4TH EDITION

E-EXTENDED

ABSTRACT

INTERNATIONAL AGROTECHNOLOGY INNOVATION SYMPOSIUM (i-AIS)

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ABOUT FACULTY OF PLANTATION AND AGROTECHNOLOGY

The Faculty of Plantation and Agrotechnology was established in 2010 at Universiti Teknologi MARA (UiTM). The mission of the faculty is to play the vital role of producing well-trained professionals in all areas of plantation and agriculture-related industries at national and international levels.

Bachelor of Science (Hons) Plantation Technology and Management is a three-year program that strongly emphasizes the various aspects of Production Technology, Management, and Information Technology highly sought after by the agricultural and plantation sectors. Students in this program will be fully trained to serve as professionals in the plantation sector and related industries. They will have ample opportunities to fulfill important positions in the plantation industry such as plantation executives. This program provides a strong balance of technology and management courses essential for the plantation industry such as management of plantation crops, soil fertility, plantation management operation, plantation crop mechanization, and agricultural precision. As an integral part of the program, students will be required to undergo industrial attachment to gain managerial skills in the plantation industry.

The faculty is highly committed to disseminating, imparting, and fostering intellectual development and research to meet the changing needs of the plantation and agriculture sectors. With this regard, numerous undergraduate and postgraduate programs have been offered by the government's intention to produce professionals and entrepreneurs who are knowledgeable and highly skilled in the plantation, agriculture, and agrotechnology sectors.

PREFACE

International Agrotechnology Innovation Symposium (i-AIS) is a platform to be formed for students/lecturers/ staff to share creativity in applying the knowledge that is related to the world of Agrotechnology in the form of posters. This virtual poster competition takes place on the 1st of December 2022 and ends on the 8th of January 2023. This competition is an assessment of students in determining the level of understanding, creativity, and group work for the subject related to agrotechnology and being able to apply it to the field of Agrotechnology. The i-AIS 2022 program takes place from December 1, 2022, to January 8, 2023. The program was officiated by the Dean of the Faculty of Plantation and Agrotechnology, namely Prof. Madya Ts. Dr. Azma Yusuf. The program involves students from faculties of the Faculty of Plantation and Agrotechnology (FPA)and HEP participating in i-AIS 2022, namely, the Faculty of Education and Pre-Higher Education. This program involves the UiTM student and some of the non-UiTM students which come from the international university and the local university. Two categories are contested, namely UiTM and non-UiTM. To date, students from these programs have shown remarkable achievements in academic performance and participation in national as well as international competitions.

This competition is an open door for the students and lecturers to exhibit creative minds stemming from curiosity. Several e-content projects have been evaluated by esteemed judges and that has led to the birth of this E-Poster Book. Ideas and novelties are celebrated, and participants are applauded for displaying ingenious minds in their ideas.

It is hoped that such an effort continues to breed so that there is always an outlet for these creative minds to grow.

Thank you.

Dean
On behalf of the Organizing Committee
Conference Chair
Universiti Teknologi MARA
Faculty of Plantation and Agrotechnology
http://fpa.uitm.edu.my

TABLE OF CONTENTS

REAL-TIME TEMPERATURE AND HUMIDITY MONITORING OF STINGLESS BEE COLONIES USING IOT TECHNOLOGY

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ABSTRACT- This paper presents the development and testing of an Internet of Things (IoT)-based stingless bee monitoring system. The system consists of data loggers located at the stingless beehives, which use Arduino microcontrollers to measure the temperature and humidity within the hives. The data is transmitted wirelessly to an IoT gateway using Lora, and from there to a cloud database. A web-based user interface allows users to access and visualize the data in real-time. The methodology for this project involved the design and development of the system, and the system was tested over a 16-day period to evaluate its performance and reliability. The results showed that the system was successful in providing continuous, reliable monitoring of the temperature and humidity within the hives and has the potential to support the sustainable management and conservation of these important pollinators. Additionally, the system was able to withstand harsh outdoor environments during the test period, demonstrating its robustness and durability. The user interface was user-friendly and provided a convenient way to access and analyze the data. The system has the potential to be implemented in a variety of settings and could be a valuable tool for beekeepers and researchers alike.

Keywords: Stingless Beehives, LoraWAN, Arduino, Raspberry Pi gateway, Wireless sensors network.

INTRODUCTION

In many parts of the world, stingless bees provide beekeepers with a source of income through the production of honey, wax, and other hive products that can be sold for a profit. In addition, stingless bees can be used for pollination, which can be especially beneficial for farmers who cultivate crops that require specialized pollination. In the coming years, the market for stingless bee products and services is anticipated to expand due to the rising demand for natural and eco-friendly goods. As a result, keeping and managing stingless bees can provide an opportunity for economic growth and income generation in communities around the world.

Given the value of stingless bees, it is important to carefully monitor their health and colony condition in order to ensure their survival and continued contributions[1]–[3]. By monitoring the size of the colony, rate of brood production, bee behavior, condition of the hive, and the presence of diseases and pests, we can identify any issues that may be affecting the health of the hive and take steps to address them. Temperature and humidity are important parameters to consider when monitoring the health of a stingless bee colony[4]–[6]. Bees are sensitive to changes in temperature and humidity, and optimal conditions are necessary for their survival and productivity.

For most stingless bee species, the ideal temperature range is between 25-35°C [7], [8]. At temperatures outside of this range, the bees may become stressed, and their activity may be affected. For example, if the temperature becomes too high, the bees may be unable to regulate the temperature of the hive and may become overheated. On the other hand, if the temperature becomes too low, the bees may struggle to maintain the warmth needed for the brood to develop [8].

Similarly, bees require a certain range of humidity for optimal health. Too much humidity can create a humid and stuffy environment within the hive, leading to problems such as reduced ventilation and an increased risk of disease. On the other hand, if the humidity is too low, the bees may have difficulty maintaining the proper moisture level within the hive, which can affect the development of the brood [4].
Therefore, it is important to monitor the temperature and humidity within the hive to ensure that it is within the optimal range for the bees. If the temperature or humidity falls outside of this range, steps may need to be taken to adjust the conditions within the hive in order to support the health and well-being of the colony.

MATERIAL AND METHOD

The development of an IoT stingless bee monitoring system depicted in Figure 1.0 involves three major sections: the data logger or sensor node, the IoT gateway, and the web server database and web based user interface. The data loggers are located at the stingless beehives and are responsible for measuring the temperature and humidity within the hives. To accomplish this, the data loggers use Arduino microcontrollers, which are programmed to take readings every 2 minutes. The Arduino then transmits the measured data wirelessly to the IoT gateway using the Lora wireless communication protocol.

The IoT gateway, which is comprised of a Raspberry Pi 4 and a Lora receiver, receives the data packets from the data loggers and sends them to the web server database using HTTP methods. The web server database stores the data and makes it accessible through a user-friendly interface, which allows users to view and analyze the data in real-time. The system allows for the continuous collection of data, which can be used to identify trends and potential issues within the hives and to inform management decisions. By providing insights into the health and well-being of stingless bees, the system has the potential to support the sustainable management and conservation of these important pollinators.

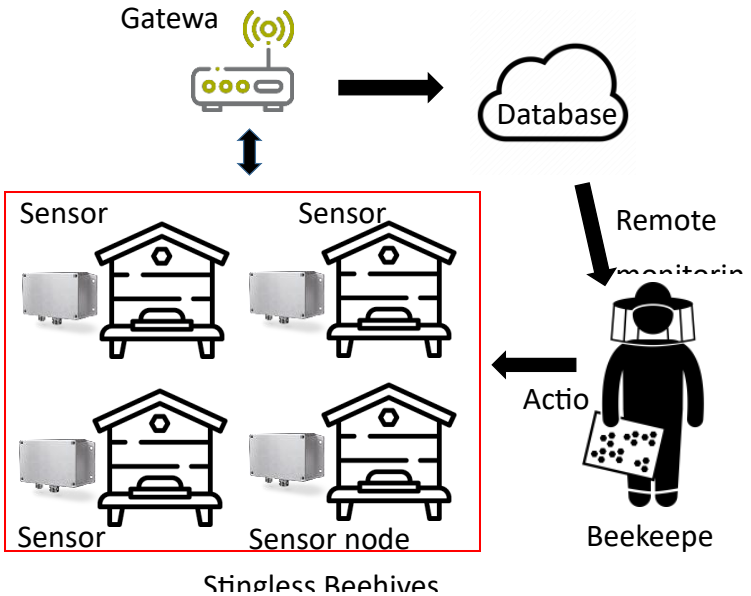

Figure 1.0: Stingless Bee Monitoring Setup

RESULTS AND DISCUSSION

The results of this paper are presented in Figure 1, which shows the temperature and humidity data collected over a 16-day test period. The temperature data is plotted on the y-axis in degrees Celsius, while the x-axis represents the day range from 1 to 16. The figure shows that the temperature within the stingless bee hives varied between 26-30°C, which is within the optimal range for stingless bee colonies.

The humidity data is plotted on the y-axis in relative humidity (%RH), with a range of 0 to 100%. 100% relative humidity represents fully wet conditions. The x-axis represents the day period from 1 to 16. The humidity data shows that the humidity within the hives varied between 83-93%RH, which is also within the optimal range for the colony.

Overall, the data indicates that the temperature and humidity within the hives were within the optimal range for the bees to thrive. This is important because bees are sensitive to changes in temperature and humidity and optimal conditions are necessary for their survival and productivity. By continuously monitoring the temperature and humidity within the hives, the IoT stingless bee monitoring system allows for the identification of any deviations from the optimal range and the opportunity to take corrective action if necessary.

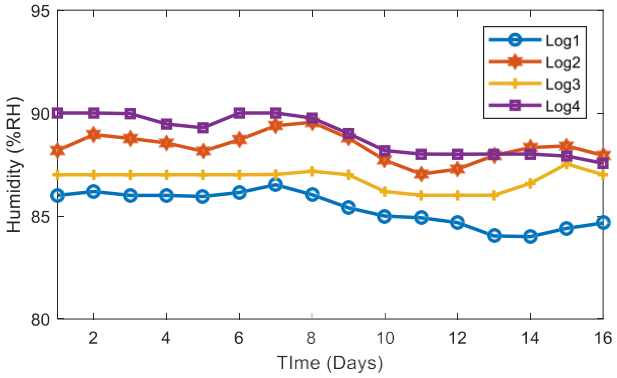

Figure 1: Temperature And Humidity Data For A 16-Day Test Period In Stingless Beehives

Figure 2 represents the web-based user interface for the proposed stingless bee monitoring system. The user interface is accessible through a web browser and provides a convenient way to view and analyze the data collected from the stingless beehives. The user interface consists of several elements, including links to access all of the log data coming from the beehives under monitor.

The user interface consists of several elements, including links to access all of the log data coming from the beehives under monitor. This allows users to easily view the temperature and humidity data collected by the data loggers and to identify any trends or potential issues. The user interface also includes data visualization, such as graphs and charts, which can help users or beekeepers to better understand the conditions within the hives.

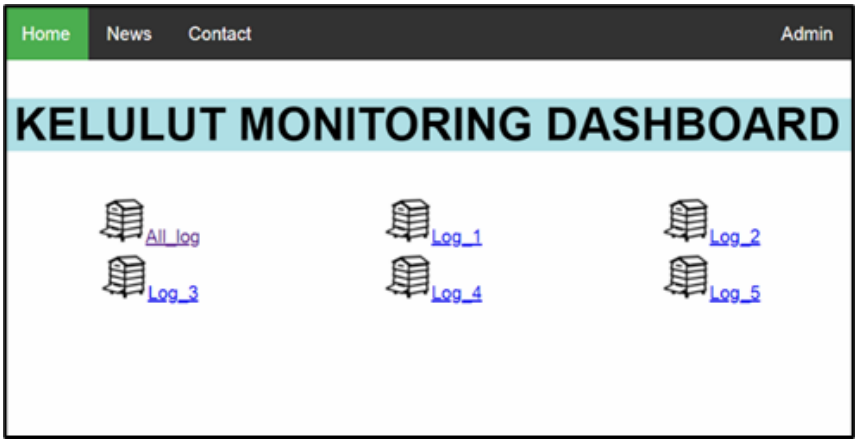

Figure 2: Web-Based User Interface For The Stingless Beehives

CONCLUSION

In conclusion, the development and testing of the IoT-based stingless bee monitoring system was a success in all of the key areas. The temperature and humidity logging system using Arduino microcontrollers was successful in continuously measuring and transmitting the data from the hives, even in harsh outdoor environments. The data was successfully transmitted wirelessly from the data loggers to the IoT gateway using Lora, and from the gateway to the cloud database, demonstrating the robustness and reliability of the system. The web-based user interface was also successful in providing a convenient and user-friendly way to access and visualize the data.

Overall, the proposed system provided a reliable and efficient way to monitor the temperature and humidity within stingless beehives, even in challenging outdoor conditions. The system allowed for the continuous collection of data, which can be used to identify trends and potential issues within the hives and to inform management decisions. By providing insights into the health and well-being of stingless bees, the system has the potential to support the sustainable management and conservation of these important pollinators.

REFERENCES

[1] N. H. Khairul Anuar *et al.*, "IoT Platform for Precision Stingless Bee Farming," *2019 IEEE Int. Conf. Autom. Control Intell. Syst. I2CACIS 2019 - Proc.*, no. June, pp. 225–229, 2019,

[2] W. N. S. W. Nik, Z. Mohamad, A. H. Zakaria, and A. A. Azlan, "i-BeeHOME: An Intelligent Stingless Honey Beehives Monitoring Tool Based On TOPSIS Method By Implementing LoRaWan–A Preliminary Study," in *Computational Science and Technology*, Springer, 2020, pp. 669–676.

[3] N. H. Khairul Anuar, M. A. Md Yunus, M. A. Baharudin, S. Ibrahim, and S. Sahlan, "Embedded Wireless Stingless Beehive Monitoring and Data Management System," *ICPEA 2021 - 2021 IEEE Int. Conf. Power Eng. Appl.*, no. March, pp. 149–154, 2021,

[4] Z. M. Yusof, M. M. Billah, K. Kadir, A. M. M. Ali, and I. Ahmad, "Improvement of Honey Production: A Smart Honey Bee Health Monitoring System," *2019 IEEE 6th Int. Conf. Smart Instrumentation, Meas. Appl. ICSIMA 2019*, no. August, pp. 27–29, 2019,

[5] S. Cecchi, S. Spinsante, A. Terenzi, and S. Orcioni, "A smart sensor-based measurement system for advanced bee hive monitoring," *Sensors (Switzerland)*, vol. 20, no. 9, 2020,

[6] A. Rafael Braga, D. G. Gomes, R. Rogers, E. E. Hassler, B. M. Freitas, and J. A. Cazier, "A method for mining combined data from in-hive sensors, weather and apiary inspections to forecast the health status of honey bee colonies," *Comput. Electron. Agric.*, vol. 169, p. 105161, 2020,

[7] M. A. M. Yunus, "Internet of Things (IoT) application in meliponiculture," *Int. J. Integr. Eng.*, vol. 9, no. 4, 2017.

[8] A. S. Ramli, A. H. Luqman, F. Basrawi, A. N. Oumer, A. A. Aziz, and Z. Mustafa, "A new cooling technique for stingless bees hive," *MATEC Web Conf.*, vol. 131, pp. 1–6, 2017,

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