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The comparison of essential oil concentration to maximum air quality produced by diffuser based on Internet of Things (IoT) technology to create a healthy room

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10th ICTAP & SFNXXXIII

20th - 22nd November 2020

10th International Conference on Theoretical and Applied Physics & Simposium Fisika Nasional XXXIII

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IRMAYATUL HIKMAH

has participated as **Presenter** in the 10th International Conference on Theoretical and Applied Physics (10th ICTAP) and Simposium Fisika Nasional XXXIII (SFN XXXIII) theme "Physics Science Research and Learning Facing Challenges in the Industrial Revolution 4.0 Era" on November 20th - 22nd, 2020 - Lombok, Indonesia

Drs. Aris Doyan, Ph.D.
Chairman of 10th ICTAP 2020 and SFN XXXIII

10th ICTAP & SFN XXXIII

10th International Conference on Theoretical and Applied Physics & Simposium Fisika Nasional XXXIII

Lombok, Indonesia
20th - 22nd November 2020

ICTAP and SFN 2020 still to be held from Lombok. Looking at the Covid-19 situation, the conference will be held using a zoom meeting.

Thank you.

Abstract submission has due, but participant registration still open until November 19th, 2020 (click here for detail)

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Welcome to the Conference

Physics Science Research and Learning Facing Challenges in the Industrial Revolution 4.0 Era

00 Days | 00 Hrs | 00 Min | 00 Sec

What is 10th ICTAP and SFN XXXIII

The 10th International Conference on Theoretical and Applied Physics (ICTAP) is a conference organized by Physical Society of Indonesia (PSI), Universitas Mataram, Universitas Hamzanwadi, Universitas Pendidikan Mandalika, Universitas Muhammadiyah Mataram, Universitas Islam Negeri Mataram, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Taman Siswa Bima, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Bima, and Universitas Samawa.

This conference is aimed at promoting, developing, and disseminating interdisciplinary research from many different fields of physics. This conference will be carried out on 20th – 22nd November 2020 by Teleconference.

Researchers from universities, institutes, and relevant industries, from many different fields of physics, are invited to participate to present the paper or just as a participant.

Who is Speaking

Prof. Mitra Djamal

(Institut Teknologi Bandung, Indonesia)

Prof. Emeritus Dato' Dr. Wan Md Zin Wan Yunus

(Universiti Pertahanan Nasional Malaysia, Malaysia)

Prof. Manjula Sharma

(The University of Sydney, Australia)

Prof. Jakrapong Kaewkhao, Ph.D

(Nakhon Pathom Rajabhat University, Thailand)

Prof. HongJoo Kim

(Kyungpook National University, Republic of Korea)

Prof. Risdiana, M.Sc.

(Universitas Padjajaran, Indonesia)

Assc. Prof. Dr.rer.nat. Muhammad Farchani Rosyid, M.Si

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Physics Education | Theoretical Physics and Computation | Advanced Material and Nanotechnology | Biophysics and Medical Physics | Nuclear Physics | Geophysics | Astrophysics | Instrumental Physics | Laser and Optoelectronics | Energy and Environment Physics

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Conference Schedule

Friday, November, 20th, 2020

Conference Day

Keynote Speaker | Invited Speaker | Paralel Session

Saturday, November, 21st, 2020

Conference Day

Keynote Speaker | Invited Speaker | Paralel Session

Sunday, November, 22nd, 2020

Conference Day

Invited Speaker | Paralel Session

Important Dates

Agenda	Dates
Abstract deadline	~~20th September 2020~~ 20th October 2020 (has due)
Payment Deadline	~~20th October 2020~~ 04th November 2020
Full Paper Deadline	~~20th October 2020~~ 04th November 2020
Camera-ready Paper Deadline	20th December 2020

Conference Fee

ICTAP Presenters/Poster

IDR 2.000.000,- (USD 140)

Includes

1 paper submission (Extra Paper Charge : Rp 1.500.000 / USD 110)

Conference Facilities

Book of abstracts

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Book of abstracts

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Participant

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Conference Facilities (Participant)

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Information Update

Participant Registration

November 14th, 2020 | 0 Comments

Participant Registration still opens until November 19th, 2020. Visit http://ictap.unram.ac.id/participant-registration/ for the registration form.

Change of Conference Fee

July 27th, 2020 | 0 Comments

Because of ICTAP Conference system changed to a teleconference, there is a change in the conference fee. For more information, please check in the payment and agenda.

Change ICTAP System

July 27th, 2020 | 0 Comments

ICTAP and SFN 2020 still to be held in Lombok. Looking at the Covid-19 situation, the conference was postponed to 20th-22nd November 2020 by teleconference. Thank you.

Template Full Paper

May 12th, 2020 | 0 Comments

ICTAP and SFN 2020 still to be held in Lombok. As an alternative, looking at the Covid-19 situation, the conference is likely through teleconference. We will continue to monitor the latest situation. Therefore, while looking [...]

Call For Paper

February 17th, 2020 | 0 Comments

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Conference Center


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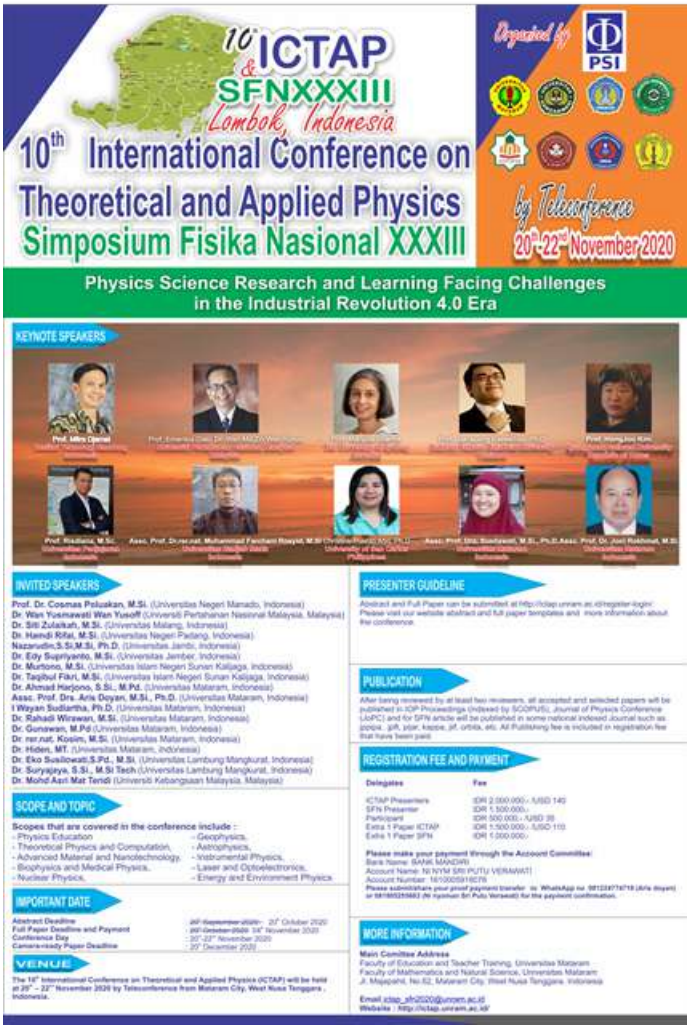
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Preface

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Preface

Assalamu'alaikum, Wr. Wb.

The International Conference on Theoretical and Applied Physics (ICTAP) is a conference organized by Physical Society of Indonesia (PSI) and hosted by Universitas Mataram, Universitas Hamzanwadi, Universitas Pendidikan Mandalika, Universitas Muhammadiyah Mataram, Universitas Islam Negeri Mataram, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Taman Siswa Bima, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Bima, and Universitas Samawa. It is an annual conference of the Society and moves from one major city to another, started ten years back in Bandung (Capital city of West Java province), then consecutively moved to Palangkaraya (Central Kalimantan, 2012), Malang (East Java, 2013), Denpasar (Bali, 2014), Kendari (South-East Sulawesi, 2015), Makassar (South Sulawesi, 2016), Yogyakarta (2017), Medan (2018), and Bandar Lampung (2019). The 10th ICTAP held by virtual conference from Lombok, which is one of the Beautiful Island in Indonesia, on 20-22 November 2020.

International Conference on Theoretical and Applied Physics (ICTAP) has offered a platform for bringing together students, postdocs, academics, and industrial experts to exchange their ideas and contributing an integrative approach to research in theoretical and applied physics. The program of the conference consisted of oral invited lectures of the leading experts on selected topics. The international seminar with the theme "Physics Science Research and Learning Facing Challenges in the Industrial Revolution 4.0 Era" is expected to provide great benefits for developing physics research in the future's challenging 4.0 era. It is aimed at promoting, developing, and disseminating interdisciplinary research from many different fields of physics.

Every submitted paper was reviewed using a single-blind-reviewed process. Note that their authors' articles presented in these Proceedings have been considerably modified after discussion during presentations or in the review process. Furthermore, let me express my appreciation and gratitude to the committee and the entire international conference committee on theoretical and applied physics (ICTAP), who have prepared this conference. ICTAP 2020 was attended by 10 Keynote Speakers, 115 participants, and 10 invited speakers, representing 40 institutions or higher education institutions.

Finally, I would like to thank all presenters and participants in the 10th ICTAP 2020 with the hope that it will provide great motivation for us, especially those who are always involved in theoretical and applied physics research, physics education research, and learning and the application of physics in our lives.

Wassalamu'alaikum, Wr. Wb.

Thank you,
The 10th ICTAP 2020 Chairman
Assoc. Prof. Drs. Aris Doyan, M.Si., Ph.D.

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Brief of Event

The 10th International Conference on Theoretical and Applied Physics (ICTAP) 2020 was held by virtual conference from Lombok, one of the most beautiful islands in Indonesia, on 20th–22nd November 2020. The conference was held virtually due to the COVID-19 pandemic. At that time, the Indonesian government issued a policy of restricting travel and gathering activities. Therefore, according to the committee's agreement, the center for hosting the conference from Mataram City, Lombok Island, especially at the Fave Hotel Ballroom 3rd floor.

Conference held in plenary for two days, which each keynote speaker talk in 20 minutes, and for the parallel session, each presenter talk for 10 minutes. The conference held virtually using the Zoom meeting platform. The presenter attended the conference from their place in around South East Asia and East Asia. The total participants is 153, consisting of keynote speaker, presenter, and participant.

The first day of ICTAP 2020 took place starting at 8.00 am with an opening by the Vice-Rector of Universitas Mataram, followed by a photo session by the committee, who attended in person and with speakers, participants, and invitations who were present virtually. The opening of the ICTAP 2020 was still a vivacious event, with all the limited to meet.

(a)

(b)

(c)

Figure 1. a) Remarks by the Chairman of the committee, Assoc. Prof. Drs. Aris Doyan, M.Si., Ph.D. b) Opening by the Vice-Rector of Universitas Mataram, Agusdin, SE., MBA., DBA. c) The situation of the opening of the ICTAP 2020

The event continued with 5 Keynote Speakers presentations, i.e., Prof. Mitra Djamal (Institut Teknologi Bandung, Indonesia), Prof. Emeritus Dato 'Dr. Wan Md Zin Wan Yunus (Universiti Pertahanan Nasional Malaysia, Malaysia), Prof. Jakrapong Kaewkhao, Ph.D. (Nakhon Pathom Rajabhat University, Thailand), Prof. HongJoo Kim (Kyungpook National University, Republic of Korea) and Prof. Manjula Sharma (The University of Sydney, Australia). After that, it was continued with a parallel session in the form of presentations by each presenter divided into 10 virtual meeting rooms.

Figure 2. The situation of a virtual parallel session guided by a moderator in each room

The second day's conference began with presentations by 5 Keynote Speakers, namely Prof. Dr. Risdiana, M.Sc (Universitas Padjajaran, Indonesia), Assoc. Prof. Dr.rer.nat. Muhammad Farchani Rosyid, M.Si (Universitas Gadjah Mada, Indonesia), Christine Pueblo Abo, Ph.D. (University of San Carlos, Philippines), Assoc. Prof. Susilawati, Ph.D. (Universitas Mataram, Indonesia), and Assoc. Prof. Dr. Joni Rokhmat, M.Si (Universitas Mataram, Indonesia). The event continued with a parallel session and closing by the Vice-Dean of Teacher Training and Education Faculty, Universitas Mataram, Dr. Gunawan, M.Pd.

(a)

(b)

Figure 3. a) Closing ceremony of the 10th ICTAP 2020, b) Organizing Committee

The 10th ICTAP 2020 was successfully held with 143 articles. However, 120 articles were accepted to be continued after the reviews to be published with a percentage of 83.9%. The selection and review process is carried out through an initial screening by the editor, including a similarity check and grammar check, followed by peer reviews by at least 2 reviewers for each article. Revisions by the author and final editing made published articles have good quality.

Overall, there are no technical difficulties in delivering the conference. However, there are fewer social aspects in the virtual conference. Commonly, out of the conference schedule (offline conference), the participant can talk to each other, e.g., dinner sessions. Because of the main schedule limit for discussion, most of the topics conference can discuss in the dinner session. But the virtual conference did not. Hopefully, all challenges in the pandemic period will end soon so that life can return to normal and the next conference can be carried out offline as usual.

The 10th ICTAP & SFN XXXIII 2020 Lombok, Indonesia

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The comparison of essential oil concentration to maximum air quality produced by diffuser based on Internet of Things (IoT) technology to create a healthy room

I Hikmah, A D Ramadhani and F T Syifa

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The efforts to maintain indoor air quality from dangerous viruses need to be improved. One way is by sterilizing the room using a disinfectant which has a weakness, namely that it is unsafe if the disinfectant is exposed to the body, especially, when entering the respiratory system, it will become dangerous toxins. Therefore, an innovation of a healthy room that is safe for the respiratory system is needed by applying essential oil as a natural antiseptic liquid which is converted into gas through a diffuser that is connected to a gas sensor equipped with the Internet of Things (IoT) technology. It can record air quality data and connect to an Internet server to monitor indoor air quality easily and practically. The research was conducted by making different variations in the concentrations of essential oil to obtain maximum air quality. From the results we obtained, the level of air quality is getting better when the oil concentration is increased because more gas particles can bind contaminant molecules in the air.

https://doi.org/10.1088/1742-6596/1816/1/012029

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The comparison of essential oil concentration to maximum air quality produced by diffuser based on Internet of Things (IoT) technology to create a healthy room

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The comparison of essential oil concentration to maximum air quality produced by diffuser based on Internet of Things (IoT) technology to create a healthy room

I Hikmah[1], A D Ramadhani[2] and F T Syifa[2]

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Abstract. The efforts to maintain indoor air quality from dangerous viruses need to be improved. One way is by sterilizing the room using a disinfectant which has a weakness, namely that it is unsafe if the disinfectant is exposed to the body, especially, when entering the respiratory system, it will become dangerous toxins. Therefore, an innovation of a healthy room that is safe for the respiratory system is needed by applying essential oil as a natural antiseptic liquid which is converted into gas through a diffuser that is connected to a gas sensor equipped with the Internet of Things (IoT) technology. It can record air quality data and connect to an Internet server to monitor indoor air quality easily and practically. The research was conducted by making different variations in the concentrations of essential oil to obtain maximum air quality. From the results we obtained, the level of air quality is getting better when the oil concentration is increased because more gas particles can bind contaminant molecules in the air.

1. Introduction

A room with good air quality has a good effect on health, such as reducing the risk of respiratory disease and improving brain performance. Meanwhile, a room with unhealthy air quality will be polluted with invisible contaminants, facilitating the spread of viruses and bacteria to the people inside. The effect of indoor air contaminants on human health is ten times greater than those of outdoor air contaminants [1].

An innovative indoor air quality control system is one important way to deal with the COVID-19 pandemic and to prevent the spread of other dangerous viruses that may emerge in the future [2]. A spray of oil diffuser destroys free radicals that trigger the growth of dangerous bacteria. Sprayed air can also combat the threat of mold effectively [3]. Modified antiseptic oil in the form of gas in the air (diffused) can bind contaminant molecules in the air, which can control air quality in a room so that it remains good [4].

The simplicity and practicality of the air quality control system make it easy for people to apply this system. This requires an Internet of Things (IoT)-based innovation in a diffuser so that people can control their indoor air quality more practically and easily by simply connecting to the Internet on a PC or smartphone [2]. IoT refers to unique objects that can be virtually identified and represented in

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the structure of the Internet. IoT aims to allow everything to be connected anytime, anywhere, with anything, and anyone who ideally uses any line/network/service [5].

Oxygen transfer is defined as the process of transferring oxygen from one phase to another, usually from liquid to gas phase (diffusion) [6]. One way to create good indoor air quality is to install electronic devices such as a diffuser. This device sprays steam into the air. The steam comes from the essential oils inside the device [4]. Cajuput oil is antimicrobial with molecules that can bind to the surrounding microbes so it is good to use as a diffuser filling [7]. However, the concentration of the cajuput oil solution needs to be considered to obtain maximum air quality output [8]. Thus, it is necessary to analyze the effect of essential oil concentration in a diffuser on indoor air quality.

To help raise awareness about the importance of good air quality and vigilance in the pollution caused by gases or other dangerous substances to human health. The implementation of the built system is expected to be useful to increase awareness of the importance of healthy air quality in the room because 90% of human activities are indoors [2]. This system can be used for buildings with closed rooms such as in houses, classrooms, offices, hospitals, hotels, etc. The air quality detector prototype describes an online air quality monitoring system that provides information on indoor and outdoor air quality via the Internet. The variable observed is the level of air quality [9]. The components connected to the IoT include an active gas sensor to detect gas. The gas sensor is connected to the Wemos board. The sensor detection results are sent to the Wemos microcontroller board and processed with the existing program. The Wemos board has a Wi-Fi module and sends the detection results to the cloud. The results are then sent to the IoT platform. Thingspeak is a platform that displays sensor detection results in real-time in graphical form. Data on Thingspeak can be accessed via computers and smartphones. Users can find out current changes in air quality in real-time by monitoring the air quality level through thingspeak.com [10].

2. Method

This experiment focused on comparing assorted essential oil and how to increase air quality. This method consists of four steps (analyze, detection, process, and conclusion).

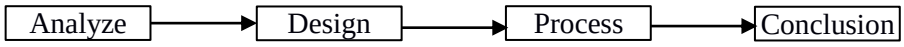

Figure 1. Methodology

2.1 Design

In this step, MQ 135 sensor is connected to Wemos D1. At a certain point, MQ 135 pin A0 (analog data) is connected on port A0 Wemos D1. Then, this minimum system or microcontroller acts as a server. The device schema is as shown in Figure 2.

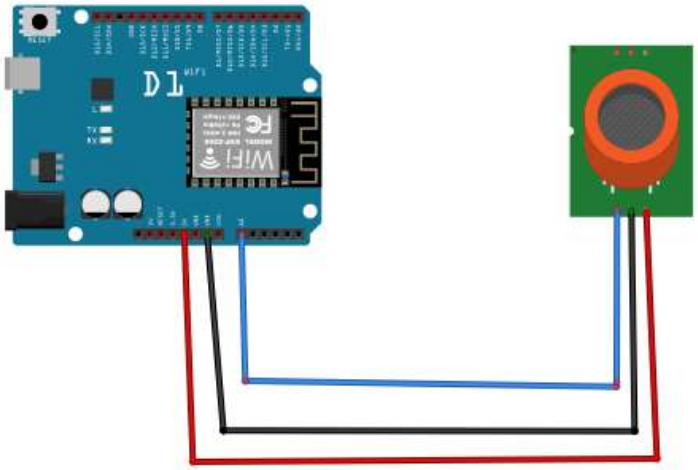

Figure 2. Design Scheme

On the other hand, Wemos D1 is connected to the network automatically to transmit sensor data. The parameter on MQ 135 is sent into Thingspeak platform. The next stage is sensing MQ 135 detection. The next criterion is about block diagram

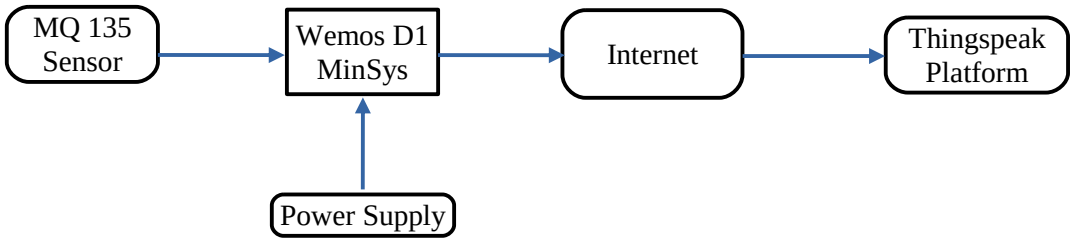

Figure 3. Block diagram

2.2 System Planning

In this monitoring system, indoor air quality is measured. The data obtained is stored in the Thingspeak cloud by sending the data every 20 seconds. Figure 4 shows the flow of this research. The monitoring system works by reading the MQ135 sensor connected to the ESP8266. ESP8266 retrieves air quality data in ADC data and forwards it to the Thingspeak cloud using a Wi-Fi connection. In Thingspeak, data is processed into a graphic displayed on a PC monitor. Channels in Thingspeak are also created and configured as in Figure 5. Field 1 is used to store data sent by ESP8266.

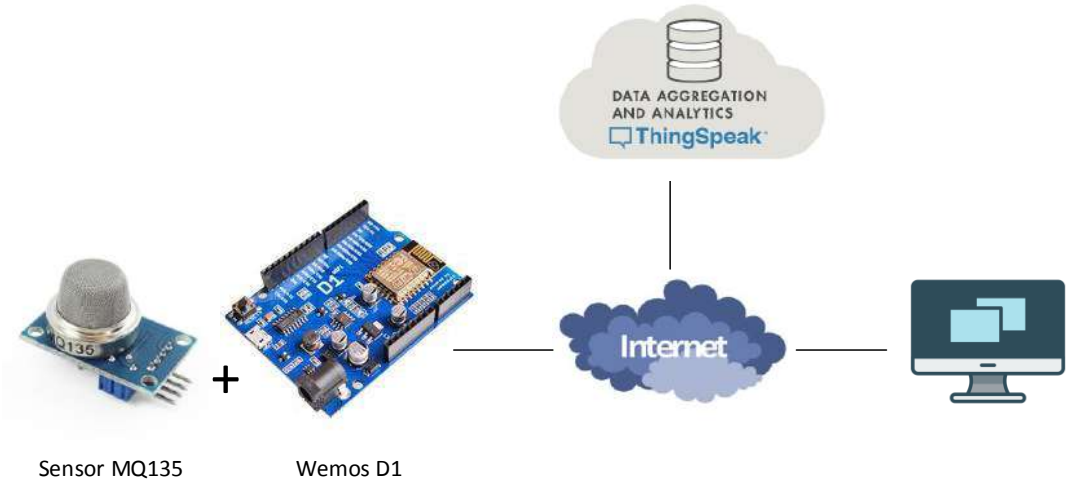

Figure 4. Research flow

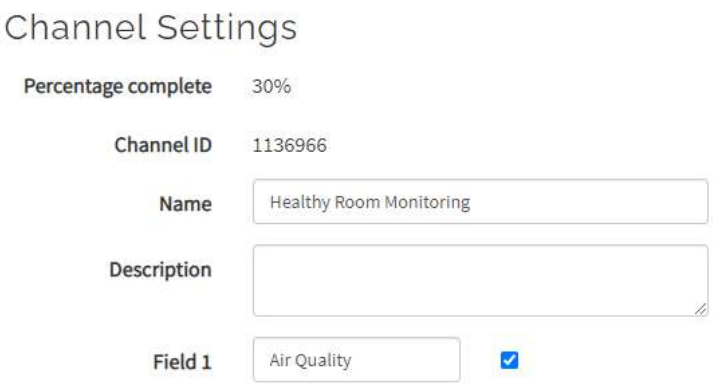

Figure 5. Healthy room monitoring channel setting

At the initial configuration, the WEMOS board is set to connect to Wi-Fi. After the Wi-Fi connection is successfully connected, the sensor will read the air quality in the room, and the data will be sent to the Thingspeak cloud to update the data on the server. The data received will be graphed and displayed on the PC monitor. Figure 6 shows the algorithm used in air quality data collection. The data are then analyzed and categorized according to the air quality indicators in the study [10]. Table 1 shows the air quality level categories using MQ135 sensor.

Algorithm: Healthy Room Monitoring

1. **Initialization:** SSID, API KEY, password, sensorValue. Channel ID
2. **Check Wi-Fi connection**
3. **Input**: sensorValue
4. **Update to Thingspeak server**
5. **Output**: Air Quality

Figure 6. Algorithm of healthy room monitoring

Table 1. Air quality indicator [10]

Air quality level	Category
> 800	High pollutant
400-800	Low pollutant
< 400	Normal (Good)

The data of the monitoring system was collected using 2 scenarios by obtaining the mean of each experiment. We had also measured air quality without a diffuser. The first scenario is measuring air quality by changing the distance between the sensor and the diffuser with the ratio of water concentration and cajuput oil of 195:5 ml. The capacity of the diffuser is 300 ml. We observed air quality at 5, 10, 15, 20, and 35 cm. Scenario 1 is shown in Figure 7. Then, the data was processed to obtain the ideal distance used in the test in scenario 2. Scenario 2 is measuring the indoor air quality with a fixed distance between the sensor and the diffuser but different liquid concentration [11]. Table 2 shows the changes in the concentration of the liquid tested.

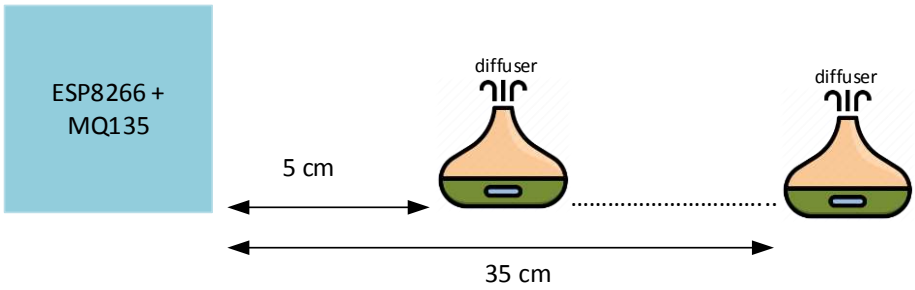

Figure 7. Test scenario 1

Table 2. Test scenario 2

No	Comparison		Distance (cm)
	Water (ml)	Cajuput oil (ml)	
1	195	0	15
2	195	5	15
3	185	15	15
4	185	20	15
5	185	25	15

3. Results and discussion

Before we collect the data according to Figure 7, a test was performed by reading the air quality on the serial monitor to prove that the data on the server was the same as the reading on the serial monitor. The results in the serial monitor were also updated via the Thingspeak cloud. Next, the air quality test data under normal conditions without a diffuser were collected for 30 minutes resulting in a mean of 138.65. Air quality under normal conditions was still in the good category according to Table 1. Figure 9 shows the graph of testing under normal conditions.

Another test was conducted based on the first scenario in Figure 7. The mean of each experiment over each distance was taken. At 5 cm, the mean of air quality is 121.8. At 10 cm and 15 cm, the value tends to be stable, but there is an increase compared to the mean at 5 cm. At 10 cm and 15 cm, the mean is 127. At 20 cm, the mean increases to 133. At 35 cm, it becomes 135. When the distance between the diffuser and the sensor is further away, the value of the air quality indicator increases. However, the value shown is still in a good category. The first scenario test graph is shown in Figure 10. If we compare to normal conditions without a diffuser, the air quality figure decreases when the diffuser is turned on.

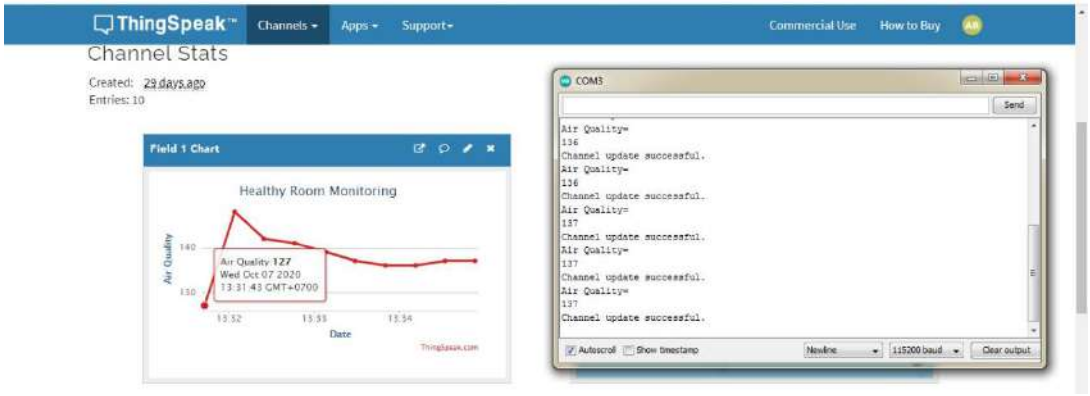

Figure 8. Reading of data via serial monitor in thingspeak.com

Figure 9. Graph of air quality in normal condition from thingspeak.com

Figure 10. Comparison of air quality to distance

In the second-scenario data collection, the test was conducted according to Table 2. The experimental results are shown in accordance with Table 3. In the first experiment, the researcher only used water and obtained the value of the air quality of 113.49. Compared with normal conditions, the value of the air quality is below normal conditions. Furthermore, 5 ml of oil was added, and it was found that the value of the air quality increased to 127.83. However, when it was added with 185 ml of water, the value was 79.64. Then, the oil concentration with a fixed volume of water of 185 ml was added. When adding 20 ml and 25 ml of oil, the value of the air quality decreased. This indicates that the level of air quality is getting better when the oil concentration is increased.

Table 3. Result of scenario 2 test

No	Mixture	Distance (cm)	Air Quality
1	water: 195 ml and oil: 0 ml	15	113.49
2	water: 195 ml and oil: 5 ml	15	127.83
3	water: 185 ml and oil: 15 ml	15	79.64
4	water: 185 ml and oil: 20 ml	15	61.63
5	water: 185 ml and oil: 25 ml	15	60.47

4. Conclusion

From the two scenarios of the test, it is concluded that the ideal distance between the gas sensor and the diffuser is 15 cm with average air quality of 127. At this distance, variations in the concentration of the solution were given where each additional 5ml of cajuput oil resulted in better air quality up to 60.47. The increase in the volume of cajuput oil enables more gas particles to bind contaminant molecules in the air.

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