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FOREWORD BY DR. NURBAITI WAHID KPP PKE UITMCTKD

Alhamdulillah, all praise to Almighty Allah who made this possible for the editorial team to complete this publication. The Extended Abstracts of Final Year Projects from UiTM Terengganu Electrical Engineering Diploma students have been published since 2018 and e-ISSN was obtained from Perpustakaan Negara Malaysia in 2019. This year, 2021 witnesses the upgrade of this publication through collaboration with Jabatan Kejuruteraan Elektrik (JKE), Politeknik Sultan Mizan Zainal Abidin (PSMZA). We are very honored to work alongside JKE, PSMZA and we hope that this collaboration can be continued in the future. I would also like to thank and extend my gratitude to the management for approving this project and to all editorial team, as well as the contributing authors for this issue. Hopefully, this publication could benefit all the readers.

FOREWORD BY MR. SAIFUL AZIZI ABDULLAH KJ JKE PSMZA

Alhamdulillah, all praises to Allah, for the successful publication of the Extended Abstracts of Final Year Projects in collaboration with UiTM Terengganu Electrical Engineering and the Department of Electrical Engineering (JKE), Politeknik Sultan Mizan Zainal Abidin, Dungun, Terengganu has finally been realised. I congratulate UiTM Terengganu and the JKE PSMZA editorial team, as well as all parties engaged in this publication. The final projects created by electrical engineering diploma students are featured in this publication which will hopefully serve as beneficial resource for all students, particularly those studying electrical engineering, while they work on their final project. Thank you.

Extended Abstracts of Final Year Projects

Volume 3

DEVELOPMENT OF AUTOMATIC SOUND SENSOR FOR NOISE MONITORING

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Abstract - The library user will occasionally produce excessive noise, which is a problem that many libraries face. Students today lack library awareness, despite the fact that they are aware that one of the most essential library norms is to remain silent and quiet for the benefit of others. Numerous sign boards are located throughout the library, however always seem to go unnoticed, despite the fact that they are understood. We are all aware of how difficult it is to counsel the individual who is causing the noise in the library, which is why we developed our own solution: an automatic sound sensor. Our prototype project's purpose is to use a sound sensor to control the noise level in the library. The maximum volume level that is permissible in a library is not more than 57dB. If this is not the case, the LED may blink and a warning message will display on the LCD.

Keywords – Sound sensor, Arduino UNO, noise level, library

INTRODUCTION

Balancing the needs of students who prefer peaceful study places with those who wish to communicate freely and work with their peers is an issue that many university libraries encounter. Academic libraries have long been a source of concern for academic librarians and users. This concern has grown as libraries have stressed their role in facilitating student learning, including learning in a crowded, collaborative atmosphere. Numerous studies have been undertaken to determine the optimal noise level range for a library [1-3]. Additionally, a noise detection device was developed and a user satisfaction survey was done. This project explored the development of an automatic sound sensor for noise monitoring and the utilization of a 57dB noise level in the library as an acceptable noise level.

METHODOLOGY

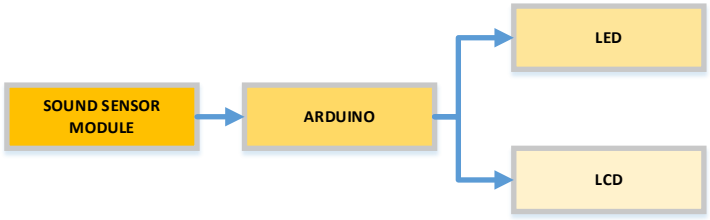

Figure 1. Project block diagram

Figure 1 shows block diagram of automatic sound sensor project. It utilises a sound sensor module (LM393) as an input to determine the decibel level of the sound (dB). The sound sensor picks up on the sound and voice made by the student. Then the Arduino receives the signals. Arduino serves as the circuit's controller. The Arduino will convert the input from the sound sensor to a digital signal. LED and LCD are used as the outputs of the sound sensor. If the automatic sound sensor engaged, the LED will be flashed and the LCD will be displayed the message 'KEEP QUIET' to warn students do not make noise in the library. Both the LED and LCD are activated, when the sound sensor module detected a sound intensity level greater than 57 dB.

RESULT AND DISCUSSION

The experimental results are shown in Table 1. The indicators is used to to indicate the noise level; normal,medium and high. Normal sound levels is range from 45 to 49 decibels, whereas medium levels range from 50 to 56 decibels. The LCD will be flashed when the sensor detected all levels of noise, however the LED only flashed when the sound level exceeded 57dB. The red LED blinked three times after detecting a high sound range. The prototype is working as intended, and it was placed in the middle and under the library table to measure its accuracy and usefulness in a real-world situation. There are two types of tables in UiTMCT library: round shape and square shape, which have different dimensions and sizes. As a result, testing is required to determine the developed

prototype's sensitivity range. The positioning of the prototype is essential because if it is too far away from the source of sound, the sound may be interpreted in a normal range even though it is at a high level.

Table 1: Experimental results

Noise level (dB)	LCD	LED
Normal	Activated (display the normal sound level)	Off
Medium	Activated (display the medium sound level)	Off
High	Activated (display warning sign)	LED blinked

Table 2: Result comparison by two different table shapes

Type of table	Distance (cm)	Sound level (dB)		
		Normal	medium	High
Round table	67	45	50	57
Square Table	36-67	43-45	48-50	55-57

Table 2 show the result obtained when there are 2 different table shapes used in the library. The distance value indicates the distance between the student and the sensor. For round table, the sensor is mounted at the centre with a radius distance of 67cm while for square table, the sensor also placed at the centre of the table with a distance ranging from 36-67cm. Results shows that there is slightly different in sound detection level for both square and round table. It means that the placement of the sensor is correct since both sensor placement gives a quite similar values range as per sensor's specification.

CONCLUSION

Automatic sound sensor development will enable students and librarians to create a calm, comfortable environment in which students can concentrate and complete their coursework without interruption. This also adheres to the library's policy of maintaining a calm and silent environment when at the library. The entire library staff will have an easier time performing their tasks because the sound sensor will alert them to preserve silence. Having this type of technology in a library will undoubtedly aid librarians in maintaining the library, especially at colleges where students frequently come to library to complete assignments or study in a group.

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RFID ATTENDANCE SYSTEM FOR EXAMINATION PURPOSE

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Abstract. Attendance means the number of people present at a particular place or event. In educational institutions, students' attendance in class is important since it will reflect their academic achievement. The basic methods of taking attendance are either by calling their names or signing on a paper. However, during examinations, students need to write down their particulars like name, student number and table number in a piece of paper in order to go to the toilet. Nowadays, these methods are not relevant anymore since it is very time consuming, insecure and thus inefficient. The solution to resolve this problem is by developing a Radio Frequency Identification (RFID) based Attendance System which can be implemented in school, college and university. The objectives of this project are to save students time during exams, make the process of collecting data of students easier and additionally a contactless attendance has created due to the pandemic situation. Therefore, by having this project, the problem is encountered as a new method in managing the issue of wasting time in writing a lot of information when students want to go to the toilet.

Keywords - Arduino UNO, RFID, attendance, examination, toilet

INTRODUCTION

Attendance is the action or state of going out regularly or being present at a place or event. During the examination session, for those who want to go to the toilet, they need to come in front of the hall to write down their name, student number, table number, program code and so on in a paper. After that, they will be allowed to go to the toilet by the invigilator if there is no one in the toilet. It is not efficient because it almost takes time for them to write their particulars on a paper or manual form. By that, we will create a smart system in which students just need to scan their RFID card as their data for invigilators' attention. This project mainly focused for the students that had an examination especially in a grand hall. In addition, due to the pandemic situation which is Covid19 and the new lifestyle, new normal, we need to follow all the Standard Operating Procedure (SOP) and need to take care of our health at a high level. So, we must make sure that the system is controlled without any hand sensory or touch directly. The main function of this project is to alert the invigilators and also make it easier for the students to go out, including saving their time. There are some researchers that proposed a biometric based attendance system [1][2] which is not suitable to be used during this pandemic.

METHODOLOGY

Figure 1 shows the block diagram of RFID based Attendance System. The input comes from the RFID card where the information of students is already stored in this card. Only students with valid registered cards are allowed to exit and enter the hall during examination. The buzzer will beep once means permission given to the student to go to the toilet and enter the hall back. If the buzzer is not beeping, it means permission to go out is not granted. Thus, the invigilator can check whether the maximum number of students have already gone to the toilet or if this student has gone out so many times during exam. The data in terms of card ID are stored in Google Sheet and this information can be access real time.

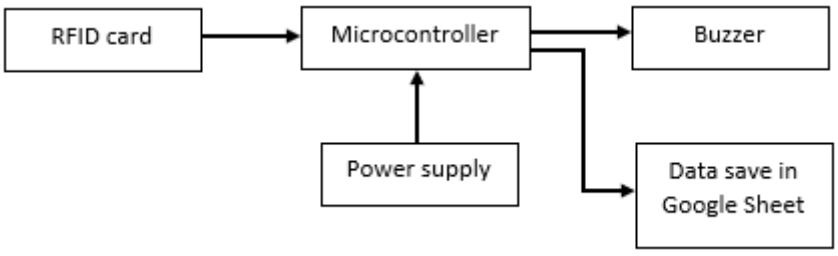


Figure 1. Block diagram of this project

The overall flow chart of this project is depicted in Figure 2. Every student who has the examination is given one access card in order for them to exit and enter the hall back if they want to go to the toilet during examination. Students need to scan their card first then if the data about this student is in this system, the buzzer will beep once and students are allowed to go to the toilet. If the card ID is not in the system, students need to scan their card again. In both situations, the card ID will be stored in the Google Sheet.

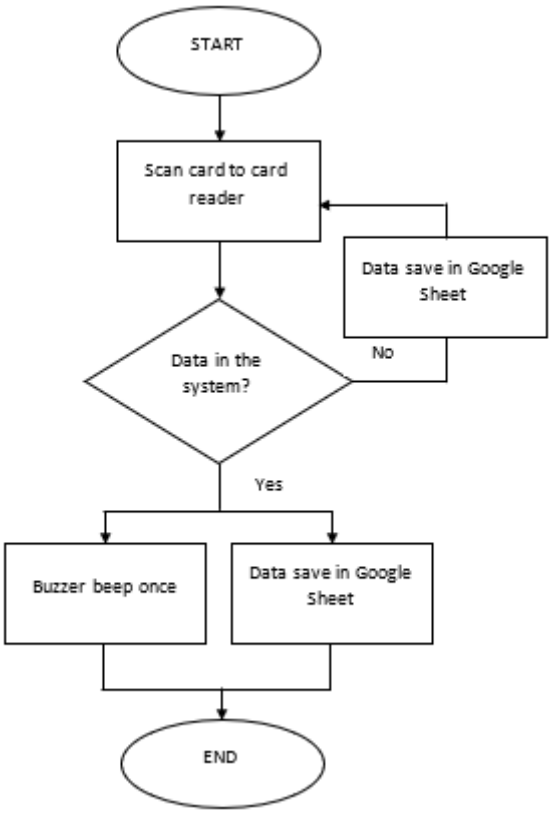
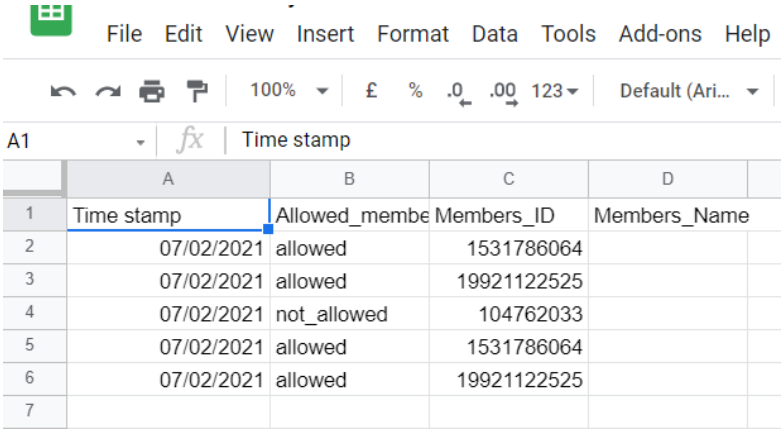


Figure 2. Flow chart of this project

RESULT AND DISCUSSION

Figure 3 shows the data in terms of card ID and permission status are saved in the Google Sheet. This means that any card scan in the card scanner is detected and automatically saved. If the buzzer beeps once, the student is allowed to go out or enter the examination hall while if no buzzer beeps, the student has no permission to do so. This will notice invigilators and make the process smooth without wasting much time in filling up the form. Less inspection by invigilator and the main power to invigilate can be reduce.



	A	B	C	D
1	Time stamp	Allowed_membe	Members_ID	Members_Name
2	07/02/2021	allowed	1531786064	
3	07/02/2021	allowed	19921122525	
4	07/02/2021	not_allowed	104762033	
5	07/02/2021	allowed	1531786064	
6	07/02/2021	allowed	19921122525	
7				

Figure 3. Saved data in Google Sheet

CONCLUSIONS

It can be concluded that by having this project, less time is consumed for students in order to fill up the form to go to the toilet. The data about students are stored according to the date and time they scan their card. This is actually really helping the invigilator to monitor how long students go out and how many times they go to the toilet. During this pandemic, contactless attendance is really important since manually filling up forms makes the student share a pen that is provided by the institutions. In the future, this project can be replaced by light in order to avoid sound interruption to another student.

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SMARTPHONE CASING WITH CHARGING SYSTEM (SCCS)

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Abstract: Smartphones have become such an essential part of daily life that it can be difficult to leave them alone, even when they are charging. However, using the phone while it is charging can be dangerous. It has the potential to endanger our lives and damage your phone. This paper presents the Smartphone Casing with Charging System (SCCS), a device that can wirelessly charge a smartphone. This project includes a solar panel, an Arduino, a cooling fan, a wireless charging transmitter and receiver circuit. Before being implemented in hardware, Proteus 8.1 was used to simulate this project. This prototype Vivo 1812 smartphone took 6 hours and 34 minutes to fully charge, compared to 4 hours and 15 minutes when charging directly from plug. It can keep the charging mechanism running for as long as feasible without harming or inconveniencing the user.

Keywords - Smart casing, Wireless charging, solar panel, Qi wireless, Arduino

INTRODUCTION

Constant smartphone recharging puts a major strain on users. As people become more reliant on their telephones for day-to-day tasks, running out of battery power is becoming an increasingly unwelcome situation for many people. To avoid such an unpleasant situation, users must keep a constant check on the battery status of their devices and physically connect a charger to charge their cell phones when the battery is low. Doing so on a daily basis not only demands a lot of user attention, but it also puts a strain on consumers' emotions. Consumers should not have to worry about recharging their smartphones because they should be recharged automatically. Existing solutions, on the other hand, are unable to achieve this desired result. Users must manually plug the charging cord into a smartphone while using a wired charger to charge it. The cable should be brought with them wherever they travel, even if it is inconvenient. People frequently have trouble charging their smartphones in cars. When travelling, a smartphone should have enough power to prepare for any eventualities that may arise during the journey. To replace the present wired charger, a casing smart charger is a better and more convenient option. Smartphone Casing with Charging System (SCCS) equipped with solar panel system, cooling system to avoid overheating while charging and wireless charging transmitter and receiver circuit. This device could be beneficial for people who need to charge their cellphones while travelling, as well as courier services, e-hailing services, and food runners, and other, as these client services are completely dependent on their cellphones while carrying out their duties.

The method of wireless power transfer can be seen nowadays in numerous portable devices ranging from medical to wearable devices [1-2]. One of the versatile and efficient wireless power transmissions is Qi standard established by Wireless Power Consortium (WPC), a leading organization that published the first specification for wireless power transmission worldwide [3]. The other two standards for the wireless power transfer (WPT) are Power Matters Alliance (PMA) and Alliance for Wireless Power (A4WP) [4]. Qi-standard devices have made high efficiency energy transfer possible by using inductive coupling method which includes communication between the power transmitter and the power receiver. Any device using the Qi interface allows the wireless charging of a Qi-compatible transmitter [3].

In recent times, the utilization of solar energy in wireless power transfer has become significant for portable charging. Beside solar energy being a very environment-friendly power source, plugging and unplugging a cable is no longer necessary in solar based wireless charging systems. Furthermore, it can be used in remote areas where electricity is unavailable [5-6]

METHODOLOGY

This project is depicted in Figure 1 as a block diagram. This project utilized two inputs: solar and an AC to DC adapter. As a result, this research achieved three outcomes: a fan as a cooling charging system, solar system as for a battery backup and inductive connection between two circuits to transmit electricity. The solar system is coupled to a TP4056 lion battery charging system equipped with a protection board. The Qi wireless charger assisted us in achieving our goal of charging the smartphone for this project. The smartphone took time to charge. We were able to charge the phone directly. On the other hand, adopting this way of charging allows us as smartphone users to

achieve zero radiation while charging our devices. After that, the DC motor could be able to keep the smartphone from overheating. The motor was controlled by a switch and powered by an Arduino.

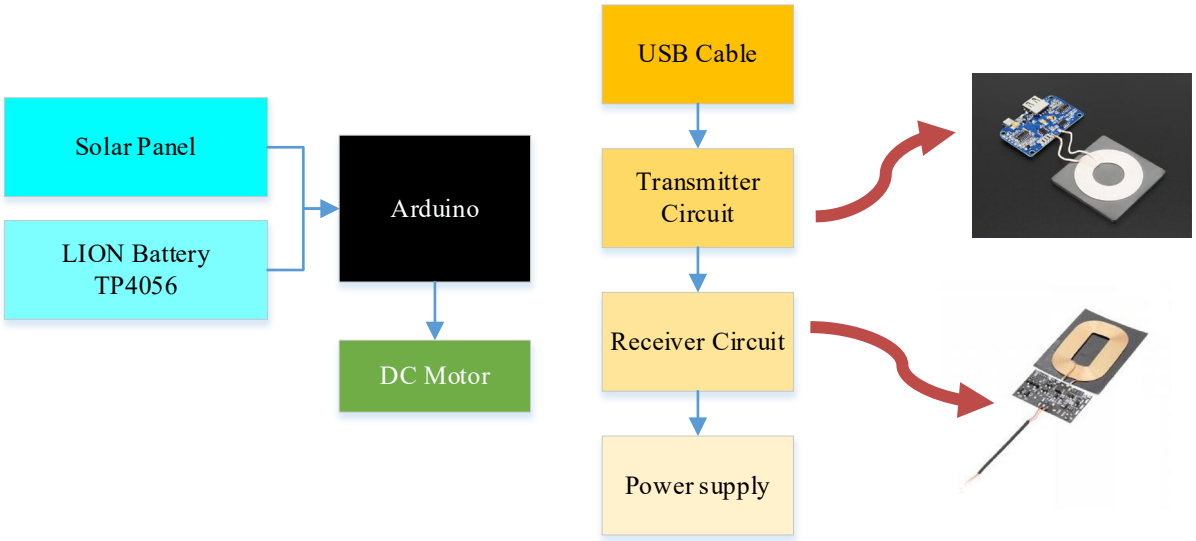

Figure 1: SCCS Block Diagram

RESULT AND DICUSSION

It took the longest to fully charge the SCCS prototype as in Figure 2. It can supply the charging system for the longest time possible without causing any harm or inconvenience to the user. The smartphone module utilized in this project is the Vivo 1812 module. It took two days to record the charging record for the phone. Normally, it takes 4 hours 15 minutes to fully charge this smartphone module. The smartphone took 6 hours 34 minutes to fully charge on the first day of data collection (refer to above graph in Figure 3. The smartphone takes 6 hours 22 minutes to fully charge the next day (refer to below graph in Figure 3). We measured the output voltage at 4.9V and the output current at 0.9A.

Next, for the other output in this project is the motor. This circuit, mostly for the usage in cooling systems to reduce the heat while charging the smartphone. To prevent an unexpected situation, happen to the smartphone or causing harm to the smartphone. In fact, there are many incidents that happen when using the smartphone while charging such as explosions and damage to the battery. So, this cooling system helps to reduce the thermal problem. Plus, this motor circuit is controlled by the Arduino and switch. The Arduino is supplied by two sources which are USB cable or solar cell. The output voltage for the motor when using USB cable is 1.64V for the best performance and the average for this output is 1.52V. Moreover, the output voltage for the motor when using solar cell is 0.7V for the best performance and the average for this output is 0.63V.

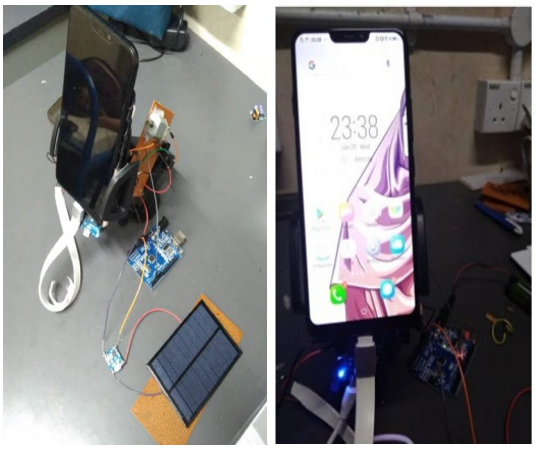

Figure 2: SCCS prototype setup

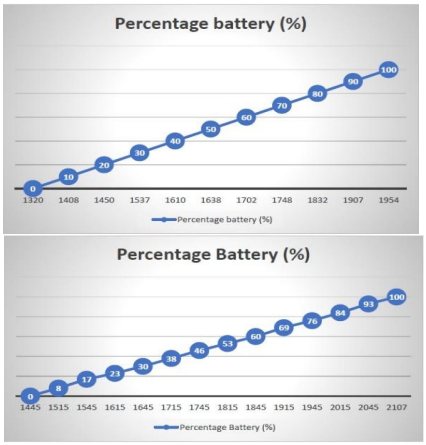

Figure 3: Recorded charging process

CONCLUSIONS

As a result, this project was able to function as expected within the scope of the project. This SCCS is a wireless charger that is extremely beneficial and convenient for smartphone users. It can be used in the home as well as in our vehicle. This type of smart charger is essential for people who use their smartphones for work. It will enable them to complete their tasks without being interrupted. Students nowadays use their smartphones frequently in their homework, online classes, and other activities, so having a convenient smart charger is a must to keep their motivation up and to ease their everyday life. The SCCS prototype works well, and commercializing it for the future is a better alternative. Furthermore, if there is a power outage, a solar system circuit can be used as a backup option so that the smart charger can keep working.

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SMART EGG INCUBATOR USING IoT

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***Abstract*:** Around the world, poultry-based food is one of the sources of protein available for human life. However, to supply poultry-based protein on a large scale, it is a major challenge for farmers in every country. In order to solve this problem, egg incubator machine have been introduced to produce poultry supplies in large scale where it can reduce costs and save time for breeders. This project aims to develop the prototype of egg incubator to incubate various types of poultry eggs by using the Internet of thing (IoT) system to regulate incubation temperature and humidity at optimal level and artificially recreates natural egg incubation by poultry. The temperature and humidity in the incubator will be measured and monitored by the temperature sensor and humidity sensor. The incubator system operation based on Arduino microcontroller, which control the bulk lamp as heater and the humidity through air circulating fans The data of temperature and humidity will be displayed in the LCD screen and also Blynk application using the IoT.

Keywords - Temperature, Humidity, Arduino Uno.

INTRODUCTION

Incubation is the process by certain oviparous animal hatch their egg by sitting on egg to provide the favorable environmental condition for development of egg embryo which called brooding for domestic fowl [1]. The most vital factor of incubation process is the constant temperature required and humidity for embryo development over a specific time period. If the air circulation in the incubator is too dry, the egg will lose too much water to the air atmosphere, which can make egg difficult to hatch or the worst-case scenario the embryonic death. Another factor that causes the low successful percentage rate of hatching mainly from improper and rough handling, genetic traits and aging parents. Incorrect turning of the eggs and infection by bacteria and fungi on incubated egg also contribute to the embryonic death [2].

Commonly, the ideal temperature for hatched bird such as chicken and duck are 37.5ºC can be acceptable. If the temperature is too high, but not enough to kill the egg embryo, the egg may hatch sooner than the normal hatch time while the egg may hatch later than normal time if temperature is too low. This paper describes the development of the Egg incubator using Internet on Thing (IoT) using the Blynk application which can help the farmers to monitor and control the egg incubator in from a distance. Previous researchers have developed the egg incubator for various egg such as chicken, quail and others based on the microcontroller to control automatically the parameters in terms of temperature and humidity [3][4]. In addition, the egg incubator can be divided to the two types in relation of air flow: forced air incubator and still-air incubator. Still air incubator, which do not have the fans to circulate air instead rely on the air circulation in the incubator while the forced air incubator more reliable in term of hatching rate because it is equipped by the built-in fans that continuously or automatically circulate the air flow to maintain the oxygen in the incubator [5].

Therefore, to provide the good airflow to embryo development by continually replenish oxygen and remove the carbon dioxide, this project using the forced air incubator by using fan to help circulate air flow through the vent.

METHODOLOGY

Figure 1 shows the flowchart of the project. The operation system is started by the DHT 11 sensor detect and measure the temperature and humidity in the incubator. The maximum temperature was set in the egg incubator is 37 °C and the minimum temperature is 35 °C. So, the bulb as heater will be on until the temperature reaches 37 °C. At the 37 °C, the bulk lamp will be off automatically and the fan will be on to circulate the air in the incubator. At 35 °C, the fan will be off and the bulb will on until the temperature increase to 37 °C. So, the range of temperature in Smart Egg Incubator will be maintained between 35°C to 37 °C. To maintain the temperature in system, lamp and fan will be turn on and off controlled by using Arduino. The humidity and temperature of incubator will always show on the lcd display as programmed and the both data also send to the user smartphone using Blynk application.

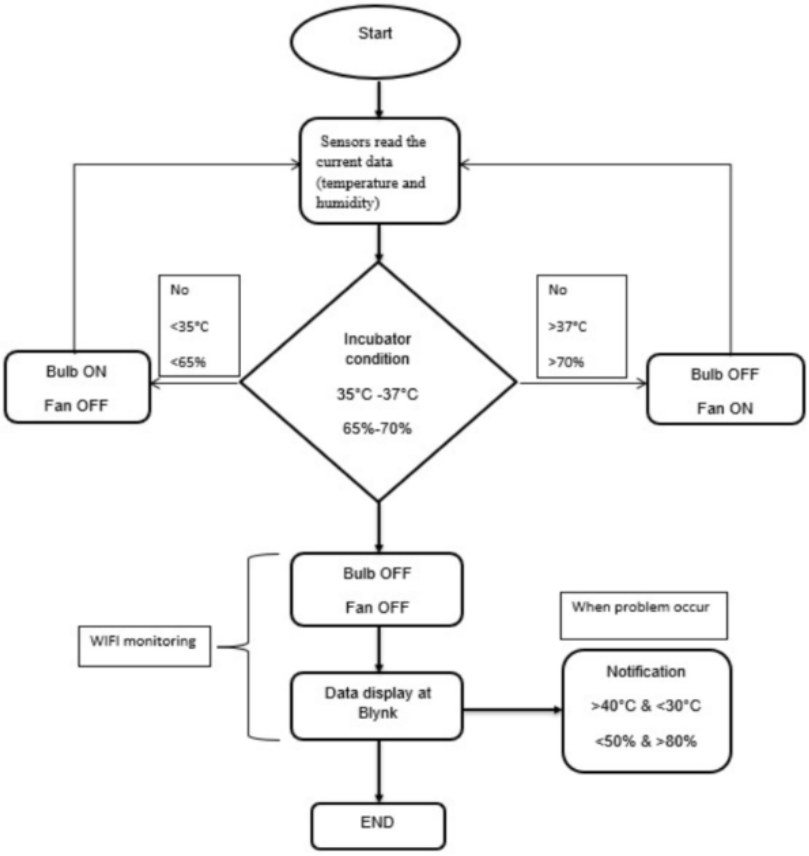


Figure 1. Block diagram of this project

RESULT AND DISCUSSION

Figure 2 shows the circuit diagram of the smart egg incubator interface with Arduino. The DHT 11 is connected to Arduino and the data is shown on the LCD as the LCD is connected to some pin on the Arduino. The Arduino acts as control circuit to control the two relays connected to the 25watt bulk lamps and fan in order to protect the Arduino circuit from damage caused by over voltage comes from 240Vac supply. The overall picture of hardware used for the smart egg incubator project can be seen at the figure 3 which shows the arrangement of the two bulk lamps and a fan in the insulated box in order to control the temperature, humidity and ventilation.

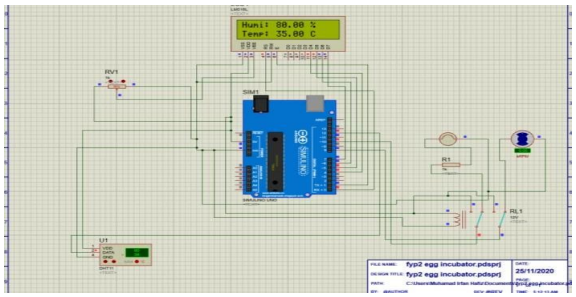


Figure 2. Smart egg incubator circuit diagram

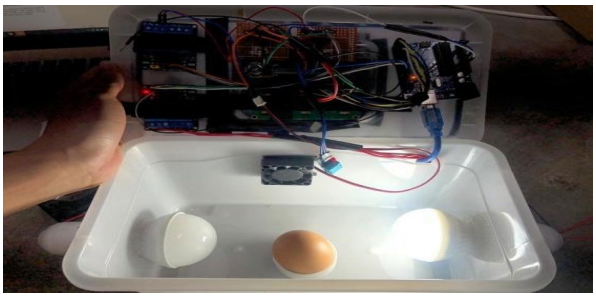
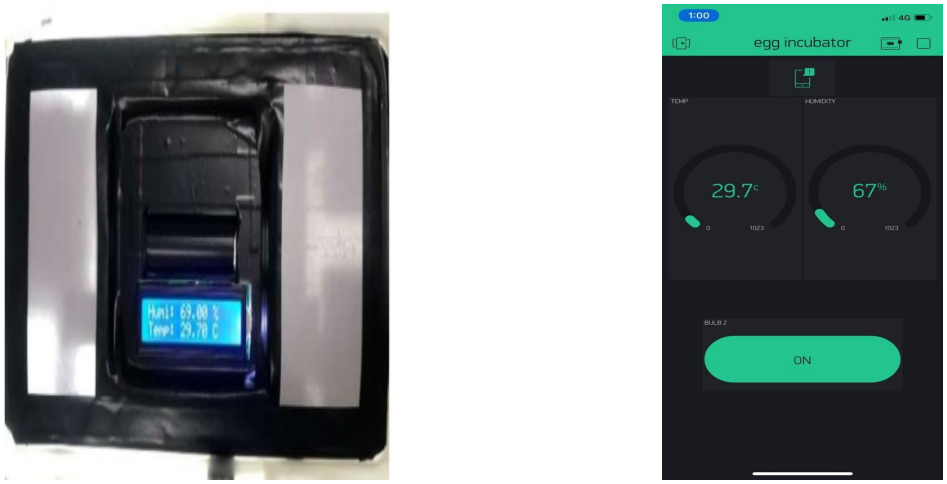


Figure 3. Prototype of the project

Table 1. Bulk and fan switching according to the temperature and the humidity range level

Temperature	Humidity	Bulb	Fan
<35°C	<65%	ON	OFF
>37°C	>70%	OFF	ON
35°C – 37°C	65% - 70%	OFF	OFF



(a) (b)

Figure 4: (a) Temperature and humidity data on LCD display, (b) Temperature and humidity data on Blynk app using smartphone

CONCLUSIONS

In conclusion, the prototype of microcontroller based using the internet of thing (IoT) has been designed was successfully developed. The Blynk application based on Internet of Things (IoT) provide the users especially the farmers monitor the incubation parameters in term of temperature and humidity automatically controlled by the Arduino. However, the system operation of this smart incubator can be upgraded by adding the automatic egg turner without having to rotate the eggs manually to reduces the possibility of embryo mortality.

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SMART HONEY HARVESTER

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***Abstract*:** This project is run by using Arduino UNO as the main device to give signal to other parts and the infrared proximity sensor to give signal for the mechanization. DC motors are used for the automation part of this project. This project is to introduce smart automation system to the stingless bee harvesting experience. The development of this project could reduce the time taken for the farmers in harvesting the honey from every hives. The farmer only need to turn on the switch to operate the system. From the sight of potential impact, this project allows the farmers to gain more profit.

Keywords: Smart Honey Harvester, Arduino Uno, DC Motor

INTRODUCTION

Stingless bees have an amazing variety of nest types [1]. Being demonstrated by a Youtube channel name 'Self Sufficient Me', it is known that it is quite burdensome to collect stingless bee honey from hive to hive due to its unique shape of the nest [2-7]. As shown, person who is in charge in collecting stingless bee honey need to draw out the honey from countless hole of the stingless bee nest. In the end, it will take a longer time to collect the precious stingless bee honey because the design of the nest is unique. As instance, the traditional method needs to use their bare hands to extract the honey from the hives which is this way will destroy the fragile hives. The old school method also causing the stingless bee feel threaten when their hive is broken and they will find the new place to build the new nest. In [4-5], the community of Kapuas Hulu Regency, Kalimantan is introduced to stingless bees' farming in order to provide income and to improve their lifestyle. It shows that the stingless bee farming sector has good potential and demands for technological smart system development. Hence, this project provides the new method to collect the honey of the stingless bee. The objectives of this project are to introduce the smart automation system for stingless bee honey harvesting and to develop honey harvester system by including infrared sensor.

METHODOLOGY

This project is consisting of two parts, hardware and software. Before constructing the hardware parts, a simulation needed to be done to make it more accurate while doing the hardware. After the simulation is done, we continue with the hardware progress. Upon settling with simulation from the software, we construct the hardware with items listed in the software. Arduino UNO is being as a main component in software and hardware parts.

A. BLOCK DIAGRAM

Figure below shows the block diagram of the Smart Honey Harvester. The project is mainly controlled by Arduino UNO. It controls all inputs and outputs of the system. As in this project, two infrared sensors are used as the input, while three DC motors are used as the output specifically; two motors are utilized for the automation of the system to move forward, backward, up and down. Another motor is used to pump out the honey from the nest. All DC motors are driven using L298N motor driver. The infrared sensors are to detect the level of the tank as well as to detect the location of the pump.

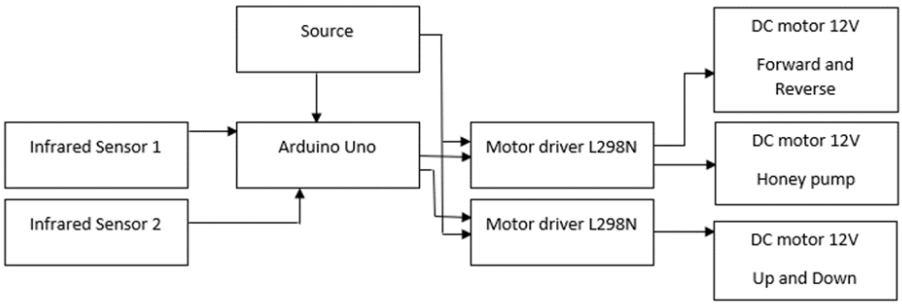

Figure 1. The rainwater system using ultrasonic sensor block diagram

RESULT AND DICUSSION

Figure 2 shows the schematic diagram of the project. First, there are two components that control the output component which is both is infrared sensor will be put at the end of hole of the stingless bee's hive, if the sucker is detected by infrared sensor its mean that it will suck the last hole of the hive and it will return bac to first hole. If the sensor does not detect anything so the sucker will move forward. For the second infrared sensor, it will be located at the tank. It will stop the sucker if the tank is full and if the tank is not full then it will operate normally. The prototype of this project is shown in figure 3.

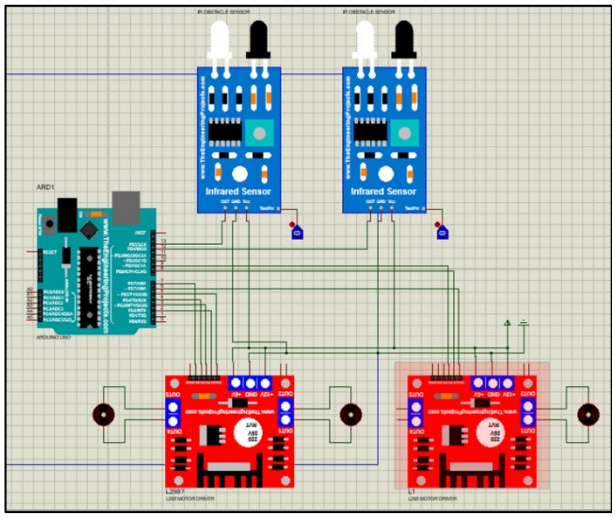

Figure 2. Smart Honey Harvester Schematic Diagram

Figure 3. Smart Honey Harvester Prototype

Table 1. Truth table of Arduino UNO programming

Sensor 1	Sensor 2	In 1	In 2	In 3	In 4	In 5	In 6
0	0	1	0	1	0	1	1
0	1	0	0	0	0	0	0
1	0	0	1	1	0	1	1
1	1	0	0	0	0	0	0

Table 1 shows the truth table of the programming installed in Arduino UNO. If both sensor 1 and sensor 2 are 'LOW' then In1 is 'HIGH', In2 is 'LOW', In3 is 'HIGH', In4 is 'LOW', In5 is 'HIGH', In6 is 'HIGH'. If sensor 1 is 'LOW' and sensor 2 is 'HIGH' then the rest of the output will remain 'LOW'. If sensor 1 is 'HIGH' and sensor 2 is 'LOW' then the output will be In1 'LOW', In2 is 'HIGH', In3 is 'HIGH', In4 is 'LOW', In5 is 'HIGH', In6 is 'HIGH'. If both sensor1 and sensor 2 is 'HIGH' then the rest of the output will be 'LOW'.

Table 2. Measurement of the Smart Honey Harvester automation

Time from hole to hole	Suction time	Time to go backward	Distance to detect sucker	Tank level for maximum
0.8 sec	4 sec	3 sec	1 cm	3.5cm

The time taken to move from hole to hole the motor needs 0.8 second, 4 seconds is taken for suction, to move from last hole back to the first hole, it take 3 seconds, the suction point needs 1 cm apart from infrared sensor to be detected, 2.5 cm from the bottom of the tank is detected as the maximum level of the honey in the tank.

CONCLUSIONS

In conclusion, this project has successfully developed by applying smart sensing technology and self-automation system for stingless bee honey harvesting. Infrared proximity sensor has effectively been implemented in indicating the level of honey extracted in the tank. The automation system also has the ability to move the suction tip go and forth as well as up and down as programmed in Arduino UNO. As a result, this project could contribute a lot by introducing the system to the stingless bee honey harvesting sector.

FUTURE RECOMMENDATIONS

In order to improve this project more excellent, a buzzer could be placed in the system to alert the surrounding if the tank is full. This project could also be improved by constructing the prototype using plastic materials.

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