UNIVERSITI TEKNOLOGI MARA

JIIICaS 2024
JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM

PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)

"Flourish and Nurturing Sustainable Innovation for a Prosperous Nation"

JIICOS 2024
JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM

Editorial Board

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector

Assalamualaikum warahmatullahi Wabarakatuh, Salam Sejahtera, Salam Malaysia MADANI and Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIIICaS 2024). This event connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
Johor Branch

(A-ST135) PORTABLE SOLAR-POWERED WEATHER OBSERVATION MONITORING SYSTEM FOR SEA-TURTLE NESTING

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ABSTRACT

The Portable Solar-Powered Weather Observation Monitoring System for Sea-Turtle Nesting aims to protect sea turtle eggs and monitor the weather conditions around their nesting sites using advanced sensor technology. The system employs the SR501 motion sensor to detect the hatching of sea turtle eggs, triggering immediate notifications to users via smartphones through the Blynk app. This enables real-time monitoring and timely intervention to ensure the safe journey of hatchlings to the beach. The DHT22 temperature sensor continuously monitors the temperature within the nesting sites, providing crucial data for analyzing hatchling gender, as temperature influences sex determination in sea turtles. Additionally, the DHT22 sensor records ambient temperature, offering valuable insights into the environmental conditions surrounding the nests. A raindrop sensor measures rainfall percentages to support conservation efforts further, helping users anticipate and respond to weather changes that could impact the nests. Powered by solar energy, this portable system ensures sustainable and uninterrupted monitoring. By integrating these sensors and utilizing the Blynk app for real-time monitoring, the project not only enhances the survival rates of young sea turtles but also gathers essential data for ongoing conservation initiatives. This comprehensive approach ensures that both immediate protective measures and long-term conservation strategies are effectively implemented, contributing significantly to the preservation of sea turtle populations.

Keywords: Sea-turtle conservation, solar-powered system, sensor technology, real-time monitoring, nesting site protection

1.0 INTRODUCTION

The world's biodiversity faces significant threats that have led numerous species to the brink of extinction.[1] These threats are prevalent in both marine and terrestrial ecosystems, including habitat destruction, pollution, climate change, and overexploitation, all of which are contributing to what is commonly referred to as the sixth mass extinction event on Earth.[2]

Sea turtles, a prominent group of large marine ectotherms, are influenced by temperature conditions both on land, where they deposit their eggs, and in the oceans, where they grow, feed, and reproduce. Consequently, it is anticipated that the expansions of foraging and nesting ranges in sea turtles are not synchronized, as the

alterations in isotherms differ between terrestrial and marine environments, thereby affecting the life history traits of sea turtles in distinct ways.[3] Furthermore, the interaction of various traits, including ontogenetic habitat shifts, extensive migrations, natal philopatry, and temperature-dependent sex determination (TSD), renders sea turtles exceptional subjects for investigating and evaluating the effects of climate change. This issue remains inadequately understood, despite the growing focus from policymakers, researchers, and the general public.[4] Refer to Figure 1 which show the generic life cycle of sea turtles with parameters expected to be impacted by climate change.

Sea turtles one of the reptilian species, the sex of the offspring is dependent on incubation temperatures and is not genetically determined at the time of egg deposition. This TSD is exhibited in different patterns among different reptile groups.[5] In the marine turtle species studied to date, higher temperatures have been shown to produce a greater proportion of females, with cooler temperatures producing more males.[6] The temperature experienced during the thermosensitive period, thought to occur during the middle third of incubation, is critical for sexual development.

The temperature at which a 1:1 sex ratio is produced is termed the pivotal temperature.[7] Although the possibility for some degree of interpopulation variation in patterns of TSD in at least some sea turtle species exists pivotal temperatures have been shown to be conservative.[8]

Since marine turtles have TSD it is predicted that increases in incubation temperatures will eventually lead to feminization of some marine turtle populations.[9] The majority of studies estimating current primary sex ratios reported female biases, for all species of marine turtles in all ocean basins in which they occur with few reports of balanced to slightly male biased primary sex ratios.

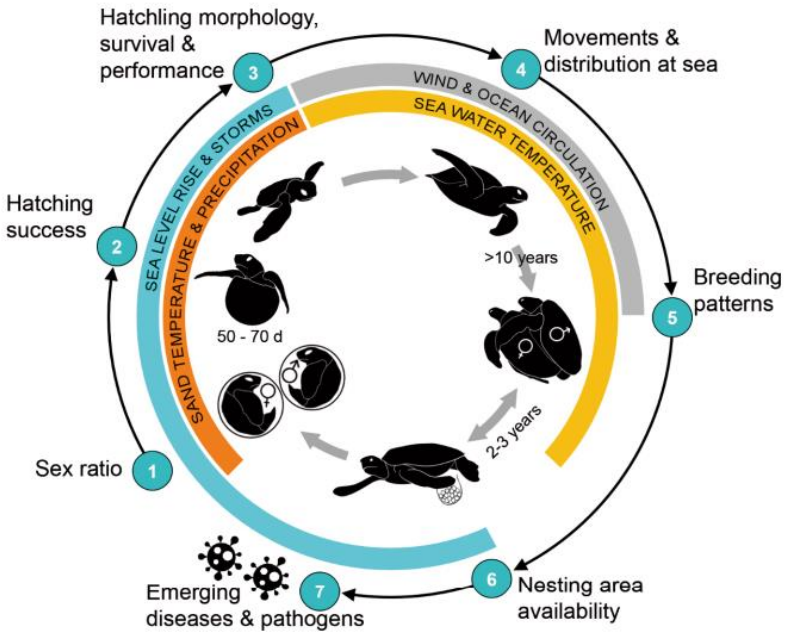


Figure 1: Generic life cycle of marine turtles with parameters expected to be impacted by climate change

2.0 OBJECTIVES

- **Enhance Sea Turtle Hatchling Survival**: To increase the survival rates of sea turtle hatchlings by providing real-time monitoring of nesting sites, allowing for timely interventions to protect hatchlings during their journey to the sea.
- **Continuous Environmental Monitoring**: To continuously monitor and record critical environmental parameters, such as temperature and rainfall, around sea turtle nests using advanced sensor technology, ensuring optimal conditions for egg incubation and hatching.
- **Data-Driven Conservation**: To gather and analyze data on temperature, humidity, and rainfall around nesting sites, providing valuable insights for understanding and influencing factors such as sex determination in hatchlings, which is temperature-dependent.
- **Sustainable and Uninterrupted Operation**: To develop a self-sustaining monitoring system powered by solar energy, ensuring continuous operation and data collection without reliance on external power sources.
- **Integration with Real-Time Notification Systems**: To integrate the system with the Blynk app for instant notifications to conservationists, researchers, and other stakeholders, enabling prompt action in response to environmental changes or the hatching of eggs.
- **Support Long-Term Conservation Efforts**: To contribute to the broader conservation initiatives by providing reliable data and insights that can inform and improve long-term strategies for protecting sea turtle populations.

3.0 METHODOLOGY

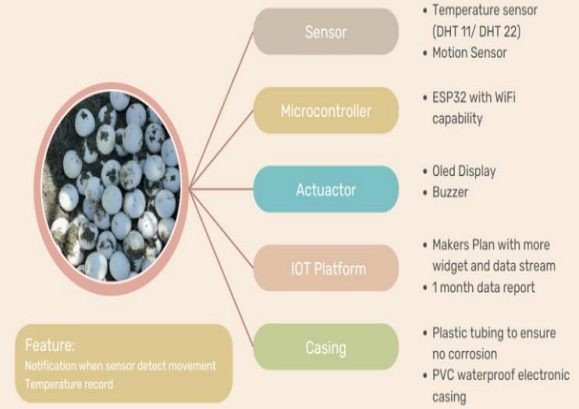
3.1 List of components

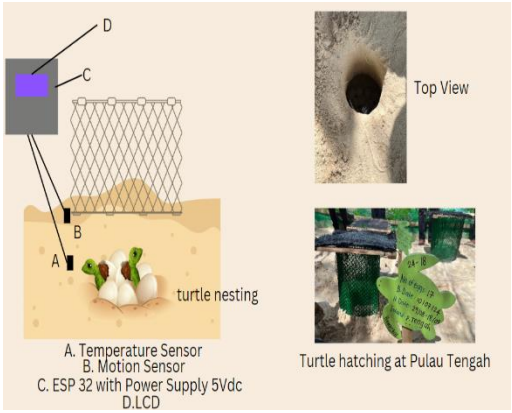
Here, the list of components:-

Table 1: List of Components

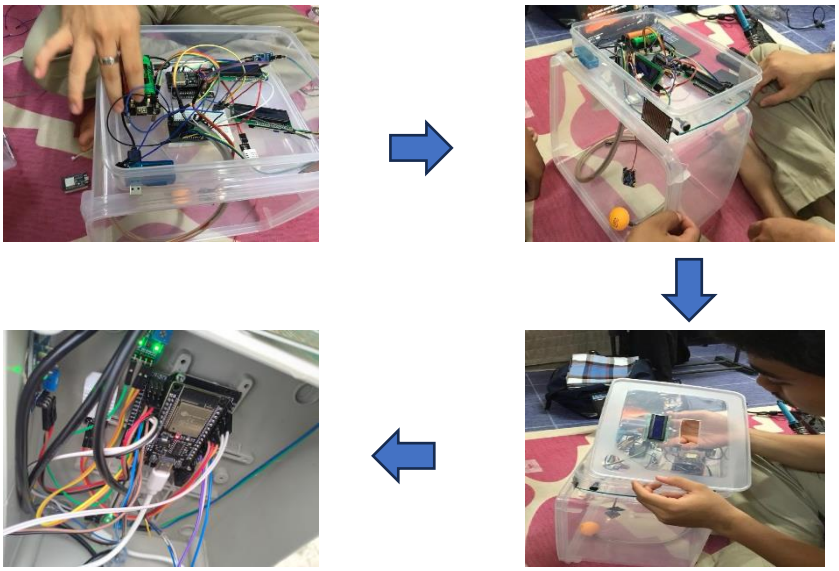
No.	Item	Quantity
1.	Lcd with i2c	2
2.	ESP32	3
3.	Expansion Board ESP32	3
4.	DHT 22	3
5.	Motion Sensor 501	3
6.	Jumper Wire Female to Male	1 Set
7.	Jumper Wire Male to Male	1 Set
8.	Jumper Wire Female to Female	1 Set
9.	Tiub Hose	1 Set
10.	Battery AA	5
11.	Battery Holder	1 Set
12.	Wind Direction	1
13.	Wind Speed	1
14.	LDR Sensor	1
15.	Raindrop Sensor	1
16.	Air Quality Sensor	1
17.	Panel solar	1

3.2 Project sketch

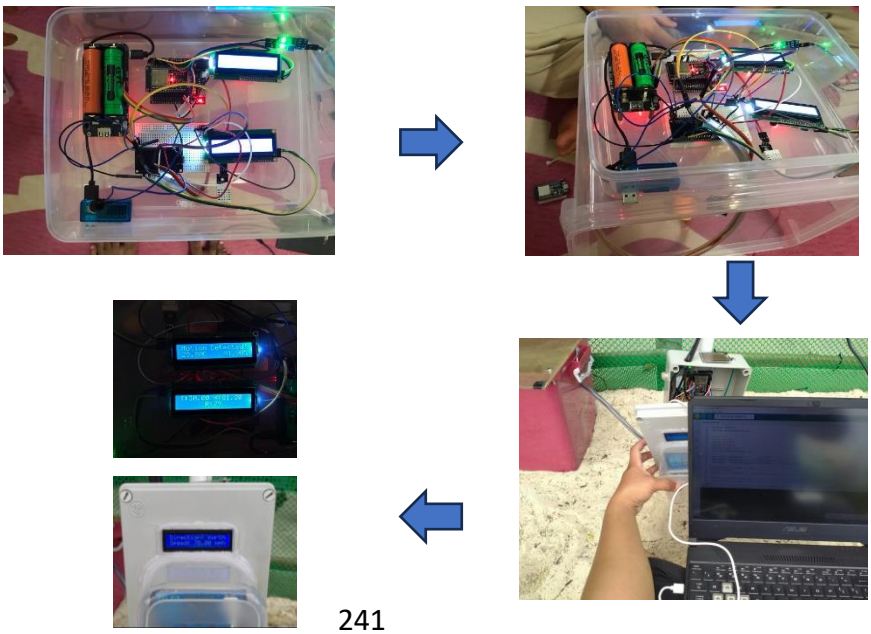




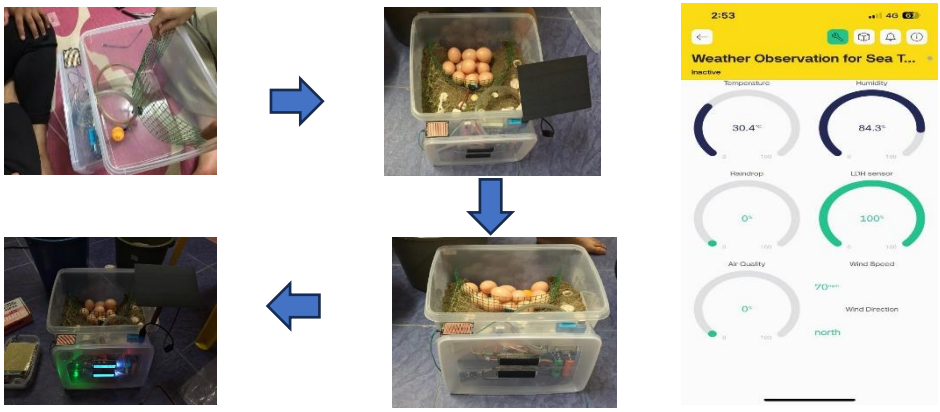
3.3 Project Installation



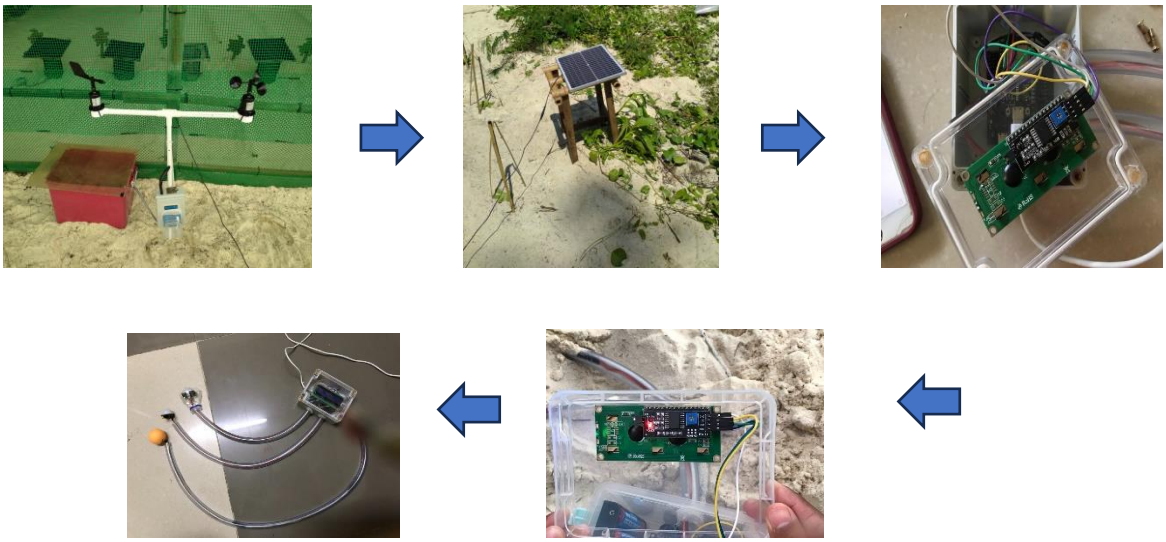
3.4 Project Testing



3.5 Installation Hardware & Blynk



3.3 On-Site Installation



4.0 RESULTS

Advantages/Impact:

- **Real-time Monitoring and Immediate Response:**
  - The integration of the SR501 motion sensor with the Blynk app ensures that any movement, such as the hatching of sea turtle eggs, is immediately detected and communicated to conservationists via smartphones. This allows for prompt intervention, improving the chances of hatchlings safely reaching the ocean, significantly reducing mortality rates.
- **Comprehensive Environmental Data Collection:**
  - The DHT22 temperature sensor's ability to continuously monitor the temperature within nesting sites is critical for understanding and managing the temperature-dependent sex determination of sea turtles. By recording both nest and ambient temperatures, the system provides crucial data that can influence conservation strategies, such as artificially adjusting temperatures to ensure a balanced gender ratio.

- **Rainfall Monitoring and Adaptive Conservation:**
  - The inclusion of a raindrop sensor allows for the measurement of rainfall around nesting sites, helping conservationists anticipate and mitigate the effects of adverse weather conditions on the nests. This data is vital in adjusting protective measures and ensuring the nests remain undisturbed by environmental changes.
- **Sustainability and Portability:**
  - The solar-powered design ensures that the system is both environmentally friendly and capable of operating in remote locations without reliance on external power sources. This portability is particularly advantageous in monitoring multiple nesting sites spread across vast and often inaccessible coastal areas.
- **Enhanced Survival Rates and Long-term Conservation:**
  - By providing a comprehensive monitoring solution that covers real-time alerts, temperature analysis, and weather monitoring, the system contributes to both the immediate survival of hatchlings and the long-term sustainability of sea turtle populations. The data collected over time will inform future conservation policies and actions, leading to better protection strategies.

Novelty:

- **Integration of Multiple Sensors in a Single System:**
  - While individual sensors for motion, temperature, and rain exist, their integration into a single, portable system specifically designed for sea turtle conservation is novel. This combination allows for a more nuanced and complete understanding of the nesting environment, enabling more effective protection measures.
- **Use of Blynk App for Real-time Data and Alerts:**
  - The use of the Blynk app for real-time data transmission and alert systems is a novel application in the context of wildlife conservation. It allows for remote monitoring and rapid response, which is crucial in protecting vulnerable sea turtle populations.
- **Contribution to Sex Determination Research:**
  - The DHT22 sensor's ability to monitor the precise temperature within nesting sites offers a unique advantage in studying and potentially influencing the sex ratios of sea turtle populations, an area of growing importance given the impact of climate change on gender ratios.

Results/Impact:

- **Increased Hatchling Survival:** The real-time monitoring and immediate notifications lead to timely interventions that significantly increase the chances of hatchlings reaching the ocean safely.
- **Data-driven Conservation Strategies:** The continuous collection of environmental data allows for the development of more informed and effective conservation strategies, ultimately contributing to the long-term survival of sea turtle species.
- **Global Applicability:** The portability and solar-powered nature of the system mean it can be deployed in various coastal regions around the world, making it a versatile tool in global sea turtle conservation efforts.

5.0 CONCLUSION

In conclusion, the Portable Solar-Powered Weather Observation Monitoring System for Sea-Turtle Nesting represents a significant advancement in conservation technology. By integrating the SR501 motion sensor, DHT22 temperature sensor, and a raindrop sensor, this system provides real-time, data-driven insights into the environmental conditions and critical events surrounding sea turtle nests. The use of solar power ensures a sustainable and reliable energy source, enabling continuous monitoring without environmental impact. Through the Blynk app, conservationists and researchers receive timely notifications, allowing for immediate protective measures and informed decision-making. This innovative system not only boosts the survival rates of hatchlings by facilitating their safe journey to the sea but also contributes valuable data for the ongoing study and preservation of sea turtle populations. The comprehensive and forward-thinking approach embodied in this project highlights its potential to make a lasting impact on sea turtle conservation efforts worldwide.

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