DROWN DETECTION SYSTEM

By

BSE 22-27

DEPARTMENT OF NETWORK

SCHOOL OF COMPUTING AND INFORMATICS TECHNOLOGY

A Project Report Submitted to the School of Computing and Informatics Technology

for the Study Leading to a Project in Partial Fulfillment of the

Requirements for the Award of the Degree of Bachelor of

Science in Software Engineering  of Makerere University.

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**Declaration**

# We, group BSE 22-27, hereby declare that the work presented is original and has never been submitted for an award to any university or institution of higher learning. We can confirm that where we have done consultations either from published material or the works of others, it has been attributed in this report.

|  |  |  |  |
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**Approval**

This project report titled “**drown detection systems**" has been submitted for examination with my approval as the supervisor of group BSE22-27.

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# Dedication

We dedicate this work to Oloa Hallan as an appreciation for the great support he rendered to us through the stages of the project, it would have not been possible without him. We also dedicate this work to our loved ones who have rendered to us unconditional support during the course of our program till this stage.

# Acknowledgements

First, we would like to thank God the Almighty for blessing us with life, good health and the continuous financial provision throughout all the four years of this course till this stage. We would like to thank our parents, guardians and friends for providing us with financial and moral support throughout the course of this program and project. We also acknowledge with great appreciation our supervisor Dr. Steven Odong Eyobu who guided us throughout the conception, realization, design and completion of this project. He has been very supportive and present whenever we needed him. Finally, we thank our fellow students for always being supportive, updating us about the relevant class information and contributing to our newly learnt skills during the development of this project.

# Abstract

This report follows the implementation of the drown detection system from the inception phase to the completion phase. The system help track the behavior of the swimmer under water so that it can detect any abnormalities.

It uses an oximeter to track the pulse and oxygen levels. If the values are out of range, an alarm goes off.

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# Abbreviations/Acronyms

|  |  |
| --- | --- |
| AI | Artificial Intelligence |
| DDS | Drown Detection System |
| LED | Light emitting diode |

**Chapter 1: Introduction**

## 1.1 Background

### 1.1.1 Scope of the project

The DDS is limited to being used in swimming pools. It can only detect drown detection in swimming pools. It is to be used by the swimmer, the pool watcher or guide.

**1.2 Overview of the document**

This document is written according to the standards for software design descriptions outlined in IEEE Recommended Practice for Software Design Descriptions [1].

This document consists of 8 chapters each with several subsections.

Chapter one provides an overview and introduction to the system to be implemented. This introduction is important for developers as they need to understand the given background to the system and what objectives it is aiming to achieve.

Chapter two provides further detail about the system in terms of expected functionality, level of involvement of users, and any additional information that was not captured in the requirements document but is deemed important.

Chapter three describes the architecture of the intended system. It includes diagrams detailing the high-level architecture and its decomposition to include lower-level elements. This information is used as support when implementation starts. Developers can figure out how closely coupled the components are and the level of abstraction to be used at each component level.

Chapter four is a description of the data that the system controls. This is represented in the form of data objects, entities, and attributes. This serves as a checklist when creating the database for the system.

Chapter five provides a deeper understanding of the flow expected when implementing user and functional requirements of the system. This is represented in the form of algorithms.

Chapter six is a further continuation of chapter five as it describes the visual representations and offers visual aids for developers in the form of screen images.

The other sections are for support and to provide any support information to the users of the document for ease of reference.

Chapter 2: System Overview

## 2. System Specifications

*The DDS consists of* a transmitter that a swimmer wears and a receiver that will be used by the pool watcher to get information.

*.*

### 2.1 Version of requirements and Version Control

*The requirements specification was modified following the defined change management process defined in [3]*

### 2.2 Input

* Pulse reading

This .

* Oxygen levels

The oximeter also provide readings of the blood oxygen levels

* Triger button

This is a button that the swimmer presses in case of an emergency

### 2.3 Output

* Alarm

This is the alerting sound. There are different sounds produced for each case

### 2.4 Functionality

The user wears the device and places his or her finger in between the oximeter. The oximeter works in a way that it has two LEDs. One LED produces a red light that passes through the individuals finger and the other led which acts as the receiver is placed under the finger. The oximeter uses intensity of the light reaching the receiver LED to measure the oxygen levels in the blood by how thick the blood is.

When the oxggen levels in the bloo are low, the blood will become thick and this will be picked up by the oximeter and an alarm will go off to notify the pool watcher.

The device also consists of a panic button. The panic button sends out a signal when pressed by the swimmer incase he/she needs help.

All these signals are sent to the receiving device via a radio freqeunce.

### 2.5 Limitations and safety

*The system* will be used around the swimming pool. It uses radio frequence singals which cover a short distance.

### 2.6 Default settings

The normal blood oxygen level ranges will be set to 99-89. The heart beat rate will be set at 60bmp of which if it goes below an alarm will be set off

### 2.7 Special requirements

*The* person operating the receiver should be near to the swimming pool due to the low range radio frequency.

### 2.8 Errors and alarms

* **Finger slipping out of the sensor**

The swimmers finger may get out of the sensor casing which would result for the system to stop tracking the swimmers behavior

* **Running out of battery**

This would occur when the device has been on for a long time and the battery gets drained. This will lead to the device to go off. To solve this issue used a device the shows the battery levels.

C**hapter 3: Design output**

## 3.1 Implementation

 Oximeter sensor



|  |
| --- |
| Arduino Nano AT16  RC Transimiter and Receiver  Alarm/ buzzer |
| 3.4 Documentation  * Software Design Document   The design phase of the software development lifecycle produced a software design document for the Drown Detection System which enabled the software developers of group BSE22-27 to easily develop the system. It provided the architecture of the system which simplified the development process since the system layout was laid out.   * User Manual   During the implementation of the DDS System, a user manual was developed to provide information of how to use the system. It contains the precautions to take and the limitations of the system |

Chapter 4: Inspection and testing

## 4.1 Introduction

The inspection and testing of the computer system is planned and documented in a test plan. The extent of the testing is in compliance with the requirements, the system acceptance test specification, the approach, complexity, risks, and the intended and expected use of the computer system. (Check what applies)

**Table No: Inspection plan and performance**

| *Topics* | **3.3.1 Inspection plan and performance** | *Date / Initials* |
| --- | --- | --- |
| **Design output**  *Results from the Design Output section inspected...* | Comments: | 07-08-2022 /KS |
| **Documentation** | Comments: | 16-07-2022/KJ |
| **Software development environment** | Comments: | 16-07-2022/DL |

**4.2 Test plan and performance**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **4.2.1 Test objectives**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Id** | **Type** | **Objective** | **Author** | **Reviewed** | **Priority** | | FC1 | Functional correctness | Ability to transmit signals from the transmitter to the receiver | Kisa Jeremiah | Reviewed | High | | FC2 | Functional correctness | Trigger an alarm when the distress button is pressed | Kyadondo Solomon | Reviewed | High | | FC3 | Functional correctness | Measure correct result from the oximeter | Lwaga Darline | Reviewed | High | |
| 4.2.2 Scope and Relevance of tests The tests were developed to validate and verify the system's functionality. The system functional requirements were verified through Code Reviews, Walkthroughs, and Inspection  Testing has been relevant during this project because of the following;   * Testing has helped the team to achieve and assess the quality of the system. * It has enabled us to ensure that the system is usable by the swimmer * It helped the development team uncover system errors and provide solutions to the errors.*.* |
|  |
| **4.2.3 Levels of tests**   * Module Tests   Each module was tested independently to allow for troubleshooting. The modules were tested to verify if the data they were providing was accurate enough for other modules to use.   * Integration Tests   The receiver and the transmitter were integrated seamlessly. After integration was done the whole system was tested and it provided the expected output.   * System acceptance tests   Acceptance tests are yet to be carried out |
| **4.2.4 Types of tests**  **Verification testing**  Verification testing was carried out during the development process of the system to uncover defects earlier. This was carried out during the requirements and programming phases.  **Purpose**: To discover software anomalies earlier from the requirements. This testing focused on making sure that the various requirements were implemented without misinterpretation and misunderstanding. It also verified that the requirements stated earlier were possible to implement by the team.  **Scope**: Functional and non-functional requirements of the system.  **Testers**: Group members of BSE 22-27  **Methods**: Walkthroughs, and Inspection  **Timing**: It was carried out at the end requirements collection and during the coding process.    **Functional testing**  This was carried out on the oximeter to make sure that it gave correct readings. Test execution and defect resolution are carried out throughout this testing to ensure correct functionality. The team was engaged in the defect tracking process and calibration to manage quality.  **Purpose**: To validate the oximeter readings.  **Scope**: System functionality.  **Tester**: Group members of BSE 22-27  **Methods**: Unit tests, module test and data entity. |
| **4.3 Precautions** |

**4.3.1 Anomalous conditions**

The DDS is an embedded system which means it has a problem of power supply.

**4.3.2** Precautionary **steps taken**

We use a device to keep track of the battery levels so as a user can know how much power is left.

## Chapter 5: Installation and system acceptance test

The validation of the installation process ensures that all system elements are properly installed.

## Chapter 6: Performance, servicing, maintenance, and phase out

**6.1 Service and maintenance**

The system will be monitored regularly so as to check if all components are functioning propeerly or need replacement.

**6.2 Performance and Maintenance**

**Table no: Performance and maintenance details**

| *Topics* | **Performance and maintenance** | *Date / Initials* |
| --- | --- | --- |
| **Problem / solution** |  |  |
| **Functional maintenance** |  |  |
| **Functional expansion and performance improvement** |  |  |

# Chapter 7: Conclusion and Recommendations

The purpose of this project was to implement a system that can be used at swimming pools to detect and be able to prevent drowning. The system develop is a prototype of how a finished system can be implemented.

We would like to recommend all swimming pool owners to implement such a system so that accidents can be avoided.