UNIVERSITI TEKNOLOGI MARA

REAL-TIME WATER QUALITY MONITORING SYSTEM BY USING WIRELESS UART MODULE

MUHAMMAD HAIZRUL FITRI BIN ZAINI

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Telecommunication and Information Engineering

Faculty of Electrical Engineering

July 2015

ABSTRACT

There are so many effects if the water quality cannot be control. It is not only affecting our ecosystem but, it can also give effect to the living things such as humans, animals and plants. The purpose of this project is to design the water quality monitoring system in real time using wireless networks. In order to design the water quality monitoring system, a comprehensive procedure for the selection of water quality parameters, cost effective and reliable sensors are needs. Monitoring system is a system used to determine the state of a parameter on certain times according to the needs. This monitoring system is focused to be implemented at lake, pond and river. The sensors used to detect the water quality parameters such as pH and temperature of water. Global System for Wireless UART module used to enable the system sends the data to the computer. User Interface used to assist the monitoring operator by display the sensors reading on computer screen.

ACKNOWLEDGMENT

First and foremost, I am grateful to The Almighty God for giving me the strength, health and establishing me to complete this project.

I would like to express my deepest appreciation to my supervisor of final year project, Dr. Nur Emileen Abdul Rashid, who has the attitude and the substances of greatest lecturer. Without her guidance and persistence help this project would not have been possible. Her willingness give motivate, supports, guidelines and ideas to me tremendously in this project. She inspired me greatly to work from the beginning until the completion of my study on this project.

In addition, an honorable mention goes to my respected parents Hj Zaini Bin Sabran and Hjh Norleha Binti Hj Hambali, and beloved family for their understandings and supports on me in completion this project. Thank you very much to my friends whose give a moral supports, sharing the literature and invaluable assistance when I really needs their help.

Finally, I would like to give thanks to one and all, who directly or indirectly have lent their helping hand in this project. Without helps of the particular that mentioned above, I would face many difficulties while doing this project.

TABLE OF CONTENTS

	Page
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS	xi
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	3
1.3 Project Objectives	4
1.4 Scopes of Project	4
1.5 Thesis Organization	5
CHAPTER TWO: LITERATURE REVIEW	6
2.1 Introduction	
2.2 General Approach	6
2.2.1 Power of Hydrogen	7
2.2.2 Temperature	10
2.3 Previous Study	11
CHAPTER THREE: METHODOLOGY	14
3.1 Introduction	14
3.2 Project Flow Chart	14
3.3 Hardware and Software Description	17

3.3.1 Hardware Description 17
3.3.1.1 Power of Hydrogen (pH) Sensor 18
3.3.1.2 Temperature Sensor 18
3.3.1.3 Cytron Uno Microntroller 19
3.3.1.4 Cytron XBee Shield 19
3.3.1.5 RFBee UART Module 20
3.3.1.6 SKXBee 21
3.3.1.7 LF356 Operational Amplifier 21
3.3.1.8 OP27G Operational Amplifier 22
3.3.1.9 ICL7660 CMOS Voltage Converter 23
3.3.2 Software Description 24
3.3.2.1 ARDUINO Software 24
3.3.2.2 PSpice Software 24
3.3.2.3 MATLAB Software 25
3.4 Simulation and Circuit Design 25
3.4.1 Voltage-to-Voltage Converter 26
3.4.2 Filter 28
3.4.3 Non-Inverting Amplification 29
3.4.4 Buffer and Voltage Divider 30
3.4.5 Differential Amplifier 31
3.4.6 Temperature Sensor Circuit 31
3.4.7 Full Stage of Signal Conditioning Circuit 32
3.5 Design and Construction of Hardware 33
3.5.1 Hardware Development 33
3.5.2 Amplifier Selection 34
3.5.3 Printed Circuit Board 35
3.6 Design and Construction of Programming 37
3.6.1 Arduino Programming Development 37
3.6.2 Matlab Programming Development 38
3.7 Method of Collecting Data 39
3.7.1 Calculation Data Collection 40