UNIVERSITI TEKNOLOGI MARA

REAL-TIME IOT-BASED WATER QUALITY MONITORING SYSTEM FOR AQUARIUMS

MUHAMAD NUAIMAN SYAH BIN MOHD FAIZUN SYAFIQ

DIPLOMA OF ELECTRICAL ENGINEERING (ELECTRONIC)

JANUARY 2024

ACKNOWLEDGEMENT

Before I get into the core of the report, I would like to express my sincere gratitude and appreciation to all those who have contributed to the successful completion of this project.

First and foremost, I would like to thank my supervisor, Ms. Atiqah Hamizah Mohd Nordin, for her guidance, support and valuable insights throughout the project. Her expertise and mentorship have been invaluable in shaping the direction of this work.

I am grateful to Universiti Teknologi MARA (UiTM) Kampus Pasir Gudang for providing the necessary resources and facilities for carrying out this project. The access to Proteus 8 Professional has significantly contributed to the quality and accuracy of the results.

Additionally, I would like to acknowledge the vast body of knowledge contributed by researchers, authors, and scholars in the field. Their work has provided a strong foundation for this project and has guided my understanding of the subject matter.

Lastly, I would like to extend my appreciation to my family for their unwavering support, understanding, and encouragement throughout this endeavour. Their belief in me and their words of encouragement have kept me motivated during challenging times.

I would like to reiterate my heartfelt gratitude to everyone mentioned above. Your support, guidance, and contributions have been essential in making this project a reality.

ABSTRACT

Monitoring systems have become essential in various domains, ranging from environmental monitoring to quality control. With that being said, the growing popularity of aquariums amplifies the challenges in ensuring consistent water quality. Current manual monitoring falls short, necessitating an innovative approach. This project presents the development of an IoT-based water quality monitoring system for aquariums using Arduino UNO. The work involves hardware installation and construction of prototype of the system. The system is intended to measure temperature and pH level of water. This system consists of temperature sensor, pH sensor, LCD, LED, buzzer, ESP01 and Arduino UNO. The results demonstrate the capability of the water quality monitoring system to effectively measure and monitor water quality parameters. Furthermore, it also exhibits its capability to integrate with IoT cloud/server which is Blynk so that the result can be displayed on the Blynk desktop and mobile dashboard.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1   Research Background

In today's world, monitoring systems have become a crucial part of many industries and applications, ranging from security and surveillance to environmental monitoring and quality control. Monitoring systems have become more advanced, scalable, and connected than ever before with the development of the Internet of Things (IoT), allowing data to be collected, processed, and analysed remotely. The surging popularity of aquariums accentuates the necessity for innovative approaches in real-time water quality monitoring. Conventional methods, relying on periodic testing, may prove inadequate in swiftly detecting and addressing sudden changes or anomalies in aquarium water conditions. The integration of Internet of Things (IoT) technology emerges as a promising solution, enabling continuous monitoring of critical parameters like pH, temperature, and chemical levels. Employing IoT protocols, such as Blynk, facilitates seamless real-time data transmission from these sensors to a centralized monitoring system. A user-friendly interface empowers aquarium keepers to visualize the data and receive instantaneous alerts in the event of deviations from optimal conditions. Practical validations through case studies conducted in real-world aquarium settings substantiate the proposed IoT-based water quality monitoring system's effectiveness and reliability in enhancing the overall health and sustainability of aquarium ecosystems.

According to a study conducted by the American Society for the Prevention of Cruelty to Animals (ASPCA), poor water quality is one of the leading causes of health issues and mortality among aquarium fish [6]. Inadequate temperature control, imbalanced pH levels, and low oxygen levels can result in stress, diseases, and even death of aquatic organisms. A survey conducted by the Iranian National Institute for Oceanography, revealed that more than 50% of aquarium hobbyists have faced