Universiti Teknologi MARA

Smart Bin for Wet Waste Detection Using ESP8266 NodeMCU

Siti Nur Athirah Binti Ab Hamid

Thesis submitted in fulfillment of the requirements for Bachelor of Computer Science (Hons.) Data Communication & Networking
Faculty of Computer and Mathematical Sciences

January 2020

STUDENT DECLARATION

I certify that this report and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

…….
SITI NUR ATHIRAH BINTI AB HAMID

2017590007

JANUARY 2020

ABSTRACT

Waste management is one of the primary problems that happen in current urbanization in the world, including Malaysia. As we can see today in Malaysia, the problem of waste disposal does not move along with the contemporary urban modernization, and this issue has become increasingly. Although the smart waste bin technology is already available, not all have a thoroughly perfect function. To overcome these situations, an efficient smart waste bin has to be developed. The objectives of this project are to develop a prototype of smart waste bin for wet waste and to evaluate the performance of ultrasonic and moisture sensors using ESP8266 NodeMCU. LEDs have been attached to the sensor for its function itself. The level of waste is monitored using the ultrasonic sensor, and a red LED will turn on when the waste reaches the threshold of the bin. The moisture sensor will measure the percentage of moisture content, and a green LED will light up. Two main tests have been conducted to identify the objective of the project, which are functionality and usability testing. It requires to measure the detection of the sensor with its capability and functionality. ESP8266 NodeMCU been connected to Wi-Fi connection which is mobile phone hotspot. Mobile phone was placed 10 meters far from the devices to see the performances of the mobile hotspot which is mobile phone. The tests revealed that the project is behaving accordingly and achieved its objective and is usable to the user and positive feedback received through the questionnaire.

TABLE OF CONTENTS

CONTENT **PAGE**

SUPERVISOR APPROVAL i

STUDENT DECLARATION ii

ACKNOWLEDGEMENT iii

ABSTRACT iv

TABLE OF CONTENTS v

LIST OF FIGURES ix

LIST OF TABLES xi

LIST OF ABBREVIATIONS xii

LIST OF LISTINGS xiii

CHAPTER ONE: INTRODUCTION 1

1.1 Background of Study 1

1.2 Problem Statement 2

1.3 Research Objectives 2

1.4 Research Scope 3

1.5 Research Significance 3

1.6 Research Outline of the Thesis 3

CHAPTER TWO: LITERATURE REVIEW 4

2.1 Waste Management 4

2.1.1 Statistic on Waste Disposal in Malaysia 5

3.4 Design and Development 23
3.5 Experiment and Testing 24
3.6 Data Analysis 26
3.7 Documentation 27
3.8 Summary 27

CHAPTER FOUR: DESIGN AND DEVELOPMENT 28
4.1 System Design 28
4.1.1 Flowchart of the Project 29
4.1.2 Fritzing Software 31
4.2 Development of the Prototype 31
4.2.1 Required Hardware 31
A) Connection of the Ultrasonic Sensor with a Red LED to the ESP8266 NodeMCU 32
B) Connection of the Moisture Sensor with a Green LED to the ESP8266 NodeMCU 34
C) Full Connection to the ESP8266 NodeMCU 35
4.2.2 Required Software 36
4.3 Development of Telegram Bot 37
4.4 Programming the ESP8266 NodeMCU 39
4.4.1 Setup Process 39
4.4.2 Loop Process 41
4.5 Summary 44

CHAPTER FIVE: RESULT AND ANALYSIS 45