SMART GUARDIAN

Project ID: 19-099

A Floating Device That Acts as A Middleware

Final Report

P.M. De Silva

Bachelor of Science Special (Honors) in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

August 2019

SMART GUARDIAN

Project ID: 19-099

A Floating Device That Acts as A Middleware

Final Report

(Final Report documentation submitted in partial fulfillment of the requirement for the
Degree of Bachelor Science Special (honors)
In Information Technology)

Bachelor of Science Special (Honors) in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

August 2019

DECLARATION, COPYRIGHT STATEMENT AND THE STATEMENT OF THE SUPERVISOR

I declare that this is our own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature
P.M. DE Silva	IT16041080	

The supervisor/s should certify the proposal report with the following declaration

The above candidates are carrying out research for the undergraduate Dissertation under my supervision

Signature of the supervisor: Date:

ABSTRACT

Drowning holds a major factor in number of yearly deaths in every country. there are no proper ways to tackle this scenario and how to monitor drowning incidents. Even if someone is in a drowning incident there's no way to let anyone know other than screaming for help. That's what we are trying to prevent from happening. And that's what the SmartGuardian stands for. Our research is there to overcome and tackle this in a proper manner. SmartGuardian consists of three components, the wearable device, floating device and mobile app. This thesis is concerning about how the floating device is going to work as an intermediary device in our research. this paper is going to cover the theoretical as well as the practical aspects of my research criteria.

ACKNOWLEDGEMENTS

Contents

1. INTRODUCTION

The purpose of this document is to give a detailed description of Smart Guardian, This document will describe the purpose and complete declaration of development of the floating device of the SmartGuardian, It will also explain the overview, literature review, research question, research methodology, research objective, technologies to be use, benefits of the system ,scope and specified deliverables, research constraints ,project plan and issues related to the current system and actions to be performed by the development team are described in order to come up with a better solution.

1.1 Literature Review

When someone is in a water area without proper guidance, they are prone to drowning, and there's no way to determine the condition of the person is in when they are in water, To overcome that challenge we are introducing a product which can help people to survive from drowning and be prepared for flooding incidents. this product includes two physical devices, a wearable device and a floating device. this document is going to cover what the floating device is and its status and how it operates. there are a number of safety featured wearable devices that one can wear. but almost all of those can't communicate when they are inside water because the speed of the sound in determined by a combination of the mediums rigidity and its density, the more rigid the medium faster than the speed of sound, the speed of sound in air is low because air is compressible, and because liquids and solids are very rigid it is very difficult to compress, the speed of sound in such areas are generally greater than in gases[1],
So the floating device is there to tackle that problem by using acoustic waves to communicate between the wearable and the floating devices. floating device also has
A built in GPS module so all the floating devices will be monitored by using an admin panel and it can be used to locate a person who is wearing a wearable device if needed. And with the mobile app the respected authorities can be warned if there is a threat or if someone who is wearing the wearable device is in critical condition and need medical attention.

1.2 Research Problem

The primary research problem is how to prevent a user from drowning and how to get necessary help if needed. the wearable device can check and warn the user if the water is getting too shallow or if he has any other medical conditions. But the problem occurs when getting those sensor data to the respected lifeguards and other parties.

Secondary research problems include:

- How to set floating devices still without those floating all over the place?

- How to Transmit the data through underwater communication?

- How to locate the floating devices?

- How to maintain the power of the floating device?

1.3 Scope

The primary scope of this research is to provide a proof-of-concept for floating device, and to demonstrate how it can be used to locate a user and predict flood and send data to the server that's coming from the wearable device.

1.4 Research Objective

This product mainly focuses on people who are likely to go swimming in known or unknown water areas.

Smart guardian product is going to help those people in many ways, the problem that we are going to tackle through this is drowning and unexpected floods, essentially this product is a drown prevention and a flood detecting system .when this product work like its intended it will monitor someone whose in water by using the wearable device and get all the sensor readings and notify the nearest lifeguard who will have the smart guardian app installed on their phone.

2. METHODOLOGY

2.1 Methodology

We implement this device because the server could not be able to communicate with the devices, which are in the water. The floating device in with a set of sensors for each task. To determine the depth of the water it has a sensor called depth-sensing sonar sensor and to determine the speed of the water flow it has a sensor called the water flow sensor. Floating device to capture the data, which are received from the wearable device at the same time sends all data to the server.

This is not the only purpose of this device, which is capable of doing. If someone's drowning, we trigger the alert to our mobile application. However, we need to locate the affected person. Therefore keeping track of a person in the underwater is an essential part of this process. To achieve this we follow a process as below that how we tackle this problem.

- A GPS tracker In the floating device so we'll know the exact location of each floating device.
- When a user data gets sent to the floating device a timestamp will also be included in the data file
- After receiving the data file, the timestamp will be converted to local time and compared with the time received and calculate how much time it took the data to arrive.

- With this result, we are going to calculate an approximate value and show it in a radius respective to the nearest floating device.

Distance = Rate * Time

As mentioned earlier, the floating device has two communication modules to communicate with the wearable device, which is the underwater communication and RF communication to capture the data from the sensors in a wearable device to send data to the server.

Floating devices are included with a sonar sensors to get the depth of the nearby water area so that people can know the depth of the water before they get into that area.people who has the smart guardian app on their phone can see the locations of the floating devices and with the web based admin panel they can see the details of the floating devices such as power of the floating devices,location of each device and the depth of the nearby water area and the flow of the water.

2.2 Testing & Implementation

2.2.1 Implementation

Implementation process of this device is rather difficult,because there are a number of different types of components that needs to be connected to the main logic board. Sonar and GSM sensor may vary from the final product due to waterproof casing.

Following are the Hardware used for the floating device. Parts list:

1) Water Flow Sensor Flowmeter Hall Flow Sensor 1/2″ 1-30L/min

2) GSM Module SIM900A

3) SIM800 Quad-Band GSM GPRS Module with Antenna

4) HC-SR04 Sonar sensor

5) One Arduino Mega
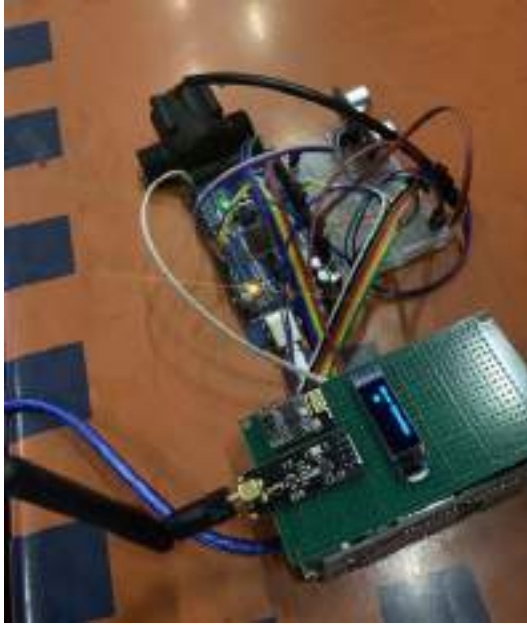
-Above picture is the implemented device without its waterproof housing.

2.3 Research Findings

- Researchers detected that the only way to keep power consistent is to put a battery bank with a solar charger.
- Initial design for the floating device was not practical and it did not float in the water.

3. RESULTS & DISCUSSION

3.1 Results

Researchers had to test the devices both underwater and above the water, below picture shows the results researchers collected from using the device above the water.
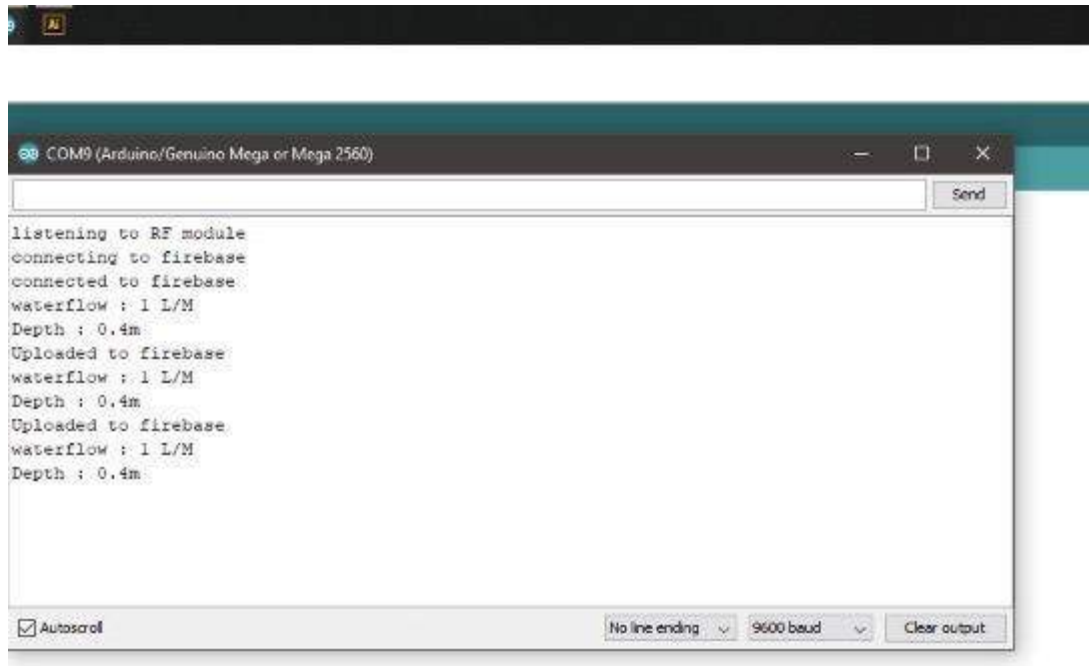
3.2 Discussion

4. CONCLUSION

Our Solution to prevent drowning incidents and flooding is to build and deploy two devices that

can help people to be more aware of their environment.A Person who is wearing our wearable device can know the depth of the water that they are in and if he/she is in any kind of danger they can press the panic button on the device and alert the nearest respectable authorities,and authorities can know the location of a particular using the mobile app.

Developers of smart guardian will decide on the new areas to be improved.

5. REFERENCES

[1] https://opentextbc.ca/physicstestbook2/chapter/speed-of-sound-frequency-and-wavelength/?fbclid=IwAR1IoCNVAl3aoi3D2V6tkqINkLlgGTVmdfUw7Zn6pbiHqE7_X3SijE_yg8E

6. GLOSSARY

7. APPENDICES