Orange Health Group
Following the future...

January 21st 2006

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

Re: ENSC 440 - Project Proposal for Oxygen Caddie
Dear Dr. Rawicz

The subsequent document, Proposal for an Oxygen Caddie, contains a description of our company as well as a description of our project for ENSC 440. Our proposed product is an assistive device that will caddie around an oxygen tank and follow the user. This product is meant to make life easier for those who need an oxygen therapy system.

Contained in our proposal is an overview of the system, other solutions to the problem, and then our design approach to solving the problem at hand. This document also contains a budget and timeline for the project as well as a profile of the company and its members.

Orange Health Group consists of five enthusiastic 4th-year SFU Engineering Science Students; Richard Chan, Robin Chuang, Nathaniel Culham, Jason Czerniej, and Rex Lin. For questions or concerns you may contact Rex Lin at 604-783-3167, or contact us via email at OHGroup@gmail.com.

Sincerely,
Rex Lin

CEO
Orange Health Group

Enclosure: Proposal for Oxygen Caddie

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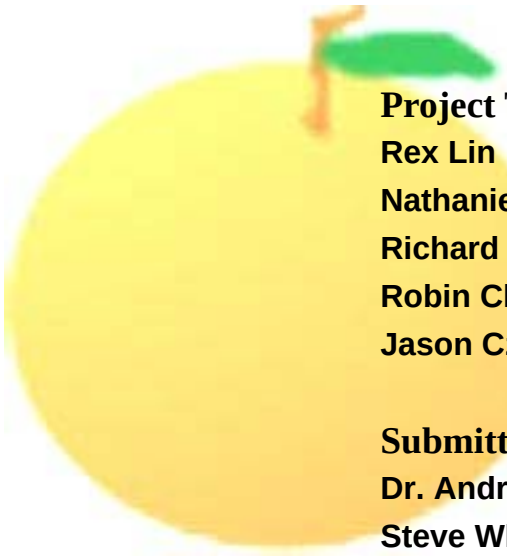
Proposal for Oxygen Caddie

By Orange Health Group



Project Team:
Rex Lin
Nathaniel Culham
Richard Chan
Robin Chuang
Jason Czerniej

Submitted to:
Dr. Andrew Rawicz
Steve Whitmore
School of Engineering Science
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Contact Person:
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Executive Summary

As the baby boomer ages, support for the elderly will become increasingly important. The workforce will decease and there will be less people to take care of our seniors. To ensure that these baby boomers live a comfortable and healthy retirement we will have to provide them with the technology to remain independent as they age.

Today's current solution to provide our seniors with a portable oxygen supply consists of an oxygen tank attached to a cart. This solution forces seniors to drag the oxygen tank around under their own strength which makes walking awkward, as well as may cause them to tire out faster. The simple task of walking can become even more difficult if the subject would like to carry something else such as a handbag, or groceries. Eliminating the necessity for them to drag around this oxygen tank will provide them with a more mobile retirement.

Our proposed solution, the Oxygen Caddie, is a device that follows the user carrying an oxygen supply and whatever else the subject may want to be carried. The Oxygen Caddie will be designed to track the path of the user through our sensor system and then follow that path at a reasonable distance from the subject. Although the main propose of this device is to carry an oxygen tank, our design could easily be expanded for other proposes. For example, it could be used in hospitals to carry the medicine that is connected to patient's arms through intravenous needles. It could also be used at a golf course to carry golf clubs, or a simple dog walking toy.

The Orange Health Group was formed in December of 2005 and consists of five engineering students. Between our team members, we have backgrounds in computer, electronic, and system engineering, as well as knowledge in software coding and business procedures. We have experience in working with actuators, PCB design, and firmware programming. We are committed to designing devices to improve the quality of life for the elderly because we see it only fair to care for those who cared for us as we grew up.

The first prototype is expected to be completed by March 15 and a refined version will be released on April, 1, 2006. The seed money required for this project is expected to be $760. The main source of funding will mainly come out of our own pockets, but it will also come from funding sources such as the EUSS and ESSEF.

Orange Health Group
Following the future...

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1.0 Introduction

It is known that the baby boomer generation is reaching into the upper sixties in terms of age. This shifts the focus on what a majority of people need to maintain a good livelihood. Tasks that are considered simple by most people, such as carrying around a light backpack, can be a huge or even impossible burden on some of the elderly. This leads to a limitation on what these people can do in their daily lives.

Those who are afflicted with COPD (Chronic Obstructive Lung Disease), emphysema, and other oxygen-dependent lung diseases often carry oxygen tanks to help them breath easier. These tanks are commonly carried in backpacks or pouches on the body, or dragged behind on a cart. It becomes a chore to lug these tanks everywhere and hinders activities such as jogging.

There are inventions out there that can increase the comfort in carrying the oxygen tanks, however, there is nothing presently out there that can stop the discomfort entirely. The objective of our project is to allow those carrying oxygen tanks to not even feel the effects of weight from the tank.

This objective can be reached by letting something else hold the tank and follow the user. Of course a person can be hired or volunteered for this task, but this can be expensive and inconvenient. A robot is perfectly suited to this task and can be configured to be unobtrusive. There are many design choices to be made here such as the physical design of the robot itself, how it will move, and its carrying methods.

How successful we are with our project depends on a variety of factors. Researching every option in our designs will allow us to maximize our efficiency and effectiveness of our project. Using our imaginations will give insights that can provide unseen advantages to our project. Design choices and other factors that will influence our project such as costs will be discussed in the proceeding sections.

2.0 System Overview

The following picture shows the general concept of our Oxygen Caddie product. The user will have a sensor on her/him in order for the caddie to locate and follow the user. The receiver on the Oxygen Caddie will receive the signal that the sensor transmits and will be able to turn this information into a position vector. The continuous transmission of this signal will create a path for the Oxygen Caddie to follow. Also, the Oxygen Caddie will be equipped with a sensor to detect the environment in order for the system to avoid any miscellaneous barriers between the user and the Oxygen Caddie.

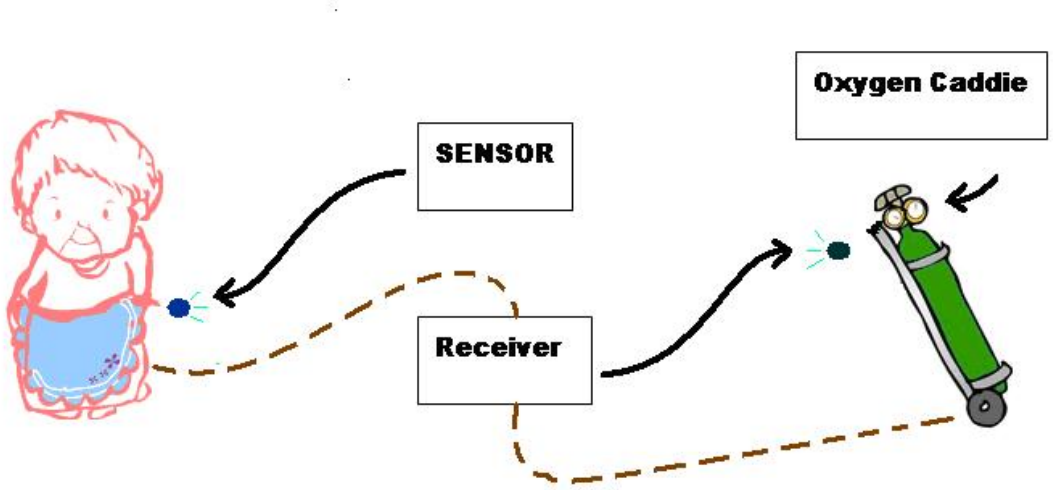

Figure 2.1: System Overview

2.1 Possible Features to be Added

The first possible feature is to develop a remote control for the user which will allow the user to adjust the distance between the caddie and him/herself, and turn on/off the machine as necessary. Another possible feature to be added is to design the Oxygen Caddie so that it can climb up and down stairs such that there will be even less limitations on the user's mobility. Currently, we are planning on designing it such that it is light enough to carry up stairs. This second idea will require a lot of effort in design and most importantly will greatly increase the cost of our product. However,

the decision on whether to add these features or not will be made depending on how successful our present design is and if we have the time and resources.

3.0 Current Design Solution

Currently, there are two solutions to supply our potential users with a supply of oxygen. The first solution is to attach an oxygen tank to a pulley and have the user drag this device around. This will make mobility awkward and cause the user to spend more energy, and in turn, cause the user to use more oxygen. Moving the oxygen tank is also cumbersome since the person may only need it occasionally. Because dragging the tank will seem like a lot of effort when one only need use it a few times a day, the user may not brother dragging it around and will not have it in those situations when they need it most.

Indoors, our potential users have another option, to have a long tube connected to a device that will supply oxygen. The tube could be as long as 50 feet long and is connected to a stationary oxygen generator within the building. When issuing this product, installation is required and a considerable amount of thought, time, and money spent in the installation of the equipment. Ideally, the device will be stationed where the user can reach all essential parts of the home. Once again, one problem that arises is that the user must drag the oxygen tube while moving. Also, the user does not have the luxury of walking wherever they like, they are constricted to areas that are reached by the hose, and must always keep it in mind wherever they go so as to not get it tangled, or wrapped around itself. While moving, the user will have to retrace their path in order to unwind the tube to get to a different desired location. When taking a shower, the tube must be able to slip under the door in order for the user to use the oxygen after or while taking a shower. Since the tube is so long, it is also more prone to failure. In addition to all of the aforementioned inconveniences, this particular device still does not address the problem of allowing the user to have a portable supply of oxygen outdoors.

4.0 Proposed Design Solutions

Our proposed design solution, the Oxygen Caddie, is a device that will carry around an oxygen supply for the user. In this way, the user will have their hands free for other purposes while moving around. This would be especially beneficial for those who also have trouble walking and need walking aid devices such as a four legged cane stick or other walking aids. The necessity of both a walking aid and an oxygen supply would make transportation most difficult and almost impossible, if not severely awkward. Our Oxygen Caddie will also be capable of carrying around other items for the user, to help keep hands free for more important tasks.

Our device will track the path taken by a user and follow the path detected. This will allow the user to walk freely without having to worrying about our device crashing into objects such as walls and chairs. The device will follow the path the user has taken and navigate around the object the same way the user did. By tracing the path, the Oxygen Caddie will not require significant AI and thus decrease the cost of our overall device. The sensor system will be a crucial part of our design, identifying both the location and identity of the user. Identification of the user is most important, for signals can easily be crossed with like signals, or other Oxygen Caddies' signals which obviously would pose a problem.

Motor control is another key component of the Oxygen Caddie. Using the data provided from the sensor, the Oxygen Caddie will only move when the user is moving. Our motor control system will also allow the device to move around sharp corners and stay at a particular distance away from the user, as close as can be without disrupting the users normal walking pattern or bumping into the user. By keeping the proper distance, the user will be able to access the device if necessary. Furthermore, this distance is reprogrammable by the user to adapt to crowded environments, avoiding confliction with other objects or people.

Future models of the Oxygen Caddie will be able to move up stairs which will allow the user to be even more mobile. Affordability and battery life are also issues we foresee to improve. The goal of this product is to allow the user to live as normal a life as possible under their given circumstances.

5.0 Sources of Information

A project such as this cannot simply be completed by brainstorming and using trial and error. This will lead to enormous time loss and costs due to unneeded materials being purchased. Therefore, we will need to use other sources of information that are available to make sure we work as efficiently as possible.

The most obvious sources of information are course textbooks and the internet. This will help us with the technical aspects of our project, such as mechanical building methods and software code that can be implemented. The internet can sometimes be an unreliable and inaccurate source but it does provide us with very up to date information, therefore we use caution to what information can be genuinely used.

At Simon Fraser University we have many skilled researchers that specialize in a variety of fields. Our project will involve the use of sensors and motors, so we can contact those specialized in these fields for advice and information. Graduate students or those that work in fields similar to our project work may also be beneficial to talk to.

We strive to create something new that can be unique and beneficial to today's world. By making ourselves and our own experiences as a source of information we can personalize our work and perhaps make something never seen before. Imagination along with the proper research will result in a product to be proud of.

6.0 Budget

In budgeting our project, we based our costs on products available in the market today. For this project we will need a receiver/transmitter system (likely infrared or ultrasonic) in order to locate the user, an IC to massage and condition the signal, and a motor and battery to provide power for our Oxygen Caddie. The most expensive item will likely be the programmer for the IC. Depending on what is available for use form the Engineering Science department, we may be able to reduce our tentative costs by a third. A table of our tentative budget can be found in table 6.1 below.

Equipment	***Estimate Cost***
Transmitter/Receiver	$100
IC and Programming Software	50
Programmer	260
Motor	90
Frame and Running Gear	80
Battery and Charger	80
Casing	50
Miscellaneous	50
Total	**$760**

Table 6.1: Tentative Budget

The estimates found in table 6.1 are overestimates in order to compensate for unforeseen mishaps.

6.1 Financing

In order to fund our project we intend to apply for a grant from the Engineering Science Student Endowment Fund, ESSEF, as well as to the EUSS. We are also looking into the possibility of funding from companies that may be interested in launching our product into the market after completion.

The good thing about the Oxygen Caddie is that the costs are not so great that we as a group are already prepared to cover the full $760 cost if necessary.

7.0 Timeline

The following Gantt chart will show the milestones and estimated time spent in each product development stage. Table 7.2 will be the set date for each milestone shown in the Gantt chart.

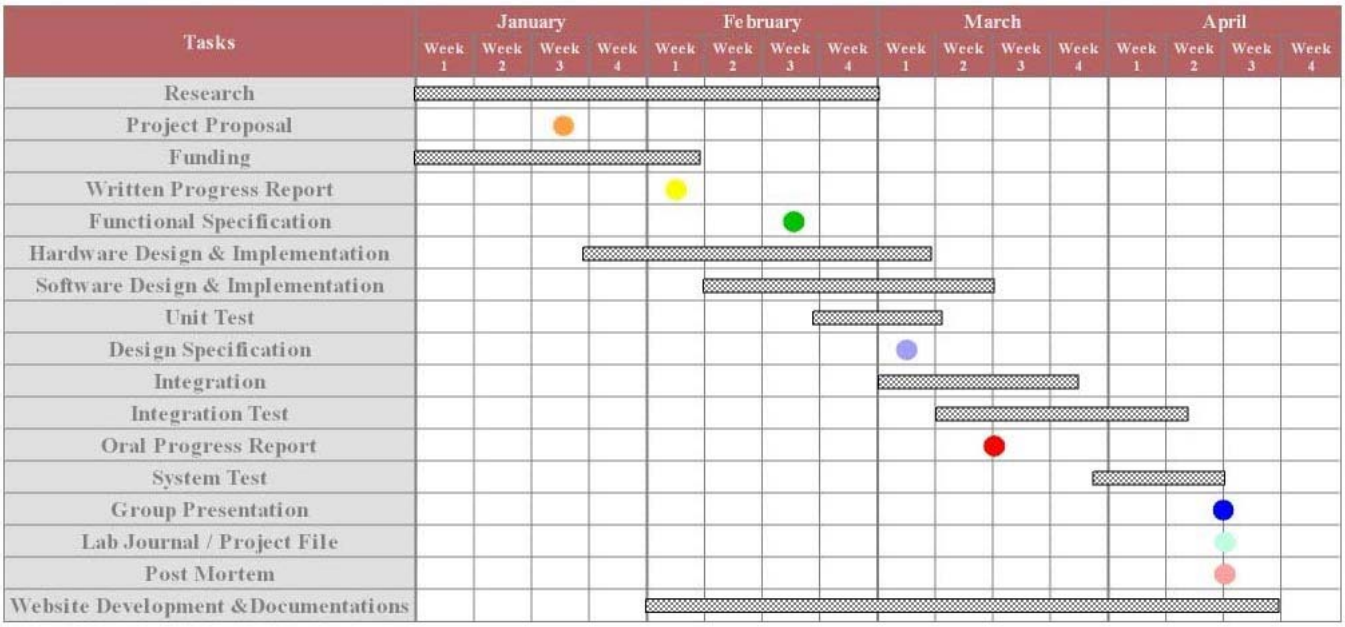

Table 7.1: Time Line Gantt Chart

Key Dates			
	Mon, Jan 23		Mid-March
	Mon, Feb 06		Mid-April
	Mon, Feb 20		Mid-April
	Mon, Mar 06		Mid-April

Table 7.2: Key Dates for Milestones

8.0 Company Organization

Orange Health Solutions comprise of five multidiscipline engineering students in their final year at Simon Fraser University. Our members complement each other so that we can achieve our goals. Orange Health Solution is a small friendly company where everyone is enthusiastic about the product we are developing.

In Orange Health Solutions, everyone is encouraged to express ideas and opinions about the development of our project. We feel this environment is crucial in generating innovative ideas. Our company also has an organized corporate structure with our Chief Executive Officer, Rex Lin, in charge of the overall direction of our company. The Chief Finiancial Officer, Nathanial Culham, is in charge of overseeing our budget and funding. Richard Chan, the Chief Operating Officer, is in charge of making sure task are completed on time and that the task are assigned evenly to the correct people. Jason Czerniej is the Chief Technical Officer is in charge of researching technologies so that we know where we stand in our field. Robin Chuang as the Vice President of Marketing will handle inquires by investors and also oversees our website so to insure the public know how our product is progressing.

We have assembled great team where our combined members will have experience in most stages of our design cycle. Our task will be assigned to the most qualified person so that the task is completed as quickly as possible. By assigning task to the person that is most interested in that particular part of production, we feel this will generate the best results. That said, most of our task will be assigned to at least two people so that we can all understand how our system as a whole work. This will also help us if we ever lose one of our members so that production can still continue without a huge setback.

9.0 Company Profile

Rex Lin Chief Executive Officer

Rex Lin is a fourth year SFU Computer Engineer student, whose expertise is in software development and project control. During and internship with Net Fusion Corp. Rex gained a great deal of experience in object oriented design and analysis of developing software and web applications. He is experienced with Java, C/C++ and assembly languages such as M86HC12 microcontroller. Furthermore, he is very perceptive when it comes to programming flaws and is excellent in debugging.

Nathaniel Culham Chief Financial Officer

As a Systems Engineering Student pursuing a Minor in Business, Nathaniel Culham will be able to combine his technical skills and monetary knowledge to direct this project in a very efficient manner. In specializing in sensors and actuators as well as a good knowledge of programmable logic controllers Nathaniel will contribute to both the hardware and software components of the project, hopefully making integration as smooth as possible. Nathaniel will also manage the budget to ensure we stay within it as well as do additional research to ensure that we produce a marketable product, affordable to the consumer.

Richard Chan Chief Operating Officer

During his four years as an Electronic Engineering Student at Simon Fraser University, Richard had two work terms to gain skills in both hardware and software design. As a research assistant at SFU Experimental Robotics Laboratory, he learned about the hardware and firmware design processes involved in creating a miniature robot that plays hockey. In addition to gaining experience in a group research environment, he learned about the various steps and problems involved while building a product from scratch which will be a great asset to this company. As a Developer at Illuminated Technologies, Richard gained experience in software development using PHP and mySQL. Also, with experience in building PCB chips Richard is the perfect candidate to lead our hardware department.

Jason Czerniej Chief Technical Officer

Jason is a fourth year Systems Engineer student at Simon Fraser University with co-op experience in the school's lab. The work required a development of skills such as soldering, operating equipment found in a lab, and other physical tasks that a

professional engineer would perform in the workplace. Furthermore, augmented with course knowledge Jason is able to program in C++, Java, and Assembly language. Jason enjoys working in teams and has demonstrated competent communication skills, both in paper and person, which we are sure will be a great benefit to this company, especially when launching our finished product into the consumer market.

Robin Chuang Vice President Marketing

As a fourth year Electric Engineering Student, Robin obtained great knowledge in both hardware and software fields. Also, he has sharpened his skills in signal and image simulation with MatLab in past work experiences, circuit board design, and soldering the testing circuit board. With his outgoing characters, Robin will help the group to communicate with our original founder and future potential customers as well as help keep a light and friendly atmosphere within our own group

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10.0 Conclusion

Orange Health Group's innovations on the Oxygen Caddie system will create a more convenient life for many families and people that need oxygen therapy. This machine will allow many elders to be independent and have a much easier life. Moreover, this application not only applies to people who need oxygen therapy, but this system can be evolved into many other possible applications that may make some difficult tasks less so. Some future applications include helping house wives carry heavy groceries. This product will certainly make life easier for those who struggle with everyday tasks like carrying backpacks or groceries.

The proposal put together here shows that Orange Health Group is capable of making this dream come true. The thorough research on the budget shows that we can keep the development within the limit. Furthermore, in the timeline section we have taken into account that testing and integration will be very time intensive, we are certain that we will be able to match this schedule.

In conclusion, with the well devised strategy and a diverse and balanced team, we are confident we will be able to build our Oxygen Caddie, on time and within our budget.

11.0 Reference

Active Electronics, January 10, 2006 http://www.active-tech.ca

Digi-Key Corporation, January 10,2006 http://www.digikey.ca/

Home Care, January 10,2006 http://www.homecaremag.com/