January 26, 2011

Dr. Andrew Rawicz
School of Engineering Science
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Re: ENSC 440 Project Proposal for an Intelligent Lifeguard System for Swimming Pools

Dear Dr. Rawicz,

Please find enclosed a proposal for iLifeGuard from GESS Inc. iLifeGuard is an intelligent lifeguard system that uses underwater communication technology. It is designed to prevent the loss of lives due to drowning by alerting the lifeguards when a swimmer is in need of help. Children below the age of twelve and adults with medical conditions are more likely to face the risk of drowning. As such, they form the backbone of our target audience.

The proposal is intended to provide an overall view of our product. Design requirements, possible solutions and system overview are explained in detail in the proposal. In addition, the forecast of a potential budget, timeline, and details of the team organization are also included.

GESS is comprised of five passionate and industrious engineers namely Suleiman Mohamed, Mehdi Elahi, Elis Micka, Gurman Thind and myself. The product has an immense social benefit, which we intend to service by providing a reliable, affordable, and appealing life saving device. For any questions or concerns please contact us at ssk15@sfu.ca.

Sincerely,
Shivam Kishore
Shivam Kishore
Executive Manager
GESS Inc.

Guardian Electronics System Solutions

26th January 2011

Proposal for

Executives:

Shivam Kishore – Chief Executive Officer
Elis Micka – Chief Hardware Engineer
Suleiman Mohamed – Chief Software Engineer
Gurman Thind – Chief Design Engineer
Mehdi Elahi – Chief Research Engineer

Contact Person:

Shivam Kishore
ssk15@sfu.ca

Executive Summary

According to lifesaving Society [1], a Canadian charity organization, drowning is the third leading cause of accidental death for people 60 years of age or older. Each year almost 500 Canadians die in water-related incidents. Red Cross [2] reports that approximately 6% of drowned populations in Canada are toddlers and infants. Although young children below the age 12 and adults 60 years or older face the greatest risk of drowning, people of all ages who have medical problems are also prone to the risk of drowning.

Current swimming pools have lifeguards around the clock. However, due to the large number of swimmers, lifeguards have to divide their attention and may at times misunderstand a gesture for help [4]. Making a device that alerts lifeguards the instant a swimmer needs help would tremendously reduce the risk of drowning and lessen the emotional burden experienced by lifeguards who would live through the guilt of not saving a swimmer under their watch.

We at GESS propose to design an intelligent wireless lifeguard alerting system, which would enable the lifeguard in shift to attend to swimmers in urgent need. This would not only save swimmers from drowning but also from suffering irreparable brain damage. This system would be composed of a wrist bracelet that will be worn by the swimmer, a device that will be installed in the swimming pool to receive signals from the swimmers' bracelet and send signals to a receiver carried by the lifeguard. In addition, to identify the swimmer calling for help a blinking light will be emanating from the bracelet worn by the swimmer.

GESS was founded by five Simon Fraser University engineering students with diverse experiences to enrich the design team. Our device must be reliable, affordable and conform to the quality and usability standards of medical devices. In order to develop a functional prototype, iLifeguard will require an approximate funding of $ 980.The Engineering Science Student Society Education Fund and Wighton Fund are expected to be the main sources of funding for this project.

1.0 Introduction

"If it is foreseeable, it is preventable" must always be the watchwords of any successful risk prevention system. The aforementioned risk is not limited to deaths caused by drowning but also includes long term health affects faced by many who survived drowning. In today's swimming pools there are lifeguards capable of attending to the urgent needs of swimmers. However, lifeguards are at a distinct disadvantage as they are watching out for a lot of swimmers with different needs some of which may have serious difficulty breathing under water or just panic instead of calling for help. Currently there are no electronics devices in the market to serve the purpose.

GESS is developing an intelligent under water communication systems to alert lifeguards. iLifeGuard will utilize commercially available receivers, transmitters and transceivers to transmit signals from a bracelet worn by the swimmer to a transreceiver installed in the pool. The transceiver will then convey the received signal to a receiver held by the lifeguard. In order to identify the swimmer in need of help each bracelet will have a light emitting diode (LED) to output a visible blinking light when the transmitter is triggered. Stage one of the iLifeGuard system will focus on sending signals through water while subsequent stages will be emphasize on making the signal reception reliable, making the device marketable and conform to the quality and usability standards of medical devices.

This project proposal will present an overview of the architecture that we will implement in the iLifeGuard system. In addition, possible design solutions are explored and a proposed design solution is presented. The financial aspect of the project is described, a tentative schedule is presented, and a concise description of each member is given in this document.

2.0 System Overview

The iLifeGuard System is composed of three devices. The first is a bracelet worn by the swimmer, which contains a transmitter that sends signals when a swimmer is at risk of drowning. The second device is installed in the pool. It has a transceiver, which receives signals sent by the transmitter in the bracelet while at the same time relaying the received signal. The third is a gadget carried by the life guard, which buzzes whenever a swimmer activates their bracelet. Figure 2.1 below shows an overview of the configuration of the iLifeGuard system.

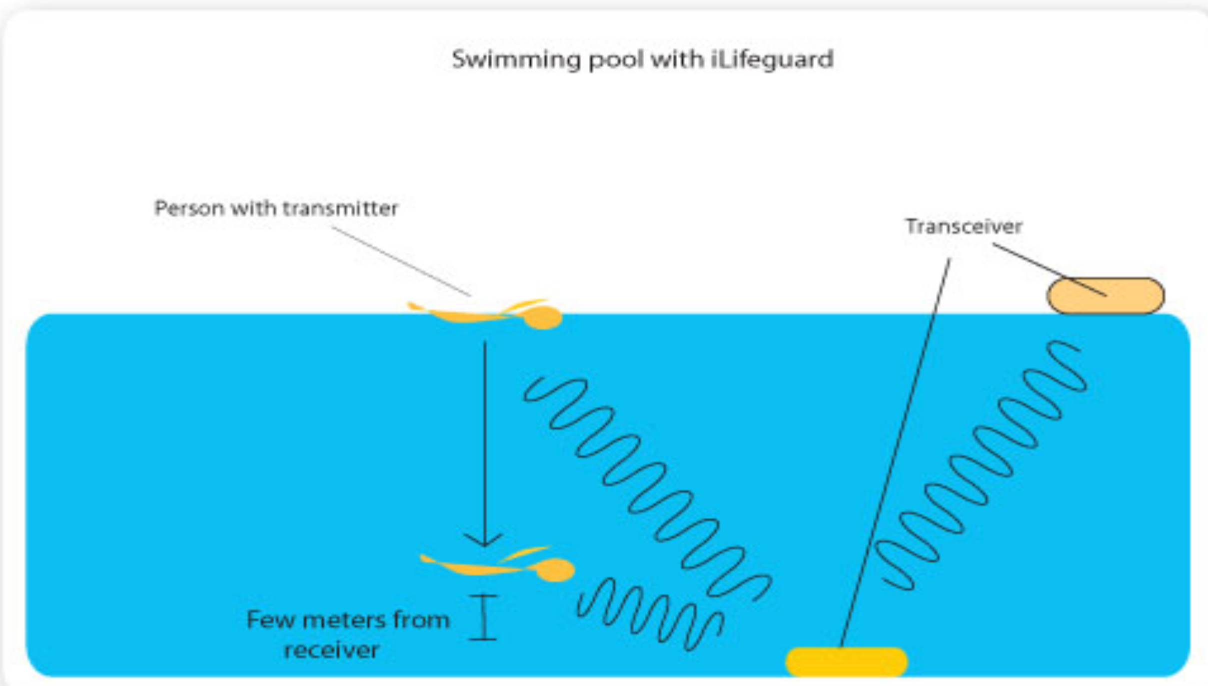

Figure 2.1 – System Overview

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The path taken by signals and conditions for their generation or transmission is outlined in figure 2.2 below,

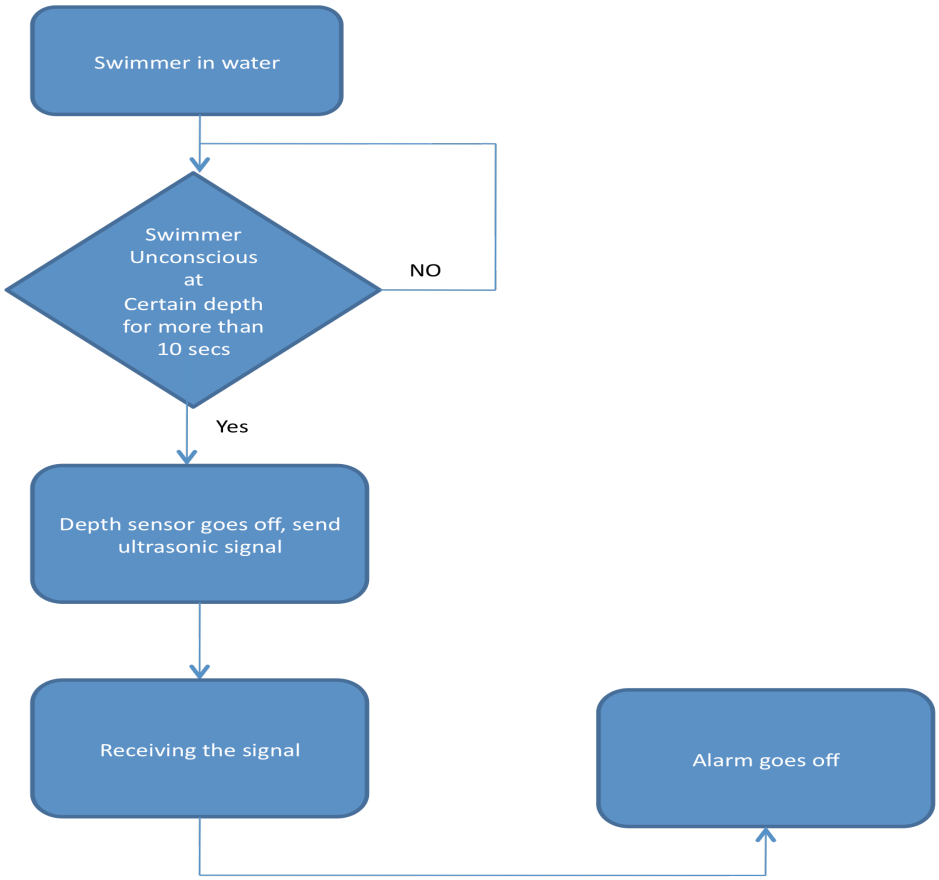

Figure 2.2 – System Signals Flowchart

3.0 Existing Design Solutions

Currently there are no devices in Canada that services the problem addressed in this project. However, there are safety measures in place to safeguard adults and under age swimmers in danger of drowning. Parents supervise their kids or delegate the duty to a responsible adult when kids are using swimming pools at home. Swimmers who are at risk of drowning also use floaters of different design while being watched by lifeguards. Nonetheless, these options are not as reliable as our proposed solution.

4.0 Proposed Design Solutions

4.1 Generation of the "help signal"

This serves as the first stage of the iLifeGuard system – the signal generation and transmission stage. The signal is generated when the swimmer press the help button on the bracelet or when the swimmer is within a metre or less from deepest section of the pool for a period greater than 10 seconds. Upon generation the signal is transmitted to the device installed in the swimming pool. The bracelet also has a light emitting diode (LED) component that flashes whenever a signal is being transmitted.

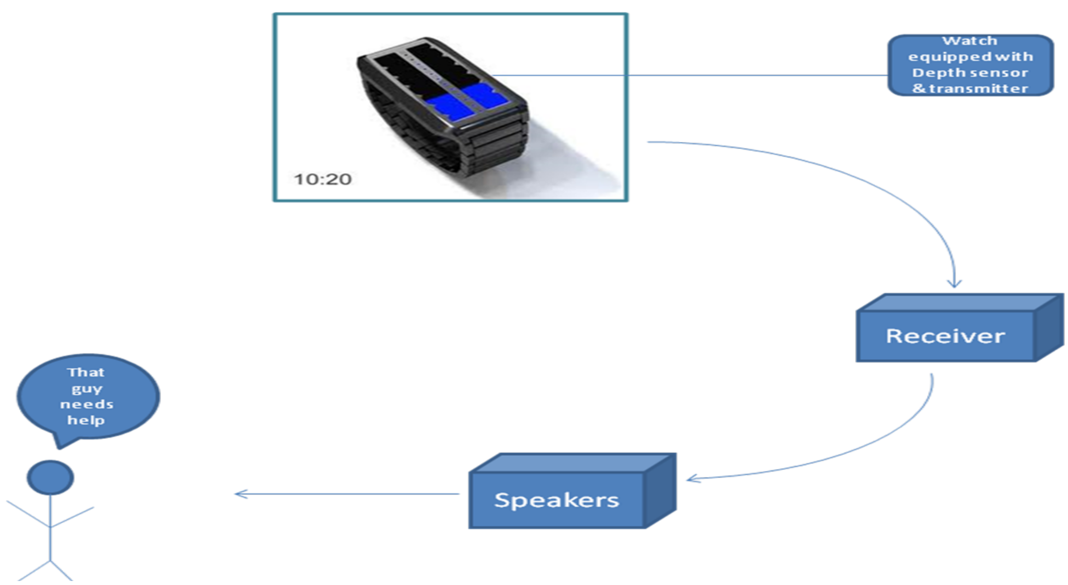

Figure 4.1 – "Help Signal Generation"

4.2 Relay of Signal

The device installed in the swimming contains a transceiver – a device that both receives and transmits signals. This device is programmed to receive multiple signals at the same time. In addition, the transceiver relays the signal received from the bracelet.

4.3 Reception and response to signal

The lifeguard carries a small device which contains a receiver. The device makes a distinctive sound that alerts the lifeguard when a signal is received. Guided by the flashing light that is emitted from the LED mounted on the bracelet, the lifeguard will then be in a position to identify the swimmer in need of urgent help and rescue them in time.

5.0 Budget and Sources of Funds

5.1 Budget

A tentative budget for the iLifeGuard is summarized in Table 1.1. Due to the possibility of cost overruns and the fact that the parts will be tested and operated underwater, a 20% contingency cost has been added to the overall tentative budget. Furthermore, considering the increased cost of the parts for orders in small quantities and the need for replacements in case of loss, the prices outlined in this budget are higher than they will be for the actual product. In order to boil down the table, the individual components have been grouped together into specific categories that define the operational block that they will be a part of.

Components	Cost
Receiver	$ 20
Transmitter	$ 30
Microcontroller	$ 70
Transceiver	$ 70
Pressure Sensor	$ 100
Batteries	$ 50
Vacuum Bags	$ 100
Small Components	$ 100
Printed Circuit Board	$ 200
Contingency	$ 150
Total	$ 890

Figure 5.1 – Approximate Budget

5.2 Funding

As is obvious, the cost for the research, testing, design and development of the prototype is quite in excess of actual cost required for production of the system. To cover these costs we are currently applying to both the Engineering Science Student Endowment Fund and the Wighton Development Fund. Also, to aid in the cost reduction, many small parts and components that are needed will be obtained from the School of Engineering Science in the form samples and unused parts.

6.0 Timeline

Figure below outlines the estimated schedule we plan to follow for this project.

ID	Task Name	Duration	Start	Finish
1	Project Research	17 days	Mon 1/10/11	Tue 2/1/11
2	Proposal	5 days	Thu 1/20/11	Wed 1/26/11
3	Component Selection and Purchasing	9 days	Wed 1/26/11	Mon 2/7/11
4	Structural Specification	6 days	Fri 1/28/11	Fri 2/4/11
5	Transmitter Design	5 days	Tue 2/8/11	Sun 2/13/11
6	Tranciever Design/Reviever	7 days	Tue 2/15/11	Wed 2/23/11
7	Microcontroller Programming	3 days	Fri 2/25/11	Tue 3/1/11
8	Integration	12 days	Thu 3/3/11	Fri 3/18/11
9	Debugging and Testing	5 days	Sun 3/27/11	Thu 3/31/11
10	Documentation	55 days	Thu 1/20/11	Wed 4/6/11
11	Demo and Oral Presentation	6 days	Mon 4/4/11	Sun 4/10/11

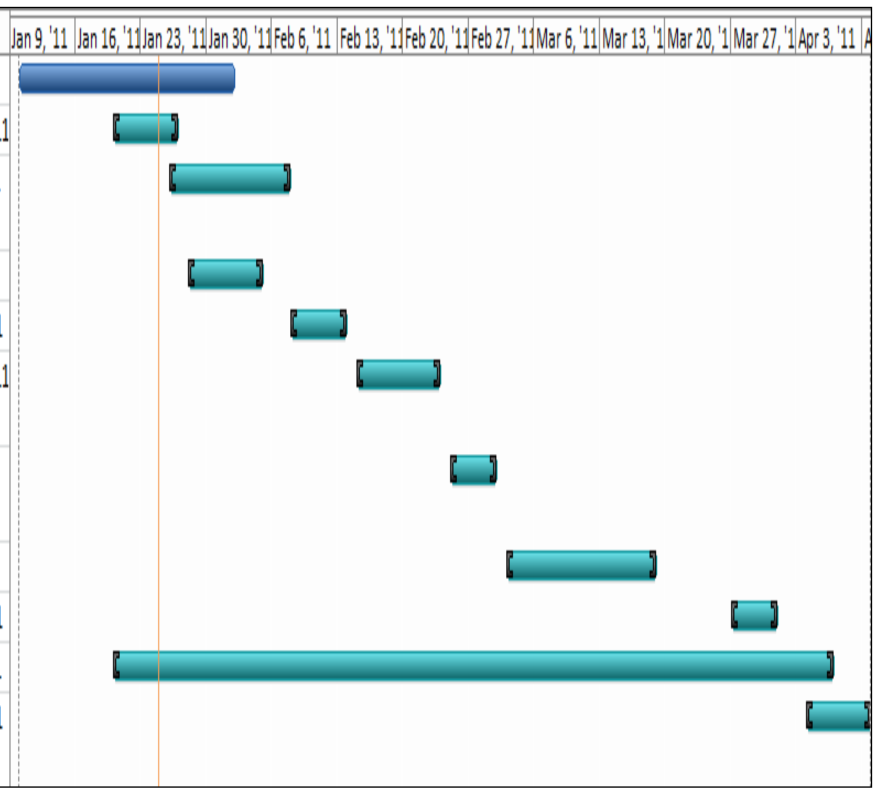

Figure 6.1 – Gantt Chart depicting tentative schedule

7.0 Company organization and Team Profile

7.1 Company organization

GESS was founded by five engineering students at Simon Fraser University: Shivam Kishore – Chief Executive Officer, Gurman Thind – Chief Design Engineer, Elis Micka – Chief Hardware Engineer, Mehdi Elahi – Chief Research Engineer, and Suleiman Mohamed – Chief Software Engineer. The figure below shows the organization of the team.

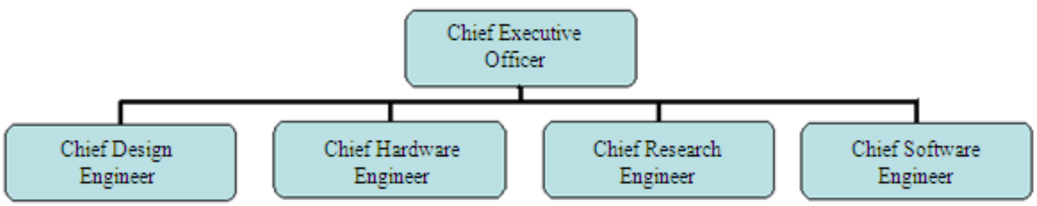

Figure7.1 – Structural Organization

Members have extensive experience in various fields such as underwater communication, processor programming, and integration of electronics components along with marketing and entrepreneurship which are vital to successful completion of the proposed project.

The company will research existing products that serve similar purposes currently in the market. Bearing in mind the shortfalls of existing products and the need of the target consumers, the design of the device will be improved in each iteration with all iterations tested, verified, and documented. In order to achieve the timeline stated in this document, meetings will be held twice a week. Prior to each meeting our Executive Manager will invite members to send him items of discussion, compile them, and then send meeting Agendas to all members. In meetings each member will give a progress report of tasks assigned and possible improvements will be discussed. The meeting minutes will be then posted on the company's blog.

The corporate structure of GESS is team decision based on individuals' skills and interests. Although each member is assigned a specific task, all members are required to provide their input on other aspects of the project. As a result, minor details that may have been overlooked by the assigned member can be pointed out by the rest of the team. This will enhance co-operation among the members and ensure that the final product is stellar in quality.

GESS was founded by an innovative team with diverse experiences. As stated before, *"If it is foreseeable, it is preventable".* The team is committed to build a reliable, affordable, and an appealing device. Since the members have clearly defined roles, the company is based on the concept of co-operation and diversity. Thus, each member will provide their input as assigned when the members present the progress reports of their tasks.

7.2 Team Profile

Shivam Kishore – Chief Executive Officer

The Chief Executive Officer will be the sole representative of the company in both managerial and legal aspects. With a diverse experience in corporate management, he will be in a position to move the company to a tire one status. Due to his background in electronics, he will be best suited to ensure cooperation among the different departments in the company.

Elis Micka – Chief Hardware Engineer

With more than 4 years on hands on experience in hardware projects and courses as the Chief Hardware Engineer I will be the person responsible on most of the hardware product decisions. Working with numerous FPGA projects while using VHDL, VERILOG, C and C++ has made me very experienced with hardware. It will be these kind of qualifications the will be very handy to our company and our respectful products.

Suleiman Mohamed – Chief Software Engineer

The main role of the Chief Software Engineer will be to co-ordinate the deployment of applications developed. In addition, he will ensure that applications undergo rigorous standardized testing cycles before deployment. The user interface aspect of software designed will also be released in parts followed by appropriate patches. The Chief Software Engineer will also cooperate with other department to ensure proper integration of the various products of the company.

Gurman Thind – Chief Design Engineer

Gurman is currently an Electronics Engineering Student at Simon Fraser University. He will assist the group in any Hardware and Software development related to iLifeguard. His experience and innovative ideology will certainly provide a valuable designing and giving technical guidance to other members of the group. His expertise in software development, especially in C/C++ and experience in hardware such PCB designing and STA methodologies, should be an asset to the group. His approach fosters excellent working relationships with fellow colleagues and classmates, enabling him to provide and seek assistance to meet project deadlines and course needs with the utmost quality.

Mehdi Elahi – Chief Research Engineer

As Chief Research Engineer at GESS, he will conduct research to come up with new solutions and technologies based on company's certain required specifications. His division's main focus is to provide proper research data and results for both software and hardware divisions. He also worked closely with other divisions of the company to plan the budget, and participate in buying the proper equipment. Some of his skills are working with microcontrollers, PCB design and manufacturing, Assembly and C programming, and communication.

8.0 Conclusion

The corporate vision of GESS is based on delivering affordable, appealing and marketable product. iLifeGuard is designed to allow swimmers call for help when in danger of drowning. Depending on the need, the call for help signal can be sent to different destination. For example, it could be programmed to directly ring the emergency call centre.

The product will prove effective in minimizing the number of deaths in swimming pools. In addition, it will reduce emotional burden faced by lifeguards or first responders who fail to save the swimmer. Swimmers utilizing this device will experience a higher degree of comfort and allow parents to spend quality time with their children without the fear of them drowning.

GESS carried out ample research in preparation for the production of the first prototype of the device. With our proposed budget and intensive research on the subject, iLifeGuard should be a breakthrough device that ensures that swimming pools are a safe haven for swimmers.

9.0 References

[1]	"The Facts About Drowning In Canada" , [online] 2001, http://www.redcross.ca/cmslib/general/factsaboutdrowning.pdf
[2]	"New Canadians at Higher Risk of Drowning", [online] 2010, http://www.lifesavingsociety.com/PDF/LSResearchResultsRelease_FIN_ENG.pdf
[3]	"Drowning Facts" ,[online] 2008, http://www.poseidon-tech.com/us/statistics.html
[4]	"Drowning Facts and Figures", [online] 2010, http://www.ilsf.org/index.php?q=en/drowning/facts