3)$$

Where,
|error| = Absolute measurement error value
Setting value = Actual average Value

4) Calculation of the Number of Bacteria. Calculation of the number of errors to find out how much bacteria are reduced before and after sterilization, with a percentage to make it easier to see the effectiveness in killing bacteria at each time, using the formula in (4).

$$Bacterial\ Reduction = = \frac{No-Nt}{No}\ x\ 100\% \quad (4)$$

Where,
No = Initial Number Value Before Sterilization
Nt = Final Sum Value After Sterilization

5) Accuracy Percentage
The accuracy percentage is calculated by comparing the measurement value to the standard/setting value using the formula in (5).

Accuracy = 100% - Error Presentation (5)

The analyzed data is presented using tables and graphs to facilitate a clear understanding of the results.

III. RESULT AND DISCUSSION

In this section, measurement results taken from the UV-C and ozone sterilizers are presented to determine if they meet the expected specifications. The data obtained has been processed and analyzed to ensure accuracy and stability. This analysis focuses on measuring time, ozone concentration, UV-C intensity, and bacterial reduction. The results of these tests are significant for evaluating the device's performance.

1) Time testing data
Performed at 5, 10, 15, and 20 minutes. Each measurement is carried out six times to determine whether the timer module is suitable or still within the tolerance value using the comparison tool, so that the difference between the module and the comparison can be determined.
Table 1 data show that the time obtained from stopwatch calculations and the time recorded in the layer are not much different. Each time is measured six times to determine the measurement error due to repetition. Measurement error can be used as a reference for the stability of the LCD screen's time display, because when sterilization time is displayed, it has an average percentage error of 1.2% and an average percentage accuracy of 98.79%.

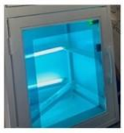
TABLE I
TIME TESTING

Time (minute)	Stopwatch (minute)	Time on screen (minute)						average	% error	% accuracy
		I	II	III	IV	V	VI			
5	05.00	5	5	5	5	5	5	5	0%	100%
10	10.00	9,59	9,59	10	10	10	10	9,91	1,4%	99,14%
15	15.00	14,59	14,59	14,59	14,59	15	15	14,72	1,86%	98,13%
20	20.00	19,59	19,59	19,59	19,59	19,59	19,59	19,59	2,05%	97,91%
overall average									1,2%	98,79%

Safety door lock testing data
This test aims to ensure safety during the sterilization process by using a tightly closed door that cannot be opened manually, so that the process runs safely. Equipped with an infrared sensor that reads objects at a distance of 3 cm, the solenoid will automatically lock the door. This is the Safety Door Lock System.

The results of testing the safety door lock are shown in Table 2. The results show that if the door is wide open or not tightly closed, the solenoid will not lock, and a buzzer will sound to indicate that the door must be closed. This is because the sensor does not detect any nearby objects [8].

TABLE 2
SAFETY DOOR LOCK TESTING

No.	Door Condition	Picture	Buzzer Sounds					
			I	II	III	IV	V	VI
1.	Door is Wide Open		1	1	1	1	1	1
2.	Door Not Closed Tightly		1	1	1	1	1	1
3.	Door was Tightly Shut		2	2	2	2	2	2

Description:
1 = door is unlocked, buzzer sounds
2 = door locked, buzzer off

2) Ozone Concentration Testing
Ozone concentration testing using an Air Quality Monitor, with results fixed every 5, 10, 15, and 20 minutes, as shown in Table 3. Ozone concentration continues to increase at 1 second and at 1 minute 20 seconds, and the ozone produced has reached a maximum of 50.00 ppm and remains stable at all times because the ozone generator is placed in a chamber with only fixed oxygen conditions [9].

TABLE 3
OZONE CONCENTRATION TESTING

Time (Minute)	Air Quality Monitor Testing (ppm)					
	I	II	III	IV	V	VI
5	50.00	50.00	50.00	50.00	50.00	50.00
10	50.00	50.00	50.00	50.00	50.00	50.00
15	50.00	50.00	50.00	50.00	50.00	50.00
20	50.00	50.00	50.00	50.00	50.00	50.00

Table 3 showed results of testing ozone levels using an air quality monitor detector from testing from each time 5, 10, 15, and 20 minutes, the readings at each time have the same ozone level of 50 ppm due to the limited oxygen levels in the chamber so that the ozone produced cannot increase and remain, for the time ozone levels decrease has an average of 8 minutes until the ozone disappears and becomes oxygen again. Each time is measured 6 times to determine the measurement error due to repetition.

3) UV-C Lamp Intensity Testing

Testing the intensity at a UV-C wavelength of 254 nm is done using a UV-C light meter to determine the actual intensity by comparing the measured value with the inverse law formula [10].

TABLE 4
UV-C LAMP INTENSITY TESTING

Energy (watt)	Calculation Intensity ($\mu W/cm^2$)	UV-C Light Meter ($\mu W/cm^2$)						Average	% error	% accuracy
		I	II	III	IV	V	VI			
8	1.200	1197	1198	1199	1200	1201	1202	1199	0,042 %	99,96%
16	2.400	2396	2397	2398	2399	2400	2401	2398	0,063 %	99,94%
24	3.600	3596	3597	3598	3599	3600	3602	3598	0,005 %	99,96%
overall average									0,004%	99,95%

Testing the intensity of UV-C lamps, compared to the value of the inverse square law formula, to determine the Value of UV-C intensity using a UVC light meter. Repetition of measurements 6 times, which aims to determine the measurement error due to repetition and to determine whether the value of the measurement tool remains the same or is not much different, so that the value of the formula calculation and measurement can be appropriate, with an average percentage error of 0.004% and an average percentage accuracy of 99.95%.

4) Sterilization Testing Using Escherichia Coli Bacteria

Testing sterilization indicators for Escherichia Coli special bacteria using Endo Agar media because the media is selective specifically for e.coli bacteria to show a clear difference between conditions before and after the sterilization process, with a time of 5, 10, 15, and 20 minutes. Using a UV-C lamp at 24 watts and 50 ppm ozone, after sterilization, the bacteria will be incubated at 37 °C for 48 hours. After incubation, bacterial development will be visible, allowing it to be counted using a colony counter.

TABLE 5
TESTING OF ESCHERICHIA COLI BACTERIA

Time (Minute)	Before Sterilization (CFU)	After Sterilization (CFU)		Percentage Reduction in Bacteria Count (%)	
		Ozon	UV-C 24 watt	Ozon	UV-C
5	300	221	104	26,33%	65,33%
10		106	28	64,67%	90%
15		54	7	82%	97,66%
20		10	0	96,67%	100%

Table 5 showed Tests on E. Coli bacteria using Endo Agar media, with a percentage reduction in the number of bacteria after 5 minutes (26.33%), 10 minutes (64.67%), 15 minutes (82%), and 20 minutes (96.67%). Percentage of bacteria reduction using UV-C 24-watt 5 minutes: 65.33%, 10 minutes 90%, 15 minutes: 97.66%, 20 minutes 100%.

5) Medical Device Sterilization Testing Using Ozone

Testing sterilization indicators for free bacteria in medical devices, such as KN95 masks, using ozone with Nutrient Agar media to show clear differences between conditions before and after the sterilization process at 5, 10, 15, and 20 minutes. Using nutrient agar media because NA media can be used by various kinds of bacteria, after sterilization, the bacteria will be incubated at 37 °C for 48 hours.

TABLE 6
TESTING OF MEDICAL DEVICES USING OZONE

Medical Equipment	Time (Minute)	Before (CFU)	After (CFU)	Percentage Reduction in Bacteria Count (%)
Masker KN95	5	300	184	38,67%
	10		76	74,67%
	15		42	86%
	20		18	94%

Table 6 showed that the number of bacteria in the KN95 mask at each time was reduced by the amount of reduction and the percentage of reduction. Obtained E. coli bacterial colonies; there were 300 Colony Forming Units (CFU), with a percentage reduction in the number of bacteria using ozone: 5 minutes 38.67%, 10 minutes 74.67%, 15 minutes 86%, 20 minutes 94%.

6) Medical Device Sterilization Testing Using UV-C 24 Watt

Testing sterilization indicators for free bacteria in medical devices, such as tweezers, using UV-C at 24 watts with Nutrient Agar media to show apparent differences between conditions before and after sterilization at 5, 10, 15, and 20 minutes. Using nutrient agar media because NA media can be used by various kinds of bacteria, after sterilization, the bacteria will be incubated at 37 °C for 48 hours.

TABLE 7
TESTING OF MEDICAL DEVICES USING UV-C 24 WATTS

Medical Equipment	Time (Minute)	Before (CFU)	After (CFU)	Percentage Reduction in Bacteria Count (%)
	5		182	34,30%
Pinset	10	277	21	92,41%
	15		16	94,22%
	20		3	98,91%

From Table 7, it was found that the number of bacteria in the tweezers at each time was reduced by the amount of reduction and the percentage of reduction. Obtained E. coli bacterial colonies; there were 277 Colony Forming Units (CFU), with a percentage reduction in the number of bacteria using UV-C at 24 watts: 5 minutes 34.30%, 10 minutes 92.41%, 15 minutes 94.22%, 20 minutes, 98.91%.

IV. CONCLUSION

Based on the tests carried out, several conclusions are: a prototype of a Medical Sterilization Tool with Dual-Mode UV-C Lightwave and Ozone Integration, based on an Arduino Atmega328p and a Nextion display, has been designed. Timer testing with each - 5, 10, 15, 20 minutes - carried out 6 times; obtained average percentage error (1.2%) and average percentage accuracy (98.79%). Testing the safety door lock shows that an infrared sensor reads the object, the solenoid closes, and the new sterilization process works as programmed. Testing tool sterilization data: ozone testing results in an ozone concentration of 50.00 ppm at each time point (5, 10, 15, 20 minutes). Testing tool sterilization data, UV-C intensity testing with six tests of each lamp power, for 8 watt lamp power with percentage error results (0.042%) and accuracy (99.96%), for 16 watt lamp power the percentage error results (0.063%) and accuracy (99.94%), for 24 watt lamp power the percentage error results (0.005%) and accuracy (99.96%). Testing tool sterilization data, testing sterilization of pure E. Coli bacteria using ozone from 5 to 20 minutes is reduced by a percentage (96.67%), using 24-watt UV-C from 5 to 20 minutes is reduced by a percentage (100%). Testing tool sterilization data: testing bacterial sterilization on KN95 masks using ozone for 5 to 20 minutes reduced the percentage by 94%. Testing tool sterilization data: testing bacterial sterilization on tweezers using a UV-C lamp (24 watts) for 5 to 20 minutes, resulting in a reduction of 98.91%.

REFERENCES

[1] I. S. Kurniawansyah, S. Warya, H. S. Rahayu, and D. L. Y. Putri, "The Reusable Instrument Sterilities Stored in the Burn Care Unit at a Hospital in Bandung," *Indonesian Journal of Clinical Pharmacy*, vol. 4, no. 2, pp. 98–105, Jun. 2015, doi: 10.15416/ijcp.2015.4.2.98.

[2] A. Leiden, F. Cerdas, D. Noriega, J. Beyerlein, and C. Herrmann, "Life cycle assessment of a disposable and a reusable surgery instrument set for spinal fusion surgeries," *Resour Conserv Recycl*, vol. 156, May 2020, doi: 10.1016/j.resconrec.2020.104704.

[3] W. Salira, D. Nurcipto, P. Kusi Olla, and S. K. Tinggi Ilmu Kesehatan Semarang Jl Kolonel Warsito Sugiarto, "Sterilisator Kering Berbasis Arduino dengan Teknologi Ozon dan Pemanas," *Applied Industrial Engineering Journal*, vol. 7, no. 2, pp. 80–88, 2023, [Online]. Available: http://publikasi.dinus.ac.id/index.php/aiej/indexn80

[4] L. Sofiana and D. Wahyuni, "PENGARUH STERILISASI OZON TERHADAP PENURUNAN ANGKA KUMAN UDARA DI RUANG RAWAT INAP DI RUMAH SAKIT UMUM PKU MUHAMMADIYAH BANTUL 2014," *Jurnal Kesehatan Masyarakat (Journal of Public Health)*, vol. 9, no. 1, Mar. 2015, doi: 10.12928/KESMAS.V9I1.1553.

[5] T. Abuzairi, N. I. Sumantri, N. A. Putri, M. V. Andarini, E. J. Lampung, and D. Sitinjak, "Development of the Sterilization Box for Medical Equipment with an Ozone Gas Leak Sensor Feature," *International Journal of Technology*, vol. 13, no. 8, pp. 1672–1680, 2022, doi: 10.14716/ijtech.v13i8.6156.

[6] B. A. Sutopo;, "Sterilisator Lampu UV Box Dengan Removate Remote Kontrol," 2016, Accessed: Aug. 20, 2025. [Online]. Available: //repository.poltekkesjkt2.ac.id%2Findex.php%3Fp%3Dshow_detail%26id%3D3286%26keywords%3D

[7] L. Wang and J. Yu, "Principles of photocatalysis," *Interface Science and Technology*, vol. 35, pp. 1–52, Jan. 2023, doi: 10.1016/B978-0-443-18786-5.00002-0.

[8] "Module Pendeteksi Halangan Rintangan Inframerah, Infrared Module Proximity Sensor Robot Line Follower dan Obstacle

Avoider - Technology and Electronics." Accessed: Apr. 25, 2025. [Online]. Available: https://electronicsbot.blogspot.com/2019/06/module-sensor-infrared-proximity.html

[9] A. (Anita) Aprillia, D. F. (Dwiky) Syahbana, I. (Imam) Arifin, and A. (Ahmad) Hafizh, "Implementasi Sistem Kontrol Aliran dan Tekanan Ozon Menggunakan Logika Fuzzy pada Box Sterilisator," *Jurnal Teknik ITS*, vol. 10, no. 2, p. 511499, Dec. 2021, doi: 10.12962/J23373539.V10I2.69185.

[10] A. Fanany Onnylita Gaffar, A. Bramanto Wicaksono Putra, and D. Jurusan Teknologi Informasi Politeknik Negeri Samarinda, *RANCANG BANGUN ULTRAVIOLET STERILIZER BERBASIS MOBILE ROBOT*.