BUSITEMA UNIVERSITY

Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

AN AUTOMATED WATER QUALITY MONITORING SYSTEM

BY

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A FINAL YEAR REPORT SUBMITTED TO THE DEPARTMENT OF COMPUTER ENGINEERING AS A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR OF COMPUTER ENGINEERING DEGREE AT BUSITEMA UNIVERSITY.

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DECLARATION

I AINE LORNA MARIA BU/UG/2013/1568 declare that the work in this project report with all its contents was done by only me except where indicated by citations. I would like to point out that, no one has ever presented or duplicated this kind of project or with any of its contents at any institute of higher learning.

Signature:…….

Date: ……/……/……

APPROVAL

This is to approve that the project under the title "AN AUTOMATED WATER QUALITY MONITORING SYSTEM" has been done under my supervision and now is ready for examination.

Signature:……. Date:……/……/……..

Mr. Davis Matovu

Department Of Computer Engineering

DEDICATION

To My grandmother, Mrs. Constance Birakwate, My Parents Mr.&Mrs. Byarugaba Frank and my siblings Anita and Dorothy, you all are a pillar of hope.

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to all those who have made this project a success.

I thank the Lord Almighty, for giving me life, guiding me spiritually and academically.

I greatly appreciate my parents, siblings and friends for the encouragement, motivation, never ending financial and advisory support.

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LIST OF ACRONYMS

WHO…….World Health Organization

LCD……..Liquid Crystal Display

GSM……Global System for Mobile Communication

SQL…….Structured Query Language

IDE…….Integrated Development Environment

NTU……Nephelometric Turbidity Units

mg/l……milligram per liter

pH……potential of Hydrogen

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ABSTRACT

This project report discusses the design and development of an automated water quality monitoring system. It seeks to address the challenges posed in monitoring water quality while using the routine monitoring method. These challenges include; the tedious routine that is costly and has poor data collection and storage. Under this project an automated system is designed and developed. The system reads values of selected parameters along a water distribution line and sends them over GSM to a database where they are stored for further interpretation. The system is based on an 8 bit RISC AVR microcontroller, the atmega 328P-Pu.This project provides a less tedious, real time, deployable and manageable way of monitoring Water quality along distribution lines.

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CHAPTER ONE

1.0 INTRODUCTION

This chapter introduces the project by giving a background study into generation of the problem statement and highlighting the necessary objectives to be achieved .It further discusses the significance of the project and specifies the scope.

1.1 BACKGROUND

According to the United Nations Water Policy brief [1], clean safe and adequate fresh water is important for the survival of all living organisms and smooth functioning of communities and economies. However declining water quality has become has become an issue globally threating industries like the food and processing industries.

Every year more than 680,000 people die of water related diseases in Uganda [WHO 2009] due to poor sanitation and deteriorating water quality. While in Uganda the government under ministry of Environment and other private companies like National water and sewerage cooperation has tried to deliver safe water, only 71% of the urban population are accessing piped water. With 274 gazette urban centers, 40.9% of these gazette centers is managed by NWSC while the ministry through sub-contracting water distribution firms manage 59.1%. Only 41% of these water supplies comply with the water standards [2].

Although distribution networks are designed with minimum level of risk of contamination, factors like leakages, bursts, and change in temperature and under dosing increase this risk of contamination especially when they occur in areas of vulnerability like along storm water channels or slums. This poses a great need to monitor the change in quality along the distribution network [3].

To understand water quality and its probable impacts there is need to collect and monitor data from time to time. The commonly used method is the **routine monitoring method**. This involves a number of individuals manually taking samples from selected sampling points, testing the samples and making reports from time to time. In relation to a population being served by a

distribution network, there are a minimum number of samples required while testing for quality of water within the distribution network. (Appendix 1)

With evolution of new technologies there is a need for improved, deployable means of monitoring the quality of water in real time considering a number of indicators.

1.2 PROBLEM STATEMENT

Routine monitoring of water quality along distribution networks is done by going to the field, collecting samples from selected sampling points, testing the samples and making reports from time to time. This process is tedious in a way that personnel have to carry sterilized equipment in the field and while at it they should ensure constant incubation of this equipment. Some samples require up to six hours of incubation before tests are carried out that poses an issue of time taken to carry out the tests for different samples. The cost of purchasing reagents and paying off personnel is high for the given number of minimum required samples to be collected and tested. This routine is tedious, costly and time consuming, hence a need to develop an automated water quality monitoring system that is less tedious, real time, deployable and manageable.

1.3 OBJECTIVES

1.3.1 Main Objective

To design and implement an automated water quality monitoring system

1.3.2 Specific Objectives

1. To identify water quality parameters relevant to the system
2. To design and develop a water quality monitoring system.
3. To test and validate the water quality monitoring system.

1.4 SIGNIFICANCE OF THE PROJECT

1. The system aids in data collection in relation to water quality monitoring. It provides real time data with high precision and regular back-ups.
2. The system reduces costs and saves time of doing routine field maintenance along distribution networks.
3. The system contributes to a nation-wide database of water quality figures that aid in research and policymaking. This also contributes to strengthening consumer confidence

1.5 SCOPE

The developed system is a water quality data collection tool. It is limited to the water distributors that treat and deliver water across the country. It focuses on three parameters i.e. ph., turbidity, nitrates. The system was developed for Ugandan market only.

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