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Automatic dispensing mosquito repellant machine with motion detector (Arduino)

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Abstract

Globally, dengue fever is becoming a more serious health issue. Since it is prevalent in the community, prevention is still an important method to remain safe. This study aids in keeping people safe from mosquito-borne illnesses like dengue and malaria by developing an efficient product that prevents toxic substances of mosquito repellants from being directly inhaled by the users. The researchers developed an Automatic Dispensing Mosquito Repellant Machine, that is powered by Arduino and performs automated functions with the use of a PIR sensor. Each component has its specific functions: the PIR sensor senses the motion of an individual or people inside a closed room; the servo motor puts pressure on the head of the mosquito repellant every ten minutes after sensing that there is no motion detected. The machine then sprays mosquito repellant within proximity at a given time interval. In instances that there is motion, the machine will refrain from spraying and indicate that No Motion was detected. The indication of sensing motion is when the red LED lights up and turns green if no motion is detected. This applied experimental research introduced the uses, advantages, and features of Automatic Dispensing Mosquito Repellant machines using motion detection sensors. It tested the efficiency and effectiveness of automatic dispensing rather than manually spraying the repellants. This study introduced a safer experience with repellants and solved people's fear of the toxic substances that could kill mosquitoes but damage human health.

Keywords: Dengue, mosquito repellant, automatic dispensing, motion, machine

Automatic dispensing mosquito repellant machine with motion detector (Arduino)

1. Introduction

Individual human subjects are differentially attractive to mosquitoes and other biting insects. Previous investigations have demonstrated that this can be attributed partly to enhanced production of natural repellent chemicals by those individuals that attract few mosquitoes inside or outside. The Philippines, being a tropical country, has a season when dengue mosquitoes and other related diseases are most active; this year, based on the article of Virola (2022), there is an alarming increase in the number of dengue cases in our province. Dengue is a virus that is carried and transmitted to humans by mosquitoes, primarily Aedes aegypti mosquitoes. This virus targets the lungs, heart, kidneys, and nervous systems of humans; it also causes inflammation and in severe cases hemorrhage that leads to death (Povoa et al., 2014). For many years, many products and many ways on how to avoid the spread of mosquitoes in our community are introduced, but every year death by mosquito-borne diseases is still prevalent. Increasing dengue cases is a problem experienced by many tropical countries around the world. There are available repellents, insecticides, and other preventive measures to ensure the safety of Filipinos, several studies are conducted, and as STEM students at Divine Word College of San Jose, the researchers conducted this experimental research and develop a device that will help in ensuring safety by repelling mosquitoes.

Around the world, people use insect repellents to guard against mosquitoes that bite unnecessarily and spread disease. There has recently been a resurgence of interest in the creation of repellents as instruments to reduce the spread of diseases carried by mosquitoes. The concern is that mosquitoes are small, they can hide anywhere, and people are not always aware of what's around them. They can attack and a person will feel nothing but an itch. Mosquitoes, as the deadliest animal in the world, cause diseases like malaria, dengue, and yellow fever. According to the World Health Organization, mosquito kills about 725,000 individuals worldwide (https://www.pfizer.com/news/articles/mosquito_as_deadly_menace, n.d.). In the Philippines, as of July 2022, dengue cases reached more than one hundred thousand cases, which is 131% higher than the record of last year (Sarao, 2022). These numbers indicate the need for additional prevention measures to prevent the further increase of cases in our country. The vaccine scare worsened the dengue issue and widened the gap of how to solve the problems and lessen the fatality of the said disease.

Mosquito bites can be uncomfortable and can spread diseases like dengue or malaria that are vector-borne to people. Mosquitoes are drawn to human blood because it contains protein, which helps them lay their eggs. When they bite one person after another, they spread the vector illness to humans. There are already lotions and incense present in the market. A more comprehensive effort to manage mosquitoes that spread diseases like dengue or Zika includes insect repellents as one component. With the changing times, everything is turning automatic, making a hassle-free and modernistic way of disinsectization of rooms relevant. The researchers introduced an Automatic Mosquito Repellent Dispenser, that sprays repellent whenever there’s no motion detected inside a room, which is made possible with its motion detection feature. Using Arduino circuits and programming, the product is functional, and the researchers have control over the time interval and duration of each spray of the dispenser. The product is most efficient in enclosed areas like classrooms and offices, where people spend most of their time and mosquitoes are inevitably present (Wasnik & Mehta, 2017).

Mosquito prevention is essential in today’s world, with the number of mosquito-borne diseases on the rise. The increase in mosquitoes is due to several major causes like stagnant water in crowded areas, widespread industrial farming, and overpopulation. That’s why products such as repellents are introduced to fight mosquitoes, and products have different effects, depending on their composition or chemical content. Mosquitoes are attracted to carbon dioxide and lactic acid, which are found in the sweat of warm-blooded animals. The odor is detected by chemoreceptors, which are found in mosquito antennae. what repellants do is

cover the human odor, as a result, mosquitoes distance themselves instead of coming toward their target. A variety of repellants has been studied by professionals and proved the effectiveness and benefits of using organic or natural and chemical repellants. Mosquito repellents based on chemicals have a remarkable safety profile, but they are toxic against the skin and nervous system, in extreme cases result in rashes, swelling, eye irritation, and on worse occasions, anaphylactic shock, and low blood pressure. Hence, natural mosquito repellants are preferred over chemical repellants (Shukla et al., 2018).

The success of this Science Investigatory Project (SIP) is measured through the performance of the dispenser, even so, to incite change in the community regarding the diseases mosquitoes carry, the researchers – as STEM students, also studied the effectiveness of repellent brands, and other possible purposes of an automatic dispenser using Arduino. As students, the project aimed to measure and apply the knowledge researchers acquired, and the product will be of great contribution to providing safety and comfort in the community. This study produced an automatic dispensing machine to keep people safe from mosquitoes spreading diseases and maintain a mosquito-free environment. Dengue and other vector-borne infections can be prevented by avoiding or preventing bites, that's why to fully ensure the safety of everyone in the community, individuals must participate in the prevention of the spread of mosquitoes by maintaining the cleanliness of the surrounding, another highly suggested preventive measure is to not let any water stagnate so mosquitoes will have no place to repopulate.

Statement of the Problem - This study aimed to produce an Automatic Dispensing Machine using a motion detection sensor that releases mosquito repellent every 30 minutes and when there is no motion detected. Specifically, it sought to answer the following questions: (1) What is the level of performance of the automatic dispensing machine (mosquito repellant) using a motion detection sensor in terms of the ability to dispense automatically; ability to sense motion? (2) Is there a difference between using the automatic dispensing machine and the manual dispensing in the frequency of mosquito repellant dispense? (3) Will the automatic dispensing machine spray mosquito repellant accurately every ten minutes when there is no motion detected? (4) What are the lifespans of the different components of the machine when using a 9v battery? (5) What is the level of acceptability of the automatic dispensing mosquito repellant machine with a motion detector in terms of the preferred mode of dispensing; function of the machine; overall perception of the machine?

Significance of the Study - The device's invention revolutionized the use of insect repellants by making them automatically dispensable. And, using motion detection, it can discharge insecticides when no motion is detected in the proximity of the machine, promoting a safe and hassle-free atmosphere. The results and findings are beneficial to the following: For the students of DWCSJ. The machine might be beneficial to the students at Divine Word College of San Jose as a safety device that will protect them from mosquitos while they are inside their classroom. For the citizens and consumers. The device can be beneficial for individuals to provide an efficient, hassle-free, and safe environment, free of mosquitos and the dengue virus. For the community. The invention of this machine could considerably influence others to reduce the spread of mosquitos inside their neighborhood and other establishments within the locality because of the automated design of the machine. And finally, for future researchers. The invention of the device, as well as the information acquired in the study, can be valuable and utilized as a reference for future research. This study intends to provide an overview of the use and effectiveness of automatic dispensers for mosquito repellants, as well as to educate and serve as a guide for future researchers conducting on similar and related topics.

Scope and Delimitation of the Study - The general intent of the study is to produce an automatic dispensing machine using Arduino for maintaining a safer place, especially during the rainy season. This study exists to halt the spread of diseases caused by mosquitoes and their diverse variations, which in turn be beneficial in ensuring the community's safety and an efficient type of repellant. This project, entitled "Automatic Dispensing Mosquito Repellent with Motion Detection Sensor", used Arduino Circuit to produce this machine. With the use of Arduino, this machine only dispenses when no motion is detected. It is to ensure the safety of the users from the chemicals in mosquito repellent. This study did not cover other aspects regarding the production of automatic mosquito

repellents, such as counting how many mosquitoes died when the machine dispensed the mosquito repellant and the effectiveness of the chosen mosquito repellant. And other mechanical enhancements and features that may broaden the field being studied. However, in conducting the study, the quality of the mosquito repellant to effectively kill mosquitoes was considered.

2. Methodology

Research Design **-** This study used an experimental research design in order to test the effectiveness of the target variable in the study. The analysis and examination of the selected related literature and studies were guided by the efficacy of the corn cob ash material. The researchers used this design to determine the effects of the automatic dispensing of mosquito repellant with a motion detector and Arduino. With the help of this experimental research design, the researchers answered the research questions and developed conclusions and recommendations for future researchers in line with a similar research topic. According to Sirisilla (2022), the experimental research design is all about a framework with protocols and procedures to conduct a scientific approach between the two sets of variables in the study. This research design is useful for researchers who want to make accurate research decisions and solid facts. For the primary source of the study, the researchers experimented and tested the difference in the performance and efficacy of the Arduino as an additive to the usual material of mosquito repellant. Due to this, the researchers are able to define and compare the results for determining the efficacy of the focused variables of this study, specifically with regards to the Arduino and automatic dispensing mosquito repellant.

Data Gathering Procedure **-** This project was carried out with the use of simple random sampling in choosing the participants to test the product. The researchers acquired the necessary data to evaluate the device's accuracy with the cooperation of selected individuals. This experimental research design involved ten to fifteen people and an automatic mosquito-repellent dispenser. To increase the device's probability and accuracy when spraying mosquito repellant when there is no motion in the room, the testing stage should last about one month. However, the target individuals and timing may vary owing to future challenges and problems. The researchers instructed the chosen individuals on whether or not to enter or exit the room where the device was placed. They are expected to stay within 5m of the device. Following that, each participant carefully moved outside the room to see if the device will begin spraying mosquito repellant. This method was repeated indefinitely until the required outcome and accuracy were met.

Research Process; Stage 1 Preparation and Gathering of Materials **-** The materials needed to produce the Automatic Dispensing Mosquito Repellant Machine are as follows:

A. **For the machine**:

Figure 1: Arduino Uno R3  https://learn.sparkfun.com/tutorials/arduino-comparis

Figure 2: PIR Motion Sensor  https://shopee.com.my/HC-SR501-PIR-Motion-Sensor-i.8822702.1045682085?sp_atk=6d5c25ff-7c10-4864-

Figure 3: Wires  https://www.pinterest.com/pin/855965472914565431/

Figure 4: Resistor  https://www.amazon.in/INVENTO-Resistor-Resist

Figure 5: DC Motor Dynamo  https://www.made-in-china.com/showroom/funtainmotorjason/product-detailmvSJYuhDXokC/China-3V-DC-Electric-Motor-FF-N20ta-12000rpm-for-Door-L

Figure 6: Battery  https://www.koreanclass101.com/blog/2014/06/29/

B. Casing and Accessories:

Figure 8: Plywood  https://www.alibaba.com/product-detail/18mm-4-8-Birch-Plywood-price_10000007345440.html?spm=a2700.7724857.0.0.40ea3fd6c4qBOu

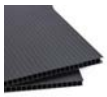
Figure 9: Corrugated Plastic Sheet  https://www.amazon.ca/T-SIGN-Corrugated-Poster-Sh

Figure 10: Breadboard  https://www.sparkfun.com/products/12002

Figure 11: LED Light  https://us.rs-online.com/product/vcc-visual-communic

Figure 12**:** Mosquito Repellant  https://www.dreamstime.com/royalty-free-stock-photography-mosquito-spray-can-repellent-white-background-image39419517

The researchers used the already familiar controller kit used in Divine Word College of San Jose, the Arduino. Major materials were bought online, such as the Uno R3, Motion sensor, and DC motor. Wires, resistors, and LED lights were bought online as well. Plywood for the casing and mosquito repellant was bought at a local hardware store. The materials above were purchased online at a cost of P2,000.

Stage 2: Construction and Development of the Product - As the design illustrated below in Figure 14, the machine consists of different components that function together to perform the intended mechanism of the product. The researchers used an automatic dispensing mechanism in forming the device and its intended output for the experiment, meaning the use of a motion-sensing component was the key part of the construction of the machine. With the P.I.R Sensor being present in the machine's exterior and connected indirectly to the Arduino UNO R3, it senses the movement of any moving and living entity within the machine's proximity. The activation of the P.I.R sensor sends an electric signal to the Arduino UNO R3 and the component is the one to process the signal and makes the decision based on what is programmed to do, which is to dispense mosquito repellant every ten minutes.

The Arduino UNO R3 served as the machine's brain, receiving and sending electrical signals to the device's various components, and is powered by the machine’s battery power supply. The Arduino controls the spray intervals of the machine and is programmed by the researchers to determine whether or not to dispense mosquito

repellant based on the sensor's input signal, which indicates whether or not the motion is detected. After the motion was being detected, the machine waits ten minutes before performing another scan for signs of movement; when motion is still detected, the device waits until no motion is detected; otherwise, it dispenses continuously every ten minutes until motion is detected again.

The machine's indicator was the LED lights located above the P.I.R sensor. The component is programmed and is indirectly connected to the Arduino UNO R3. The researchers can use it to indicate whether the machine detects movement or dispenses the repellant. The program code for the lights is connected to the machine's systematic process to signal the machine's succeeding course of action. The red LED light is activated if the sensor receives an electrical signal indicating that motion is detected in the surrounding environment, whereas the green LED lights flicker or blink to indicate that the machine is ready to dispense the repellant at the specified time. The researchers plan to use a servo motor as the product's pushing mechanism. The Arduino is programmed to only rotate the servo motor at a specific angle to push the nuzzle of the aerosol can and then retract to its original position after the dispensing process is complete. A breadboard connects the components such as the servo motor, P.I.R. sensor, and LED lights. It acts as a channel system between the components and the Arduino. This part is useful to researchers because it allows the circuit wires of various components to be moved, replaced, and temporarily placed during the machine's experimental and construction stages.

For the construction of the machine, the researchers created a connection between the P.I.R. sensor, the servo motor, the LED, and the Arduino using circuit wires and the breadboard. To test the functionality of the components, the researchers programmed the functions of each component until they operated together. The components are then attached inside and outside the box in the locations depicted in Figure 1. The researchers designed a compartment to hold the repellant inside the box; the compartment is strong enough to hold the can and be able to release it for replacement. Once the machine's components are secure and properly positioned, the final step is to test the Arduino program and the function of the components to ensure that everything is working properly.

Figure 13. Actual product of automatic dispensing mosquito repellant machine with motion detector (Arduino)

Stage 3: Experimental Stage, Observation and Data Recording - The researcher experimented with the capacity and effectiveness of the PIR Sensor and Servo Motor in terms of detecting the motion, automatic dispensing, and consistency in dispensing every 10 minutes. First, the researcher used the Tinkercad Arduino Simulator to encode and program the system. Then, assemble the Arduino Uno R3 by connecting the breadboard, PIR sensor, jump wires, servo motor, LED, resistor, dynamoelectric machine, mosquito repellant, and wood to create and build the machine. To run the program, the encoded and programmed data in Tinkercad has been applied to the Arduino. Then, testing and simulation of the circuit followed. The researcher then measured the capacity and effectiveness of the Arduino in dispensing automatically while no motion was detected. Finally, the researcher measured the performance of the machine in terms of its consistency in motion detection and accuracy in dispensing.

In this project, the researchers gathered the primary data before and after the completion of the machine. In the making of the machine, the researchers recorded every step, procedure, preparation of the materials needed, and construction of the machine. In the making of the machine, all photos and videos were conducted in order to

show that the machine was made by the researchers. With the completion of the machine, the researchers observed whether the finished product is functional. And also, they wrote down all information and assured that the data gathered will provide accuracy and honesty.

Statistical Treatment of the Data **-** The researchers used several statistical treatments such as the T-test for Correlation Coefficient, frequency counts, weighted mean, and also descriptive analysis. Each research problem was given an answer by constructing tables, presenting graphs, and explanations for the interpretation of the data collected. These provide validation and proof that Automatic Dispensing Mosquito Repellent Machine with Motion Detection can be further improved to produce better-performing items. Every data explained how this machine can be beneficial to the community in terms of staying safe from mosquitoes.

3. Results and Discussions

Table 1

Time it takes for the automatic dispensing mosquito repellant machine to spray

Spray Count	Time taken before spraying (seconds)
1st	7:43
2nd	7:37
3rd	7:29
4th	7:58
Average	7:42

The data in the table above signifies the consistency of the motion detection function of the machine. The timer started when the green LED blinked for the first time, indicating that it is about to power the PIR motion sensor. Since no motion was detected, the machine was successful in automatically dispensing mosquito repellant with an average of 7-second duration from warning to detection process, and to the actual spraying. As stated by Manyika et al. (2017), Automation is vastly relevant in these times, and that's why a functional automatic machine will provide efficiency and effectiveness in people's lifestyles. Being successfully automatic it will also introduce potential and can pave the way for improvements in the future.

Table 2

Time it takes for the automatic dispensing mosquito repellant machine to indicate no motion detected

Spray Count	Time taken before the indication of not spraying (seconds)
1st	7:18
2nd	7:47
3rd	7:35
4th	7:44
Average	7:36

Repeated exposure to chemicals when in an enclosed area can cause health issues according to the National Library of the Philippines (2017). That's why the automatic dispensing mosquito repellant's ability to perform highly in terms of sensing motion is crucial. After blink warnings, the red LED will light up, signifying that there is no motion within the proximity. Table 2 shows that the indicator function is as effective as the spraying's, proven by the equal 7 seconds duration from a warning to the detection process, and the actual spraying. The machine not spraying within a consistent and ideal time interval implies that it is detecting motion successfully.

Table 3

Frequency of mosquito repellant being dispensed by automatic and manual dispensing in the period of 1 hour

Frequency of repellant being dispensed within the time interval of 1 hour	Automatic	Manual
1 minute	1	1
5 minutes	0	0
10 minutes	1	0
15 minutes	0	0
20 minutes	1	0

25 minutes	0	0
30 minutes	1	1
35 minutes	0	0
40 minutes	1	0
45 minutes	0	0
50 minutes	1	0
55 minutes	0	0
60 minutes	1	1

Legend: 1 = Repellant did dispense; 0 = Repellant did not dispense

A test was conducted to determine the difference in efficiency between the two ways of dispensing. Table 3 shows how the automatic machine dispenses the repellent every 10 minutes for an hour. In terms of manual dispensing, the researchers discovered that a typical home resident can spray mosquito repellent every 30 minutes at most, given the time and availability to do the task. With this data and result, it was concluded that automatic dispensing is more efficient with the task of spraying than manual spraying, which can be taken as an automatic machine and processes are very beneficial to people's livelihoods and lifestyles because automatic machines can be programmed to perform certain tasks with precision without the assistance of humans. And with the advancement of technology, these machines and concepts can be further enhanced to make their features and characteristics more efficient and effective as stated by Manyika et al. (2017).

Table 4

T-test of Frequency of mosquito repellant dispense

t-Test: Paired Two Sample for Means	Automatic	Manual
Mean	0.538461538	0.153846154
Variance	0.269230769	0.141025641
Observations	13	13
Pearson Correlation	0.394771017	
Hypothesized Mean Difference	0	
df	12	
t Stat	2.738612788	
P(T<=t) one-tail	0.00898874	
t Critical one-tail	1.782287556	
P(T<=t) two-tail	0.01797748	
t Critical two-tail	2.17881283	

As observed in Table 4 above, the t critical value is 2.18, while the computed t is 2.74; indicating that t comp is greater than the t critical value, hence there is enough evidence that there is a significant difference between using automatic and manual spraying of mosquito repellant. Additionally, 0.01 p value being less than 0.05, proves that the null hypothesis stating there is no difference between using automatic dispensers and manual dispensing was rejected. According to the study of Ahmad et al. (2021) spraying techniques have improved over time, even now it is still evolving. For instance, pesticide sprayers are used in agriculture, and alcohol dispensers are widely used. Because of automatic spraying, the machine can save costs, and increase the effectivity rate, using automatic frequency of dispense.

Table 5

Spray the count of mosquito repellant every 10 minutes when there are no people detected.

Spray count	Time (pm)	Interval (minutes)
	8:07 pm (time started)	
1st	8:17	10
2nd	8:27	10
3rd	8:37	10
4th	8:47	10
Total		40 mins

The machine was placed in a corner facing the wall for assurance of no motion detection occurrence. Table 5 shows the consistent spray of the automatic dispensing mosquito repellant machine. As programmed, the machine was able to spray every ten minutes for four consecutive times when there was no movement. As

proved by a simulation conducted by Gami (2017) which showed that the PIR sensor has a 93% - 99% accuracy in terms of effectively detecting the presence and distance of a human.

Table 6

The lifespan of the functionality of the different components in the machine using a 9V of battery

Components	Servo Motor	P.I.R. Sensor	LED Lights	Arduino UNO R3
Duration of Function by the hour with 9v Battery	7 hours	7 hours	9 hours	10 hours

The machine experiments with a 9v battery to test the lifespans of the machine's components, particularly the Arduino. The researchers discovered that the machine can run for about 8-10 hours. According to their observations, the Arduino UNO R3 can run for about 10 hours before the 9V battery runs out of power also stated by Forum System (2023). Other components, such as the servo motor and PIR sensor, can only run for about 7 hours, and the LED lights only for 9 hours. It concludes that the machine can run for numerous hours using a 9V battery without being turned off. Turning it on only when needed will allow the machine to run for a long time before needing a new battery.

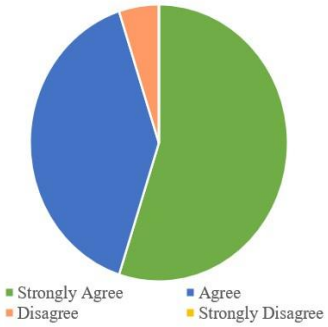


Figure 14: Survey result of respondents' preference towards automatic and manual dispensing.

Part of the survey conducted includes a measurement of the respondent's preferred mode of dispensing, whether they agree or not that using an automatic dispenser is better than manual spraying. 55% of the respondents Strongly agreed that automatic is better than manual, 40% agreed, while the remaining 5% think that manual is still better. Strengthened by the research of Bakar et al. (2021) who introduced an intelligent auto-dispenser system programmed with cognitive computing, internet, and cloud computing, that solved the problem of when the system will spray. They called it the iAMR device; it successfully ensured the safety of the whole family by ensuring a mosquito-free home.

Table 7

Mean Level of the Respondents' View on the Function of the Machine

Questions	Frequency				Overall		Percentile Rank
	4	3	2	1	WM	Descriptive Equivalent (D.E.)	
The automatic dispensing repellant machine dispenses automatically.	19	1	0	0	3.95	Strongly Agree	1
The automatic dispensing repellant machine's PIR Sensor is functioning and can detect people.	14	6	0	0	3.7	Strongly Agree	4.5
The automatic dispensing repellant machine can spray accurately every ten minutes or any stated time when motion is not detected.	13	7	0	0	3.65	Strongly Agree	3
No errors occurred while testing the automatic dispensing repellant machine.	15	5	0	0	3.75	Strongly Agree	2
The automatic dispensing repellant machine can effectively help keep people safe from the toxic substances in the mosquito repellant.	10	10	0	0	3.50	Strongly Agree	6
The PIR sensor can detect motion from different corners of the closed room.	13	6	1	0	3.6	Strongly Agree	5
The automatic dispensing repellant machine can occupy the room when it is spraying.	3	13	4	0	2.95	Agree	7
The automatic dispensing repellant machine can effectively dispense a consistent amount of mosquito repellant every time.	15	4	1	0	3.7	Strongly Agree	4.5
Overall Weighted Mean					3.6	Strongly Agree	

Table 7 shows the effectiveness of the automatic mosquito repellent dispenser based on the response to the survey conducted. This first part of the survey consists of 8 questions that comprise the respondents' views about the function of the machine. The overall weighted mean was 3.6, which indicates the respondents strongly agreed that the automatic dispensing mosquito repellent machine is functioning well. Bai et al. (2013), stated that there was scientific evidence that supported the high rising cases of mosquitoes-borne diseases having a relation with climate change in the country. With issues and problems facing climate change and global warming, the study shows the impact of it on the transmission of diseases from mosquitoes. Therefore, the automatic mosquito repellent machine can help halt the spread of diseases caused by mosquitoes.

Table 8

Mean Level of the Respondents' Perceptions of the overall machine

Questions	Frequency					Overall	Percentile Rank
	4	3	2	1	WM	Descriptive Equivalent (D.E.)	
The automatic dispensing repellant machine can help households and enclosed areas decrease mosquito presence.	13	6	1	0	3.6	Strongly Agree	3
I recommend the automatic dispensing repellant machine to others to help them eliminate mosquitos and other insect presence.	15	5	0	0	3.75	Strongly Agree	1
The automatic dispensing repellant machine can be beneficial to our society to help reduce mosquito diseases.	14	6	0	0	3.7	Strongly Agree	2
I prefer this Automatic mosquito repellant dispenser to manual spraying.	11	8	1	0	3.5	Strongly Agree	5
The automatic dispensing repellant machine is durable and can be used for a long period.	12	7	1	0	3.55	Strongly Agree	4
Overall Weighted Mean					3.62	Strongly Agree	

Table 8 is the second part of the survey which shows the respondents' perceptions about the machine. It has an overall weighted mean of 3.62, which implies the respondents strongly agreed on the problems provided, such as the help of the machine to decrease the population of mosquitoes in households and enclosed areas, to recommend this automatic dispensing repellant machine to others, its benefits to our society, the fact that they prefer to use it over manually spraying, and the fact that the machine can be used for a long period. The question with the highest weighted mean indicates that they will recommend the machine to others to help them eliminate mosquitoes and other insect presence. While the lowest weighted mean indicates that they prefer this automatic mosquito repellant dispenser to manual spraying. The findings are supported by Bakar et al. (2021) who conducted a study named i*AMR: Intelligent Auto-Dispenser Mosquito Repellent System*, this device is an all-in-one system that can ensure the whole family that their home is mosquito-free.

4. Conclusions and Recommendation

Based on the gathered data, the researchers came to the following conclusions: Through experimentation and observation, the researchers found out that the Automatic Dispensing Mosquito Repellent Machine is effective when it comes to dispensing insect repellant automatically. The Automatic Dispensing Machine is more efficient to use than manually spraying it. The machine was successful in dispensing mosquito repellant every 10 minutes. The result of a conducted experiment where the machine consistently sprayed every exactly 10 minutes in the span of 40 minutes was the basis of the result. In the observation, all components were properly functioning, and the automatic dispensing machine was able to run for about 6-7 hours on a 9-volt battery. The machine is accepted and suggested by respondents to be used in maintaining safety against mosquitos and the diseases they carry.

Based on the conclusions drawn from the findings, the researchers recommend the following: The researchers found that coding is an important prerequisite for influencing the level of performance of the machine. On this basis, improving the coding with high-level commands can enhance the capabilities of the machine and also can lessen the occurrence of errors. This product can be further improved if more efficient

materials will be available in the market such as sensors and servo motors. More users will be encouraged to use automatic dispensing machines rather than manually spraying the repellant. This machine's design is determined by the researcher's selected size of repellent. Designing a better model of the machine that can fit any size and type of repellant would be revolutionary and innovative. The machine is capable of running for consecutive hours unless the battery is interrupted. With that, create a chargeable type of machine or have the ability to switch to the outlet-powered machine for long consecutive use. The machine can only spray in the corner where the user places it. Therefore, it cannot occupy the whole place. It can be further improved by adding wheels and robotic features that will help it move and spray throughout the room. The materials used in the creation of the machine's housing affected the weight of the machine, which makes it heavier. Future researchers should build their machines out of lightweight materials and make them compact for a better user experience.

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