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by 2.tri Wrahatnolo

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Design Automatic Hand Sanitizer Microcontroller Based using Arduino Nano and Ultrasonic Sensors as an Effort to Prevent the Spread of Covid-19

Meini Sondang Sumbawati[1*] Aditya Chandra H[1] Tri Wrahatnolo[1] Ibrohim[1]

L. Endah Cahya Ningrum[1] Khusnul Khotimah[2] Ali Nur Fathoni[3]

[1]*Department of Electrical Engineering Education, Universitas Negeri Surabaya, Surabaya, Indonesia*
[2]*Vocational Education Department of Graduate Program, Universitas Negeri Surabaya, Indonesia*
[3]*Department of Electrical Engineering and Informatics, Universitas Gadjah Mada, Indonesia*
[*]*Corresponding author. Email: meinisondang@unesa.ac.id*

ABSTRACT

The government through the Ministry of Education and Culture (Kemendikbud) has made a decision to suspend teaching and learning activities in schools. The learning process that starts face to face directly in the classroom turns into distance learning /brave. However, the government decided to reopen schools in the Covid-19 corona virus green zone for teaching and learning activities for students. The opening of special schools in the green zone will be held in mid-July 2020. School openings must be opened with strict health protocols, no updated potential for new Covid-19 clusters in schools. This is a form of application of the "New Normal" that is being adapted to the people of Indonesia. Indonesian people must consider the existence of this corona virus pandemic with new normalcy, such as using a compilation mask outside the home, always using a hand compass tool and using a loudspeaker and distance measuring device. The purpose of this study was to make an automated hand sanitizer design as an effort to improve the delivery of Covid-19 in schools. Automatic hand sanitizer is useful to facilitate the hand sanitizer liquid out of the bottle, so it is more effective to use and does not run out quickly. This study uses an Arduino Nano microcontroller as the main control, a human hand detection sensor, and a servo motor as an actuator that will activate the automatic bottle. The mouth of the hand sanitizer bottle uses an elastic hose that leads to the part where the cleaning liquid comes out. This research uses the Research and Development (RnD) method. The result of this research is an automatic hand sanitizer with a large size hand sanitizer that can be mounted into a tool with a maximum of 500 ml. This automatic hand sanitizer will automatically release the hand sanitizer fluid which approves the sensor under the user's hand protective device.

Keywords: *Hand Sanitizer, Automatic, Arduino Nano, Infrared Sensor*

1. INTRODUCTION

The coronavirus has caused the Covid-19 pandemic in the world. The virus, which was first discovered in Wuhan City, China at the end of December 2019, has had a tremendous impact on the survival of world citizens [1]. The reason is, this virus spreads quickly and has spread to almost all citizens of the country, including Indonesia. The government through the Ministry of Education and Culture (Kemendikbud) and the Ministry of Religion (Kemenag) has opened schools in the green zone during the Covid-19 pandemic starting July 2020 in several regions in Indonesia [2]. The opening of the school must be accompanied by stringent health protocols [3], that is not found potential new cluster Covid-19 in school. This is a form of application of the "New Normality" which is being adapted to Indonesian society. "New Normal" means a new normal state (never existed before). The Indonesian people must adapt to the corona virus pandemic with new norms, such as wearing a mask [4] [5] when going outside, always washing hands or using a hand sanitizer and maintaining physical distance when in a crowded place.

To welcome the implementation of the "New Normality", schools are obliged to prepare proper and strict health protocols. Apart from providing soap and

running water for washing hands, of course schools also have to provide a hand sanitizer in each classroom or room that is easily accessible and frequently used. Hand sanitizer is an instant hand sanitizer that can kill germs without using water and can be used anytime and anywhere [6]. Because of its practicality, a hand sanitizer is very suitable for use in a Covid-19 pandemic like this.

When the central government implemented the "New Normality" by opening schools during the Covid-19 pandemic, schools were obliged to maintain the health of all academicians, both teachers and employees., and students, as well as school guests. WHO (World Health Organization) recommends taking care of yourself in order to survive the corona virus which allows it to stick to hands. Therefore, an automatic hand sanitizer is needed that is practical and efficient in regulating the release of gel and hand sanitizer liquid that comes out of the bottle.

Before entering the classroom, according to the protocol, the teacher and students wash their hands using soap provided by the school and a hand sanitizer in each class. The school does not provide a place to wash hands in every class, and it is felt that it will take a long time for students to queue to wash their hands. terms, an automatic hand sanitizer In practical makes it very easy for users to use the hand sanitizer and reduces touch. This Automatic Hand sanitizer uses the Arduino Leonardo Pro Micro as a microcontroller and an Ultrasonik sensor as a human hand detector.

2. METHODS

Hand sanitizer s need to be prepared in each classroom. Making an Automatic Hand sanitizer based on a Microcontroller is an automatic system that functions to increase the efficiency of using the hand sanitizer so that it is more effectively used and does not run out quickly in use. Automatic hand sanitizer is useful for making it easier for the hand sanitizer liquid to come out of the bottle, so that students don't have to press the bottle first. This Automatic Hand sanitizer uses the Arduino Leonardo Pro Micro as a microcontroller and an infrared sensor as a human hand detector. The pump motor gets power from a 5 volt battery and acts as an actuator that will press the bottle automatically. The mouth of thebottle is hand sanitizer connected using an elastic hose that leads to the part where the sanitizer liquid comes out.hand sanitizer This automaticwas developed with the aim of improving strict health protocols, so that no Covid-clusters are found new19 in schools.

The research method used is the method of research and development (Research and Development or R&D). Research and Development (R&D) metho are research methods used to research a product to produce a new product and then test the effectiveness of the product so that it can function in the wider community [7]. This research and development method was chosen because it is longitudinal andstill canbe developed in the future.

2.1. Collecting Data and Information

Collecting data and information in this study using observation techniques. The observation technique was carried out to determine the proper and efficient design of the automatic hand sanitizer. The tool was designed based on observations about the hand sanitizer that had been circulating in the community, then an automatic system was added to reduce touch so as to prevent and reduce transmission of Covid-19.

2.2. Making Tool

In designing an automatic hand sanitizer using a voltage source that comes from a 5 Volt battery that can be recharged using a battery charging module with type TP4056 to turn on the hand sanitizer. The charging battery module is a module that is used to recharge the energy into the battery by inputting electrical energy through a micro USB port [8].

Automatic hand sanitizer is equipped with an switch located on-off on the left side of the hand sanitizer. The on-off switch is used to connect and cut off the current flow from the battery [9]. In this hand sanitizer there is also an indicator inform light the of a red and green LED light. A red light indicates the hand sanitizer is in standby and ready to use. The green light indicates that the hand sanitizer is active and will release liquid hand sanitizer.

On the front of the automatic hand sanitizer, there is the HC-SR04 ultrasonic sensor. The ultrasonic sensor is used to detect hands with a distance of approximately 7 cm from the sensor [10]. If a human hand has been detected, the sensor will send input to the Arduino nano as a microcontroller (central controller). The Arduino nano microcontroller is the control main which has a program to access data from the input [11] of the ultrasonic sensor. Arduino nano will send a signal and drive the pump motor, so that it will pump the hand sanitizer liquid to the water pass hose. The hand sanitizer liquid will be released by a small pipe in front of the appliance.

The design of the automatic hand sanitizer work system is as follows.

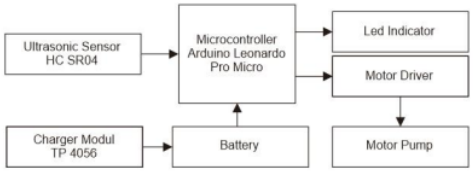

Figure 1 Automatic Hand sanitizer Design

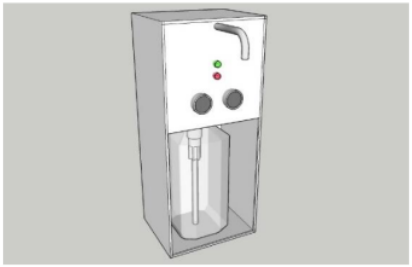

Figure 2 Automatic Handsanitizer Design

Table 1. Automatic Handsanitizer Specification

No.	Characteristic	Specification
1	Working Voltage Arduino	5V
2	Power	2.5 Watt
3	Dimension Box	11 cm x 8 cm x 30 cm
4	Material	Acrylic
5	Fluid Volume	500 ml

The main part of the automatic hand sanitizer working system is the Arduino Leonardo Pro Micro as the main control. In Arduino, there are programs that are used to access data from the input. The input consists of an ultrasonic sensor. The data from the sensor ultrasonic is then processed by the microcontroller to control the Arduino output in the form of motor drivers and lights indicator. The motor driver is used to start the pump motor when getting commands from the microcontroller [12]. The motor driver is used because the microcontroller cannot directly turn on the pump motor. The hand sanitizer design automatic is shown in Figure 2 and the specification is shown in Table 1.

3. RESULTS

This research produces a tool in the form of an automatic hand sanitizer that can be used for the general public. This tool contains 500 ml of hand sanitizer liquid that can be refilled. The hand sanitizer can be filled with liquid in the form of a gel or in liquid form. Hand sanitizer can be installed by attaching it to the wall or placing it on the table. Specifications of automatic hand sanitizer are shown in Figure 3.

Description:

A. Ultrasonic Sensor

B. Green Indicator Light

C. Red Indicator Light

D. Stainless Pipe

E. On off Switch

F. Hand sanitizer Bottle

Figure 3 Automatic Handsanitizer

3.1. Working Principle

To turn on the automatic hand sanitizer can be done by pressing the on switch on the left side tool. After the on switch is pressed, the hand sanitizer is in standby, which is indicated by a red indicator light. Users can use the automatic hand sanitizer by placing their hands in front of the ultrasonic sensor with a distance of less than 8 cm from the sensor. The HC-SR04 ultrasonic sensor is a sensor that can detect hands via ultrasonic waves.

When the ultrasonic sensor detects a hand, the signal from the ultrasonic sensor is then processed and obtained in the Arduino Leonardo Pro Micro microcontroller. After that, Arduino will send an output signal to the motor driver and indicator lights. The motor driver is used to turn on the pump motor when getting commands from the microcontroller. The motor driver is used because the microcontroller cannot directly turn on the pump motor.

When the ultrasonic sensor detects the hand, the green indicator light will light up. This indicates that the hand sanitizer is active and will discharge liquid from the hand sanitizer. The pump motor will run for 1 (one) second, because the program isset with a delay of 1 second. The automatic hand sanitizer flowchart is as in Figure 4.

The hand sanitizer is equipped with a safety device in the form of hand detection which must be more than 1 (one) second. This is done in order not to make toys for underage children. One time filling of hand sanitizer liquid can be used up to approximately 400 times. One time charging the battery, the hand sanitizer can be active for approximately 20 hours.

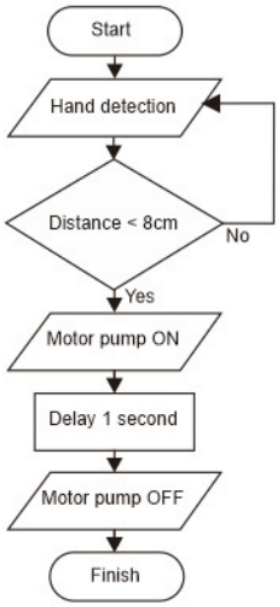

Figure 4. Flowchart Automatic Handasanitizer

Figure 5. Display of Automatic Handsanitizer System

3.2. Test Results

Testing of automatic hand sanitizer tools is carried out by testing the performance of automatic hand sanitizer s. Testing of the automatic hand sanitizer tool is in the form of testing the success rate of the tool. The component that detects hands is an ultrasonic sensor. Testing is done by testing the ultrasonic sensor by placing r hands at a certain distance, namely 5 cm, 7 cm, and 10 cm. The test was carried out on 10 people with 10 detections for each person and the distance between the hands and the sensor.

Table 2. The Success Rate of Automatic Handsanitizer

Respondent	The Success Tool		
	5 cm	7 cm	10 cm
Respondent 1	100%	100%	0%
Respondent 2	100%	100%	0%
Respondent 3	100%	100%	0%
Respondent 4	100%	100%	0%
Respondent 5	100%	100%	0%
Respondent 6	90%	100%	0%
Respondent 7	100%	100%	0%
Respondent 8	100%	100%	0%
Respondent 9	100%	100%	0%
Respondent 10	100%	100%	0%
Respondent 11	100%	100%	0%

Based on Table II, it shows that the automatic hand sanitizer sensor will work properly when the hand is at a distance of 7 cm. The successful discharge rate of hand sanitizer reaches 100%. The success rate of automatic hand sanitizer with a hand distance of 5 cm from the sensor reaches 90%. While the success rate of automatic hand sanitizer with a hand distance of 10 cm from the sensor reaches 10 cm. This is because the program is set at 7 cm to match the hand sanitizer fluid discharge pipe. The program distance can be adjusted via the Arduino program.

4. CONCLUSION

Based on the results of the research on the design of the automatic hand sanitizer that the researchers did, it can be concluded that the hand sanitizer can work well when the hands are at a distance of 7 cm. According to the researchers, 7 cm is considered ideal because it has been adjusted to the discharge pipe for the hand sanitizer . The hand sanitizer can be active for approximately 20 hours and one time filling of the hand sanitizer liquid can be used up to 400 times.

ACKNOWLEDGMENTS

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REFERENCES

[1] Wu, Zunyou, and Jennifer M. McGoogan. "Characteristics of and important lessons from the

coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention." Jama 323.13 (2020): 1239-1242.

[2] Surat Edaran No. 4 Tahun 2020 tentang Pelaksanaan Kebijakan Pendidikan dalam Masa Darurat Penyebaran Corona Virus Disease (Covid-19).

[3] World Health Organization. Protocol for assessment of potential risk factors for coronavirus disease 2019 (COVID-19) among health workers in a health care setting, 23 March 2020. No. WHO/2019-nCoV/HCW_risk_factors_protocol/2020.3. World Health Organization, 2020.

[4] Wu, Huai-liang, et al. "Facemask shortage and the novel coronavirus disease (COVID-19) outbreak: Reflections on public health measures." EClinicalMedicine (2020): 100329.

[5] Cheng, Kar Keung, Tai Hing Lam, and Chi Chiu Leung. "Wearing face masks in the community during the COVID-19 pandemic: altruism and solidarity." The Lancet (2020).

[6] Saadat, S., Rawtani, D., & Hussain, C. M. (2020). Environmental perspective of COVID-19. Science of The Total Environment, 138870. doi:10.1016/j.scitotenv.2020.138870

[7] Haryati, Sri. "Research and Development (R&D) sebagai salah satu model penelitian dalam bidang pendidikan." Majalah Ilmiah Dinamika 37.1 (2012): 15.

[8] Gowda, Manushri, et al. "Power Consumption Optimization in IoT based Wireless Sensor Node Using ESP8266." ITM Web of Conferences. Vol. 32. EDP Sciences, 2020.

[9] Tsauqi, Angga Khalifah, et al. "Saklar Otomatis Berbasis Light Dependent Resistor (Ldr) Pada Mikrokontroler Arduino Uno." PROSIDING SEMINAR NASIONAL FISIKA (E-JOURNAL). Vol. 5. 2016.

[10] Zhmud, V. A., et al. "Application of ultrasonic sensor for measuring distances in robotics." Journal of Physics: Conference Series. Vol. 1015. No. 3. 2018.

[11] Badamasi, Yusuf Abdullahi. "The working principle of an Arduino." 2014 11th international conference on electronics, computer and computation (ICECCO). IEEE, 2014.

[12] El Anwar, Yogie, Noer Soedjarwanto, and Ageng Sadnowo Repelianto. "Prototype penggerak pintu pagar otomatis berbasis arduino uno Atmega 328p dengan sensor sidik jari." Electrician 9.1 (2015): 30-41.

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