BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

DOMESTIC WATER PH AND TURBIDITY MONITORING SYSTEM

A FINAL YEAR PROJECT REPORT

BY

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DECLARATION

I, NANYANZI DIANA RITA, hereby declare that this project report is my original work except where explicit citation has been made and it has not presented to any institution of higher learning for any academic award.

Sign: .....

Date: 04/02/2021

APPROVAL

This is to certify that the project report under the title "DOMESTIC WATER PH AND TURBIDITY MONITORING SYSTEM" has been done under my supervision and is now ready for examination.

Dr Ocen Gilbert

Department of Computer Engineering

Sign: .....

Date: .....

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DEDICATION

I dedicate this report to my parents, Mr Mukwaya Godfrey Noah and Miss Nantumbwe Jane Agnes, and my siblings. Your dedication to seeing me become a person of substance through my education and life is a gift I do not take for granted. Thank you for always being there for me. God bless you always.

TABLE OF CONTENTS

LIST OF ACRONYMS

AP	Access Point
API	Application Programming Interface
IDE	Integrated Development Environment
IoT	Internet of Things
JSON	JavaScript Object Notation
LED	Light Emitting Diode
MCU	Micro-Controller Unit
NTUs	Nephelometric Turbidity Units
NWSC	National Water and Sewerage Cooperation
PaaS	Platform as a Service
pH	power of Hydrogen
PWM	Pulse Width Modulation
SDG	Sustainable Development Goals
SoC	Socket on Chip
SSID	Service Set IDentifier
TSS	Total Suspended Solids
UI	User Interface
WHO	World Health Organisation
WRB	Water Regulatory Body

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Access to safe water is vital for every human being to prevent health related issues. However, treated water is prone to contamination through pipe leakages, mud, silt, chemical precipitates, etc. In order to ensure provision of safely treated water, the authorities in charge need to constantly monitor it through its storage and distribution to customers. Turbidity and pH are some of the important factors when assessing quality of water. The aim of this project was to design a domestic water pH and turbidity monitoring system that could constantly log the turbidity and pH of water, and alert the authorities in case the levels lie outside the acceptable standards for potable water. This system has two subsystems, i.e. the water quality sensing module and the data visualization module. The water quality sensing module comprises: an Arduino UNO board to which 3 sensors are connected, i.e. the DFRobot gravity analog turbidity sensor, gravity analog pH sensor and waterproof DS18B20 temperature sensor. These sensors measure the turbidity, pH and temperature values of the water respectively before passing it on to the NodeMCU which relays it the ThingSpeak cloud platform for storage. From the ThingSpeak platform, this information is processed and displayed on a website in graphs and tabular form. It also shows the most recent status reading for each parameter on the site. This system makes it easier for authorities to constantly track and store changes in the quality of water for use to prep better treatment processes as well as catch problems in the distribution process early enough.

CHAPTER 1: INTRODUCTION

1.1 Background

Water is a basic need for every human being on earth. From life sustaining activities like drinking to health-related ones like laundry, cleaning up, etc. Access to safe and clean water then becomes a fundamental right to every person. However, according to the World Health Organisation (WHO), 144 million people in the world lack access to safely managed water services [1]. In Uganda, only 57.2% of the urban population has access to a safely managed drinking water service [2]. This implies that there are people who have no choice but to use unsafe water which makes them highly susceptible to sanitation-related and water-borne diseases, like cholera, diarrhoea, typhoid, etc. An example is the typhoid outbreak that happened in Kampala, Uganda with 1940 cases by 5th March 2015 [3]. The outbreak affected food as well as juice vendors, and was revealed by a study to have been caused by consumption of contaminated water [4].

People get drinking water from different sources. Some sources, like piped water, have water that has undergone a form of treatment, while others, like boreholes do not. Despite its source, there are standards that the water should adhere to before it is considered safe for drinking. A Water Regulatory Body (WRB) is in charge of testing and enforcing the quality of all drinking water. In Uganda, National Water and Sewerage Cooperation (NWSC) is in charge of the treatment and distribution of water to different customers. Since drinking water can easily be contaminated by a number of things, including mud, pipe leakages, inadequate treatment or dirty tanks/reservoirs, etc, the onus is on the WRB to monitor its quality at different stages to mitigate potential problems.

The current monitoring tools to help with analysis range from traditional sample collection to remote sensing technologies in the world. Where some tools are time consuming or labour intensive, others are too costly. In Uganda, monitoring is usually done by NWSC using sampling and test kits once every quarter [5]. One of the key findings of monitoring drinking water samples from NWSC service areas in Kampala, Mukono and Wakiso districts, was issues caught late in the maintenance of the distribution network in the form of pipe leakages which poses high risks of water contamination [2].Target 1 of the United Nations' 6th Sustainable Development Goal (SDG) outlines the achievement of "universal and equitable access to safe and affordable drinking water for all by 2030" [6]. In line with this goal, a need to develop a more suitable solution that can constantly monitor drinking water points becomes a necessity.

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