Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA)

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ABSTRACT

On the 30th day of January 2020, the first case of the coronavirus in the Philippines was recorded. Today, on the 26th day of September 2021, the Philippines have reached a total of 301 256 COVID-19 cases. In response to the continuous rise of coronavirus victims in the country, the government has enforced necessary protocols and safety measures to prevent the virus from spreading. The previously mentioned protocol includes instructing the public to maintain a 1-meter distance in all public places to limit the interaction between the individuals. To ensure the effectiveness of the social distancing rule, the researchers proposed an application named PBP^{2}DRA or the Bluetooth-Powered Physical Distancing Regulator Alarm, which will notify a person whenever their distance to other people is below one meter. The proposed Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA) application intends to prevent other people from infringing the protocol and protect them from possible exposure to the virus. The device can detect persons within a 1-meter distance. Therefore, it will provide a real-time reminder to humans even without the security officers around them. It has two ways of sending notifications to the person. First, it automatically emits a sound to alert the individual when a person surpasses the 1-meter social distance. Second, it sends a notification to the mobile phone of a user through Bluetooth communication. The researchers will look deeper into the development and formulation of suitable innovations to create an effective social distancing device that can address the problem of today's society.

1. INTRODUCTION

On the 30th day of January 2020, the first case of the coronavirus in the Philippines was recorded. According to World Health Organization, Coronavirus disease, popularly known as COVID-19, is an infectious disease caused by the SARS-CoV-2 virus, which can be spread from an infected person's mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. Current evidence suggests that the virus spreads mainly between people in close contact with each other, typically within a 1-meter distance (short-range). Today, the number of cases of Covid-19 is increasing day by day, continuously causing the death of thousands of people. The Department of Health stated that there are 2,731,735 total cases as of today — the 20th day of October 2021. A tally of 40,972 people died, and 2,627,126 people were able to recover from the virus nationwide. In response to the continuous rise of coronavirus victims in the country, the government has enforced necessary protocols and safety measures to prevent the virus from spreading. The previously mentioned protocol includes instructing the public to maintain a 1-meter

distance in all public places to limit the interaction between the individuals. To ensure the effectiveness of the social distancing rule, the researchers proposed a device named PBP^{2}DRA or the Bluetooth-Powered Physical Distancing Regulator Alarm, which will notify a person whenever their distance to other people is below one meter.

The proposed Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA) device intends to prevent other people from infringing the protocol and protect them from possible exposure to the virus. It specifically aims to prevent the spread of the COVID 19 and decrease the number of cases by assuring that people follow the IATF guidelines. The researchers guarantee that the use of this application will play a significant role in maintaining and monitoring the distance of each individual, especially in public places. More importantly, it will reduce contact with contaminated surfaces and stop the chain of transmission of the virus. The device can detect persons within a 1-meter distance. Therefore, it will provide a real-time reminder to humans even without the security officers around them. It has two ways of sending notifications to the person. First, it automatically emits a sound to alert the individual when a person surpasses the 1-meter social distance. Second, it sends a notification to the mobile phone of a user through Bluetooth communication.

The researchers will look deeper into the development and formulation of suitable innovations to create an effective social distancing device that can address the problem of today's society.

Statement of the Problem

This study aims to assess the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA).

Specifically, it seeks to answer the following questions:

1. What is the effectiveness is the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA) relaying alert message in terms of:
   a) Android phone alarm through Bluetooth communication
   b) Buzzer
2. What is the efficiency rate of the device in terms of lessening the COVID-19 cases?
3. What enhancement may be needed to improve the proposed system?

2. REVIEW OF LITERATURE

Distance estimation of the moving object by the use of Bluetooth. They've Received Signal Strength Indicator (RSSI) from a crowded environment and overcome it by using Kalman Filter (KF) to smooth the RSSI proportion. The filtered RSSI value is further translated using a Support vector machine using a non-linear kernel function to calculate and estimate the distance. Mobile phones resulted in certain estimation of receiving a limited rate of distance and some delay occurs on calculating the distance (Lam & She, 2019).

Miniaturized particular electronic nose (39 mm × 33 mm), a system which is managed through apps developed for smartphones. The electronic nose (e-nose) incorporates four new generations of digital gas detectors. These MOx- type detectors incorporate a microcontroller in the same package, lower from the other former generations. In this way, it makes it easier to integrate them into the electronics and improves their performance. In this paper, the operation of the device is concentrated on the discovery of atmospheric adulterants in order to round the information handed by the reference stations. To validate the system, it has been tested with different attention to NOx including some tests specifically developed to study the behavior of the device in different environment conditions. Eventually, a mobile operation has been developed to give bracket services. With a direct regard, a neural network has been established, trained, and integrated into a smartphone app for reusability purposes of information recaptured from frame-nose bias. (Arroyo et al., 2020).

In this age, people are getting more concerned to protect their residence from unauthorized people and as such, setting up an effective and dependable presence detection for residential and office operation has been a necessity. With technology advancement, movements are detected and a message sent quietly on a smart mobile phone to notify the resident to be aware of the motion for prompting actions. This paper discusses the use of passive infrared (PIR) sensors and Bluetooth devices to alert a resident of a guest coming near or into the house. This system employs a PIR sensor, a microcontroller, a Bluetooth module and controller application for Android smart phones. When the sensor is powered, it will automatically sense any movement of human beings within its field of view, it will also measure the infrared light radiating from bodies by heat variation and send it as a signal to the microcontroller. The microcontroller receives this signal, processes it and sends the information to the Bluetooth module which in turn transfers this information unto the registered smart mobile phone Bluetooth application to notify the house resident that a movement has been detected. Tests conducted showed that the system worked effectively, compact and affordable. (Fatimah et al., 2020).

The prevention of viral diseases such as COVID-19 relies heavily on social distance. By limiting intimate physical contact between people, we can reduce the risk of catching the virus and spreading it throughout the community. The purpose of this article is to provide a comprehensive overview of how emerging technologies like wireless and networking, and artificial intelligence (AI), as well as other technologies, can enable, encourage, and even impose social severance. To that end, we provide a comprehensive overview of social distance, including fundamental ideas, metrics, and models, as well as several genuine social distancing structures. Then we go over certain enabling wireless technologies that are particularly successful and may be widely used in practice to maintain distance, encourage, and enforce social distancing in general. Following that, various new and related technologies are discussed, such as machine learning, computer vision, thermal imaging, ultrasound, and so on. These innovations bring up a variety of different options for coping with social isolation difficulties, including symptom prediction, quarantine detection, and monitoring, and contact tracking. Finally, we discussed some of the most pressing issues and obstacles that come with putting social separation into practice (e.g., privacy, incentive systems, security, and organizing). Instead of reacting to COVID-19-type pandemics in the future with ad-hoc reactions, smart infrastructures (e.g., next-generation wireless systems like 6G, smart home/building, smart city, intelligent transportation systems) could embed a pandemic mode into their standard architecture/design. (Nguyen et al., 2020).

SD-Tag is a novel social distance system that helps to keep COVID-19 from spreading in crowded situations. The suggested work's key contribution is that it ensures safe social spacing between individuals indoors and provides an efficient social

distancing method for maintaining social distances between people in public spaces, with an average accuracy of 1.69 m. Using the SD-Tag device, the average estimated social distance to the headed person(s) was approximately (1.69 m) in an experiment, indicating that the proposed SD-Tag system provides an efficient estimation measurement to maintain social distance between persons in the area of interest. Moreover, to locate busy places, this social distance monitoring system uses two methods: first, computing the total number of people recognized by the SD-Tag, and second, estimating the total number of SD-Tags in a given region. Its goal is to use wireless sensor networks to ensure good quality (Alhmiedat & Aborokbah, 2021).

STEM is an interdisciplinary approach that provides a learning environment where students can apply the fields of science, technology, engineering and mathematics to their daily lives. The purpose of STEM is to train students to become STEM literate. The goal of this paper was to implement STEM learning with electricity in 8th grade students using experiments based on Arduino Android games. STEM learning was chosen as the approach for this study because it was developed through lesson plans and worksheets for Android games, YWRobot, and Arduino Uno experiments. The analysis of this study focused on the effects of lesson planning and worksheet-based STEM learning on electrical second-year middle school students' STEM abilities. The method used in this study was a pre-experiment by designing a pre-test-post-test for the group. The data for this study was taken from an objective STEM literacy test (pre-test and post-test) by Allan Zollman. It is then analyzed based on all aspects of the STEM competency, including science, technology, engineering, and mathematics. The results show that the values from the student's STEM Competency Pre-test Post-test are 0.06, 0.12, 0.06, 0.87 for knowledge of the natural sciences, technology, engineering and mathematics. The result meant that the implementation of STEM learning was not optimal for improving the fields of science, mathematics, technology and engineering. The reason for this is that the implementation of STEM learning was not continuously implemented. As a result, electricity-related science, technology, engineering, and technology literacy are not optimally emphasized. (Yasin et al., 2018).

Due to COVID-19 pandemic, society needs to embrace and adopt a new norm that includes exercising social distance to break the transmission. The smart social distance application tracker helped people to monitor social distance violations and be reminded to adhere to this practice. Through the use of this, maintaining high social distance is possible which reduces and minimizes the number of COVID-19 cases. This paper will present an innovative solution called My Safe Distance (MySD) that helps users or individuals to observe social distance advice closely. It takes advantage of smartphone hardware features that typically have Bluetooth transceivers as well GPS to determine safe distances and comply with the required level of compliance on social distancing issues (Rusli et al., 2020).

Adhering to the norms of social distance between people has become an important precaution to delay the transmission of COVID 19. This paper presents a new way to automatically detect pairs of people in crowded scenarios that do not comply with social distance limits. NS. About 6 feet between them. The approach does not assume anything about the walking direction of crowds or pedestrians. The researcher used a mobile droid with a commodity sensor, namely an RGBD camera and 2D lidar, that are used to perform collision-free navigation in the crowd and estimation of distance between all perceived people in the camera's field of view. In addition, the droid is equipped with a thermal image camera that wirelessly sends thermal images to security guards / healthcare professionals who monitor whether a person's body temperature is above average. In indoor scenarios, our mobile robots can also be combined with statically mounted CCTV cameras to further improve performance in terms of the number of social distance violations detected, accurate pedestrian tracking and more. Emphasizes the performance benefits of the approach in a variety of static and dynamic indoor scenarios (Sathyamoorthy et al., 2020).

(Yuan et al., 2020) Bluetooth Travel Time Data Information Extraction—The State of Delaware, USA" stated that using Bluetooth sensors for travel time measurement as an alternative to GPS probe vehicle data collection in determining appropriate speed limits, calculating the planning time index and identifying and categorizing congestions and causes. Moreover, the study has discussed and tested the measurement of travel time data collection with the use of Bluetooth by which it meters the sensor capability to detect and collect data from an appropriate time index, operational speed, and identifying and categorizing congestions and causes compared to GPS probe vehicles. Justifying the Bluetooth method main intention aforementioned in this study, the objective result resulted that Bluetooth can rival the GPS probes in vehicles. Only drawback is its difficulty in determining congestion problems amongst vehicles. Bluetooth sensors are obviously not capable of collecting such information and are not necessary for travel time data retrieval purposes.

A social distance monitoring system using a microcontroller and sensors, especially designed for this pandemic. This sensor will receive infrared radiation coming from the human body and will alert the user using the mobile device. It is also possible to convert the infrared radiation obtained from the sensor into the body's thermal conductivity temperature. In this way, this device will not only maintain a distance but can also measure individuals' temperatures that are within the range. This device undergoes simulation, and when the simulation is completed, the results are found to be within the range. On plotting a trend line between sensor output and distance, the coefficient of determination R2 found to be 0.95, which is close to 1. It shows that the regression line is an excellent fit to the data. Both plots confirm that the regression model obtained is correct, and so the system's accuracy is confirmed. The device is ideal for social distancing and detection of COVID symptom patients because it has outstanding skills and is less difficult to use (Nadikattu et al., 2020).

Monitoring early initial symptoms of COVID-19 tracking by using wearable devices intact with sensor technology for detection of initial symptoms of COVID-19. The review conducted between December 2019 and June 2021 evaluated at least 70 articles and scientific literature on the use of wearables related to COVID 19. Those findings discussed problems and solutions for the global use of these wearables. Those IoT-based devices and wearables have been very helpful to the researchers of this paper on diagnosing the multidisciplinary state of the human body such as pulse rate,

respiratory rate, heart rate, body temperature, etc. This systematic review provided a comprehensive overview of portable systems for remote management and automated evaluation of COVID 19, taking into account the reliability and acceptability of the implemented technology (Channa et al., 2021).

3. METHODOLOGY

3.1 Research Design

This study intends to follow experimental and descriptive methods of research. One of the protocols of the COVID-19 to protect and safety of everyone. Where the gathered data is focused on monitoring and maintaining the social distance of everyone to avoid getting infected and for safety purposes. This study will use the descriptive method of research and observations in gathering data about the problem The use of Likert Scale Technique is also noticed to measure the usability and functionality of the device, and user satisfactory level in accordance with the proposed solution to resolve the problem.

Moreover, the researcher decided to develop application software that has sensors that keep distance from everyone for their safeness. The project ensures the success of the development process of the system and addresses the problem and needs. The respondents are the Camarines Norte State College students and observe the problems they encountered in maintaining social distancing. Also, the respondents will be interviewed for their experiences in gathering data to obtain efficiency and relevant data for the project proposal.

3.2 Research Instrument

In the data gathering procedure, the researcher ensures that the responses of the target audiences will be treated with the utmost confidentiality. To gather sufficient information needed to make this study possible, the researchers will use the following instruments:

a. **Internet and Research Articles**

The researchers will collect appropriate information and ideas that have a greater relation to the present study that will be done by using the internet and research articles.

b. **Interview**

The researchers will use interviews to gather information from the respondents regarding the proposed study to be able to clarify, organize, and explain things for them to understand and gather useful information. The researcher gave understanding and opportunity for clarification and has a huge impact on the success of the study by asking directly.

c. **Observation**

The proponents will use observation to add information to the study. It will gather information through observing the students of the case on how the proposed output will be helpful to maintain the protocol during this pandemic.

Table 1. List Of Materials, Tools And Equipment

Materials	Quantity	Price
Ultrasonic Sensor	4	300
Arduino Nano	1	225
Buzzer (piezo)	1	12
Wire	1 (set)	75
Bluetooth Module	1	275
Powerbank	1	499
Breadboard	1	195

3.3 Fabrication Process

1. Prepare 4 units of ultrasonic sensors, a unit of breadboard and a unit of Arduino Nano. Then extend the connection of the terminal ports of the Arduino Nano by bonding it with the terminals of the Breadboard.

2. Connect the terminals of all the units of the ultrasonic sensors to the ports of the breadboard using a set of connecting wires. All VCC terminals are connected together as well as the GND terminals of the ultrasonic sensors. While the TRIG and ECHO terminals are connected on each individual port of the breadboard.

3. In order to extend the wirings of the ultrasonic sensors, multiple units of connecting wires were used. Secure the bond of connecting wires by using a set of soldering iron and soldering lead.

4. Cover the solder with electrical tape to prevent the wires from unnecessary contact with each other.

5. Connect a unit of buzzer to the breadboard. Use jumper wires in order to extend the terminal connection of the said unit.

6. Connect the terminals of the Bluetooth module to its designated terminals of the Arduino Nano. The VCC and GND terminals are connected to the 5V and GND terminals of the Arduino while the RX and TX terminals are connected inversely to each other.

7. Attach the set of ultrasonic sensors to the prototype. Secure the attachment.

8. Install the wiring setup of the Arduino circuit to a plastic casing. Then on the cover of the casing, drill small holes using

a mini drill for the sound of the buzzer inside to pass through the casing.

9. Connect the Arduino cord to the Arduino Nano then upload the program of the prototype.

3.4 Device Usage

a. Buzzer

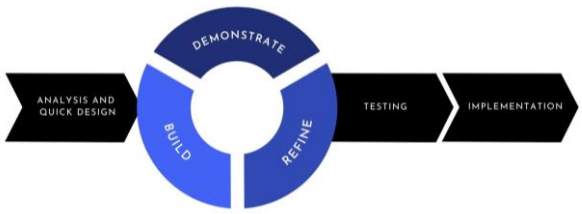
Switch on the device by connecting the cord to a power source (e.g. Powerbank). Upon switching on the prototype, the buzzer will beep three (3) times as an indicator. Then, the prototype will set-up the reading of the sensors and once the set-up is in normal condition (no person is within 1 meter distance limit) the buzzer will remain silent. Once a person exceeds the 1-meter distance limit, it will trigger the sensor on which it is located then the prototype will operate by means of a beep alarm and display on the phone thru the Bluetooth application.

b. Phone Display

Switch on the device by connecting the cord to a power source (e.g. Power bank). Upon switching on the prototype, the buzzer will beep three (3) times as an indicator then, the prototype will set-up the reading of the sensors and once the set-up is in normal condition (no person is within 1 meter distance limit) the buzzer will remain silent. Then, using a unit of mobile phone can access the same readings of the prototype. Open the application named "PBP^{2}DRA" in the user's mobile phone and connect the two devices through Bluetooth. Select the device and pair. Once paired and connected, a real time reading will now be displayed on the screen of the mobile phone. Once a person exceeds the 1-meter distance limit, it will trigger the sensor on which it is located then the prototype will operate by means of a beep alarm and display on the phone thru the Bluetooth application.

3.5 Software Methodology

Figure 1. PBP^{2}DRA RAD Software Methodology



The phases of Rapid Application Development software methodology are described below.

Phase 1:
Researchers begin to establish a broad variety of project demands during this phase, much like they would during project scoping. This phase is brief, with higher importance placed on prototype iterations, yet it is critical to project output's success. The researchers work together to identify any potential problems that may arise during the development process.

Phase 2:
After accomplishing the first stage, the developers can start developing and designing prototypes. The proponents collaborate until a final product is produced to ensure that the project's output expectations are met. This stage is usually repeated as needed as the project progresses.

Phase 3:
To ensure that the end product satisfies the output expectations and objectives, the software is rigorously tested. Developers will gather user feedback after the prototype has been turned into a functioning model in order to alter and refine the prototype and test the software to determine if it produces the desired results.

Phase 4:
This step entails coding all of the data gathered and creating the system that will be used to create the prototype.

Phase 5:
The different models are analyzed separately to quickly identify and adjust the components that will result in the most effective product. The Testing and Turnover phase ensures that the prototypes developed are thoroughly tested. Your prototype should be devoid of serious faults, as the majority of the elements have already been inspected.

3.6 Participants of the Study

The participants of this study are 10 random people from Daet, Camarines Norte. Specifically, the individuals who are present in the place of the study — Centro of Daet during the testing process. The researchers will utilize a convenience sampling method for selecting the participants to accurately gather data. From a large population of 111, 700, testing the entire community is practically impossible considering that not all of these individuals are reachable. The researcher selects respondents based on proximity. Through this technique, it is more comfortable to observe the practices and stances of the participants, especially in terms of the device's effectiveness, significance, and usability.

4. RESULTS AND DISCUSSION

This chapter covers the discussion, analysis, and interpretation of results in the data gathered performed in-lined with the research problem and objectives. It also discusses the relationships among these results whereby the conclusions and recommendations were reliably based.

The Prototype Bluetooth-Powered Physical Distancing Regulator Alarm is a device created for a sole purpose of maintaining social distancing between people to avoid the rapid spread of COVID-19 and strictly follow the IATF regulation and protocols. In this chapter, the researchers will examine the effectiveness, usability, and significance of the device and this study.

4.1 Statement of the Problem 1

An experiment and observation was conducted by the researchers to measure the effectiveness of the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA) relaying alert

messages in terms of Android phone alarm through Bluetooth communication and Buzzer.

Test 1. Time Interval

The researchers measured the time interval between the alert messages sent by the device to measure the effectiveness of the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA). The students decided to conduct a test that consists of three trials to obtain more accurate and reliable results.

Table 1. Time interval in sending alert messages to Android phone through Bluetooth communication

TRIALS	DISTANCE			
	25 cm	50 cm	75 cm	100 cm
Trial 1	0.88	1.051	1.234	1.18
Trial 2	0.96	1.009	0.964	1.438
Trial 3	0.943	0.93	1.159	1.505
Minimum Time Interval	0.88	0.93	0.964	1.18
Maximum Time Interval	0.96	1.051	1.234	1.205
Average Time Interval	0.9276	0.996	1.119	1.374

Table 1 shows that the maximum or the longest period that the sensors deliver to the android phone application is within 1.374 seconds only. Therefore, the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP2DRA) is effective and fast in sending alert messages to the android phone using Bluetooth communication. Accordingly, the device serves its intended purpose, which is to help maintain social distance in public places.

Table 2. Time interval in sending alert messages through buzzer

TRIALS	DISTANCE			
	25 cm	50 cm	75 cm	100 cm
Trial 1	0.839	0.948	1.041	1.029
Trial 2	0.89	1.058	0.949	1.474
Trial 3	0.881	0.871	1.05	1.726
Minimum Time Interval	0.839	0.871	0.949	1.029
Maximum Time Interval	0.89	1.058	1.05	1.726
Average Time Interval	0.87	0.959	1.013	1.40

Table 2 shows that the maximum or the longest period that the sensors deliver to the android phone application is within 1.4 seconds only. Therefore, the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP2DRA) is effective and fast in sending alert messages through the buzzer or beep alarm. Accordingly, the device serves its intended purpose, which is to help maintain social distance in public places.

Test 2. Data Accuracy

The researchers measured the accuracy of data delivered by the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP^{2}DRA) through the Android phone and the buzzer. The students decided to conduct a test that consists of three trials to obtain more accurate and reliable results.

Table 3. Data accuracy level when alert messages are sent through Android Phone

TRIALS	DISTANCE			
	25 cm	50 cm	75 cm	100 cm
Trial 1	4	4	3.6	2.9
Trial 2	4	3.9	3.6	2.6
Trial 3	4	4	3.6	2.8
Adjectival Interpretation	highly acceptable	highly acceptable	highly acceptable	acceptable
Mean	4	3.97	3.6	2.77
Total Weighted Mean	3.585			
Adjectival Interpretation	Highly acceptable			

Table 3 shows the device and application accuracy ratings from 10 respondents from Daet, Camarines Norte. The ratings were guided by the following rubrics: 4 (Highly Acceptable) 3 (Acceptable) 2 (Slightly Acceptable) 1 (Not Acceptable). The data above showed that the selected participants rated the application highly acceptable. Therefore, the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP2DRA) delivers accurate data

through the android application utilizing Bluetooth communication.

Table 4. Data accuracy level when alert messages are sent through buzzer

TRIALS	DISTANCE			
	25 cm	**50 cm**	**75 cm**	**100 cm**
Trial 1	**4**	**3.8**	**3.8**	**2.8**
Trial 2	**4**	**3.9**	**3.7**	**2.5**
Trial 3	**4**	**4**	**3.5**	**2.3**
Adjectival Interpretation	highly acceptable	highly acceptable	highly acceptable	acceptable
Mean	**4**	**3.9**	**3.67**	**2.53**
Total Weighted Mean	**3.525**			
Adjectival Interpretation	Highly Acceptable			

Table 4 depicts the device and application accuracy ratings from 10 respondents from Daet, Camarines Norte. The above ratings were guided by the following rubrics: 4 (Highly Acceptable) 3 (Acceptable) 2 (Slightly Acceptable) 1 (Not Acceptable). The data overhead indicated that the selected participants consider the application and the device as highly acceptable. Therefore, the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP2DRA) delivers accurate data through the buzzer or beep alarm.

4.2 Statement of the Problem 2

An analysis was conducted by the researchers to measure the efficiency rate of the device in terms of lessening the COVID-19 cases. Survey questionnaires were distributed to 10 participants from Daet, Camarines Norte selected by the researchers through convenience sampling.

Test 3. Efficiency Rate of the Device in Terms of Lessening the Covid-19 Cases

The researchers measure the efficiency rate of PBP^{2}DRA by having a total of ten major indicators. A set of ten (10) questions were given to the participants wherein they are asked to rate the device following the criteria where 4 is highly acceptable, 3 is acceptable, 2 is slightly acceptable, and 1 is not acceptable.

Table 5. Device Efficiency Ratings of the Respondents

Indicators	Mean	Adjectival Interpretation
1. The device accurately detects the distance between individuals	**3.6**	highly acceptable
2. The device sends messages and warning updates accurately.	**3.2**	acceptable
3. The device is safe to use.	**3.9**	highly acceptable
4. The device is convenient to use.	**3.4**	acceptable
5. BP^{2}DR is effective in sending updates and notifications on the android phone through Bluetooth communication.	**3.5**	highly acceptable
6. BP^{2}DR is effective in sending updates and notification through the buzzer.	**3.9**	highly acceptable
7. BP^{2}DR is effective as a warning signal.	**3.8**	highly acceptable
8. BP^{2}DR can help reduce the possible spread of viruses.	**3.9**	highly acceptable
9. BP^{2}DR is essential in today's era.	**3.4**	acceptable
10. The device can detect objects and people from all main directions (left, right, front, back)	**3.7**	highly acceptable

Table 5 illustrates the summary of the device efficiency ratings of the selected participants, guided by the following rubrics: 4 (Highly Acceptable) 3 (Acceptable) 2 (Slightly Acceptable) 1 (Not Acceptable). Based on the gathered data above, the respondents agreed that the Prototype Bluetooth-Powered Physical Distancing Regulator Alarm (PBP2DRA) accurately detects the distance between individuals. Additionally, it is safe and convenient to use, effective in sending updates and notifications on the android phone through Bluetooth communication and buzzer, and can detect objects and people from all main directions (left, right, front, back). Lastly, it can help reduce the possible spread of viruses and is essential in today's era. All in all, ten (10) respondents acknowledge the device and the application as highly acceptable.

4.3 Statement of the Problem 3

Researchers conducted an interview to identify the enhancements needed to improve the proposed system. 10 participants from Daet, Camarines Norte selected by the researchers through convenience sampling were interviewed during the test.

Table 6. Participants Responses to question: From your standpoint, what are the improvements needed to make the device more effective in performing its intended purpose?

Participant No.	Responses/Suggestions
1	Put it in a small casing to use easily.
2	The beep should sound friendly.
3	I think we should use a small equipment when the device is fully created.
4	No improvements needed.
5	No improvements needed.
6	Fix the time interval of the buzzer.
7	Warning sound for android app.
8	No improvements needed.
9	The calculations should be more accurate and determine that person is next to you, not objects.
10	No improvements needed for now.

Out of 10 respondents, four (4) individuals stated that the Arduino-powered device and android phone Bluetooth application do not need any improvement at the moment. On the other hand, six (6) remaining respondents suggested helpful changes that must be applied to both the device and application to be user-friendly and pleasing. Two (2) of them stated that the actual device must be smaller than the prototype to make it more convenient for the users to bring it wherever. One (1) participant also pointed out that the buzzer sound is not appropriate for a social distancing device — considering that it is for public use, the beep sound should be more calm and gentle. Furthermore, one (1) respondent suggested that the android app should have an alarm instead of displaying distance solely. Most importantly, two (2) of them stated that the aspects such as the time interval of obstacle detection, the calculations of the distance between individuals, and the accuracy of detecting whether the entity captured is a person or an object must be altered and enhanced. Consequently, the researchers marked these recommendations as significant changes needed to make the device and the application more reliable, functional, and satisfactory to the public.

5. CONCLUSIONS & FUTURE WORK

Social distance is one of the government's preventive strategies to contain the spread of the virus that causes COVID19 disease. Researchers have developed a device called the PBP^{2}DR, or Prototype Bluetooth Powered Physical Distance Regulator Alarm when the buzzer emits a sound, it can alert users by alerting themselves when someone is within 1 meter of them. Using the descriptive research and observation methods to collect data on the problem, the researchers also used interviews and observations as instruments. Rapid Application Development is used as the software methodology and Likert Scale Technique as the scaling method with respondents of random individuals in a community. We evaluated its efficiency based on the time interval between alerts sent by the device and the accuracy of the data delivered by the device via the Android phone and buzzer. As a result, the PBP2DR has been shown to be effective in maintaining social distance, especially in crowded public environments. This study can be further improved in gadget accuracy, device design and programming in the future.

5.1 Findings

Based on tests and trials, researchers have provided evidence that devices are effective in maintaining social distances between people.

5.1.1 Alarm and Information

The intended use of the device is met. Send data to display on your Android phone via Bluetooth communication to inform the user and send an alert via buzzer that beeps when someone is within 1 meter.

5.1.1.1 Observation

The information on the Android phone and the sound made by the buzzer were made within 35 seconds. This suggests that the Android phone will display information as soon as possible.

5.1.2 Improvements

Researchers are proposing further improvements to the device based on its design in future work such as portable device and phone sounds/vibrations.

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CONGRATULATIONS!