January 22, 2007

Lakshman One
School of Engineering Science
Simon Fraser University
Burnaby, BC
V5A 1S6

Re: ENSC 440 Project Proposal for a World of Warcraft Input Device

Dear Mr. One,

The enclosed document, *Proposal for a World of Warcraft Input Device*, outlines InDev's approach to the design and development of a device that would improve the comfort and health of World of Warcraft players.

Included in this proposal is a development schedule and a tentative budget that will be required for the successful completion of the project herein proposed. Also discussed is a possible implementation method of the system, as well as alternate implementation strategies.

Our ENSC440 group consists of three fifth year engineering students: W. William Walczak, Vijay Galbaransingh, and Calin Plesa. If you have any concerns or questions regarding this proposal, please contact me by email at ensc440@gmail.com or by telephone at 604-616-6227.

Sincerely,

W. William Walczak,
CEO
InDev Corp.

Enclosure: *Proposal for a World of Warcraft Input Device*

Proposal for a
World of Warcraft Input Device

Project Team:
W. William Walczak
Vijay Galbaransingh
Calin Plesa

Contact Person:
W. William Walczak
ensc440@gmail.com

Executive Summary

The gaming world is breaking new ground with people joining online communities in hordes and demanding to be entertained in new and innovative ways. One such example is the World of Warcraft (WoW), Blizzard Entertainment's new game that has a monthly subscription base of over 8 million people [1]. Unlike previous video games which appealed only to a small demographic, World of Warcraft has succeeded in bringing both genders and all ages to the game.

The purpose of this project is to provide users with a new gaming interface that will enable them to play longer, derive more enjoyment, and suffer fewer repetitive strain injuries that are commonly associated with gaming [2] [3].

The proposed solution will change the way users interface with World of Warcraft, liberating them from the hunched over pose with a death-like grip on the mouse and a straining and awkward hand positioning. Gamers will be treated to a comfortable and vastly more efficient way of playing.

Our target market will be the 8 million people who play Warcraft, the majority of which are over 18 years old and have proven themselves willing to spend money to improve their gameplay experience. We will entice the hardcore player with the promise of improved efficiency and speed of play. We will market to the casual after work player (typically less physically coordinated) with an intuitive system that lets them play the way they want to – beyond the limits and morose finger combinations imposed by the traditional keyboard and mouse.

We propose the engineering cycle for this project will encompass research, design, and construction. This cycle will span a 13-week period with April 6, 2007 as the scheduled completion date for an operational prototype. The entire project is tentatively budgeted at $638, which we expect to obtain from a variety of sources.

Table of Contents

Introduction

There has been an attempt in the past to provide gamers on the personal computer (PC) platform an alternative to the regular mouse and keyboard input device combination [4]. However, this combination has proven to be superior to every substitute and a viable alternative has proven elusive.

The current input devices used for World of Warcraft are the traditional keyboard and mouse. The keyboard is a combined input device that is used for both action buttons and character movement. The mouse is used to interface with onscreen controls, the WoW environment, and repositioning of camera angles. The goal of this project is to redesign the interface in such a way that will reduce strain, allow for a more comfortable body position and allow the player to game for longer and not suffer any long term effects of strain.

Current System Overview

A variety of different input device ideas have been explored on the road to the 'perfect' Warcraft input device and they will be discussed and given merit on their viability as practical solutions.

To arrive at a solution we first need to analyze the current interface in a piecewise manner and define the problem. A breakdown of functions of the current input devices gives an idea of the complexity of the interface, and the paramount undertaking that the redesign of the interface truly is.

The Mouse

The mouse, in the default configuration, is used to interface with the onscreen controls, manipulate and perform selections in the environment, perform camera angle rotations and move the character's point of view. In short, this is not a small list of tasks to interface with a completely new device. Figure 1 shows a user configured World of Warcraft interface with the character in the centre of the screen, action buttons located at the bottom, a series of enemies around the character and the camera rotated in a way that makes environmental interactions easy and precise.

Figure 1 - World of Warcraft Screen Shot

The Keyboard

The keyboard is used for a series of other interactions. Once again, we consider the default mode and configuration of the keyboard. Character movement is performed by means of the A, S, D, and W keys in a series of combinations. The number keys control the action bar and associated actions, and the SHIFT, CONTROL and ALT keys are used as modifiers. There are many ways that the keyboard can be configured to control actions depending on player preference.

Pressing ENTER on the keyboard places the player into a communication mode allowing the player to communicate with an online community. This is done by typing messages in a chat window (although, the average power user augments their interface to include a microphone enabling voice communication).

The Keyboard + Mouse

Interfacing with the game is performed by integrating the inputs from the mouse and the keyboard in a series of complex movements, button and key press combination that allow for complete character control, and game play seems to only be possible with these two

working together in perfect harmony. The game has essentially been designed around the current and very familiar interface, and playing the game any other way is surely impossible! Or is it?

The de facto interface is a relic of the many generations of computer usage and users who have not been given a better set of input devices. The current keyboard layout has remained relatively unchanged since its inception in 1866. The newest piece of hardware the average user controls their computer with is the mouse, invented in 1968, which while having undergone some cosmetic and functional upgrades over the years retains the 'drag-something-across-a-surface' style of control.

Possible Design Solutions

In the search for the perfect user interface we have explored every conceivable form of control we could think of that can be implemented with current technology and available resources. A series of ideas and pros and cons of each will yield clearer choices for design solutions.

Brain Control

Many researchers and journals have outlined possible 'Brain-Computer' interfaces, but many involve complex gadgetry or even surgical implants to work relatively well. Unfortunately, no viable solution is available at the time of this proposal.

Eye Controlled Interface

To remove the need for using hands to interface with Warcraft for we have looked into using eyes as a solution. Such a system has been attempted [5], and is the preferred method for people with disabilities. While this could reduce some clutter it is however impractical for the average user. Playing for many hours at a time would lead to eye strain by preventing the user from resting their eyes while playing.

Eye Controlled Clicking

While the eye controlled interface may not work, maybe using the eyes as selection may improve the user experience. 'Blink-clicking' was considered as an option and quickly dismissed when we realized that too many false positives may be registered, and once again eye strain may be a problem.

Neck Controlled Camera Movement

Working our way down the body, we considered the possibility of controlling either the camera angles or character movement with slight neck movements. This would once

again strain the neck which is not accustomed to repetitive and constant minor movements.

Foot Control

Another possible interface for the game could be foot control. This once again can be easily removed from the list of possible solutions by subjecting it to similar scrutiny as the neck control. Repetitive strain in the ankle flexors would surely result. It is also not possible to control the game adequately with foot devices to be used for more than auxiliary units, which would increase cost and complexity.

The Hands

The hands have always been the most natural way for humans to interact with and manipulate their environment, and gaming seems to be no exception. The hands would have to remain the method of choice for interaction with the game.

Current Trends In technology

Analyzing current technology trends we have drawn a conclusion that the ubiquity of wireless communications and the lack of desire to own tethered devices makes the choice to implement a wireless device rather obvious.

Let us next look specifically at what the market currently offers for gamers. The introduction of the Nintendo Wii [6] has shown that devices using natural hand movement augmented with push button controls are a desirable way to play. The market has also shown that users prefer the new Nintendo Wii controller to the traditional controllers, such as the one sold with the newest offering from Sony, PlayStation3 or Microsoft's Xbox 360 [7]. This leads us to the same conclusion – let the users interact with their environment in a more natural way. No longer do we need to push a mouse around a flat surface!

Proposed Design Solution

Taking into account many design possibilities that we would like to see in the perfect interface we have decided upon a clever merger of the successes of the past with new technology implemented in a simple and functional manner.

To replace the mouse we have chosen to design a wireless remote. Removing the need for a surface the user is free to sit back in a comfortable way and interact with the game. The remote will also have character movement controls in a readily accessible location. This will remove the strain on the other hand to move the character and access action buttons simultaneously. As an added feature to the remote the use of motion to control the character will also be explored. However, this feature will be implemented only if sufficient testing and market research proves that it is necessary and desirable.
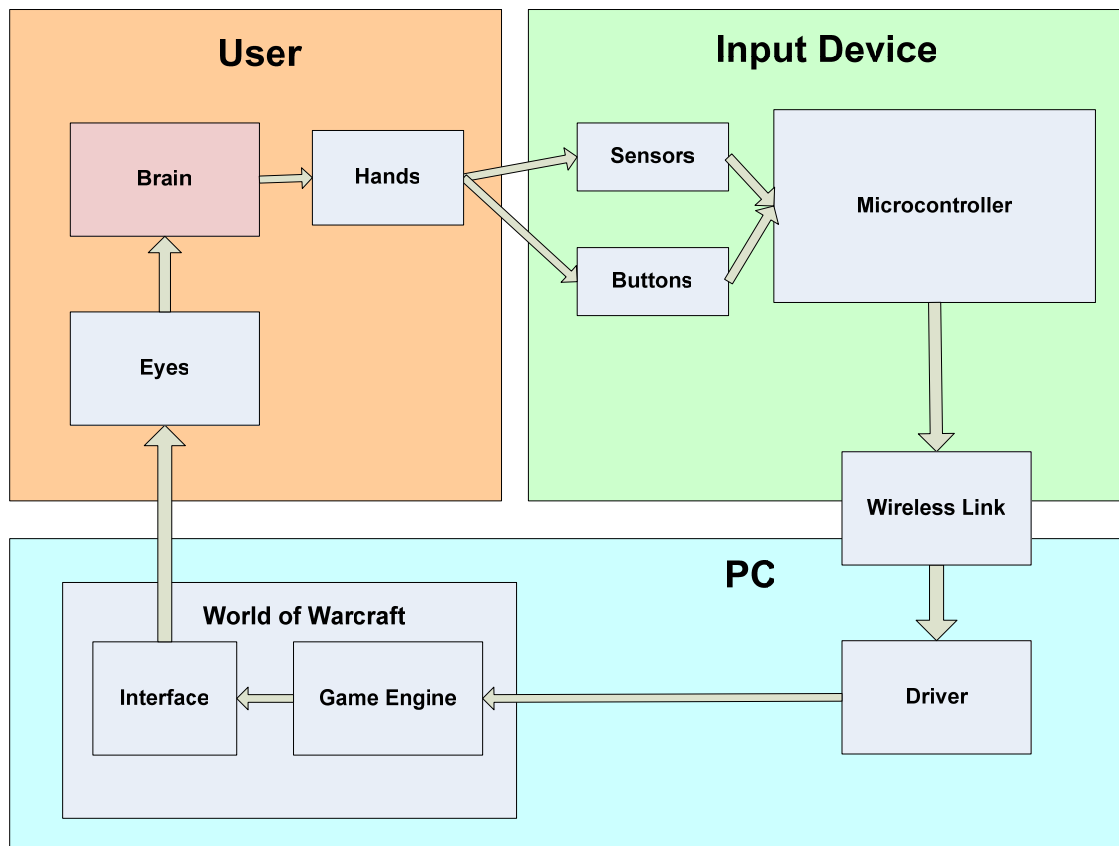
Figure 2 – High Level Diagaram of the Proposed Implementation

The action controls will be accessed with the opposite hand using a second input device with buttons placed within the optimal range of motion for the first three fingers, avoiding strain injuries caused by the existing keyboard setup. The exact number of functions on the second hand device will be determined by a survey of current Warcraft gamers (both the casual and uncoordinated, as well as the enthusiast with a trigger finger.) The second device will also be wireless allowing for freedom of movement and position.

Sources of Information

Much of our market information has been and will continue to be expanded by gaming websites, as well as Blizzard's own website and forums. Information on demographic and preferences is readily available here as well. In addition, one of the group members is an avid Warcraft player whose online team of players (called a guild) can be used as a source of ideas and user critique.

To aid in evaluating the ergonomic merit of our device, as well as provide guidance on sources of repetitive strain injuries and how to avoid them, we have the services of Umilla Stead, Occupational Therapist. Ms. Stead has a strong background in kinesiology and several years of experience working with rehabilitation patients.

Finally, to aid in developing the interface software, we will make extensive use of WoWWiki and the Blizzard support representatives, through whom information on the scripting language for the game's front end is readily available.

Budget and Funding

Budget

A preliminary budget for the project is outlined in Table 1. We have estimated costs based on the price of components used in similar hardware implementations. The greatest initial expense is expected to arise from the sensors which will detect device motion. This cost estimation takes into account a triple redundancy for critical hardware components. As with any prototyping stage, we expect that parts will fail at the most inconvenient times. We will attempt to overcome this issue by having multiple spare parts on hand. This will be particularly relevant for the parts with long lead times. A 25% contingency has been included to cover any unforeseen costs.

A variety of cost saving measures will be taken to ensure that the project does not go over budget. Once a design specification has been completed a comprehensive list of each part's sources will be generated and both low quantity and bulk prices will be examined. The possibility of salvaging components from existing devices will also be explored. Whenever possible we will request component samples directly from manufacturers.

The budget will also attempt to estimate the equivalent costs of a production stage device based on bulk component pricing and manufacturing, although this will be highly dependent on production volume. This will allow us to ensure that the device's price will be competitive and affordable to our target customers.

Part Description	Estimated Protoype Cost	Source	Estimated Production Cost
Sensors	$160	RobotShop (IDG)	$2
Microcontrollers	$50	Digi-Key	$5
Wireless System	$80	Digi-Key	$7
Power Source	$40	Digi-Key	$9
Other Electronic Parts	$50		$5
PCB Manufacturing	$80	Gold Phoenix PCB	$5
Case and Buttons	$50		$6
Contingency (25%)	$128		$10
Cost of Labour	-		$8
Total Cost	**$638**		**$57**

Table 1 – Preliminary Budget

Funding

A variety of possible funding sources for the project have been examined. We have all expressed a desire to maintain the option of pursuing the project beyond the prototyping stage open. Given this fact, sources were selected so that we can maintain full control over the decision making process and retain all IP rights. In the initial stages of the project we will apply for a grant from the Engineering Science Student Endowment Fund (ESSEF). On a longer timeline we intend to participate in several business plan competitions, listed in Table 2.

Name	Date
TELUS New Ventures BC Competition	April 2007
Small Business BC Business Plan Contest	January 2008
BDC Enterprize (UBC Sauder School of Business)	February 2008

Table 2 – Business Plan Competitions

Any expenses not covered by these sources will be distributed equally among the three members. Once a working prototype is complete, we will reevaluate this financing policy. At that point we may look to other types of outside sources of capital.

Schedule

Figure 3 shows an estimated project timeline. The Functional Design stage is relatively short due to the familiarity the team has with the game's interface and mechanics, as well as time already invested. The longest phase (and largest hurdle to overcome) will be the testing phase in calibrating the hardware to a level of comfortable use with software. We have allocated additional time in a second phase of testing once the device is working with the game, since some custom interface modifications of the game's front end will

very likely be necessary, and are a matter of feedback driven iteration. We are confident that given the spread of our abilities and a realistic division of man-hours (8 per day) we will achieve this schedule. The culmination of the project in April will be a working Engineering Prototype which is properly calibrated and interfaced with the game, leaving the reduction to a production model and aesthetic design as the next stage.
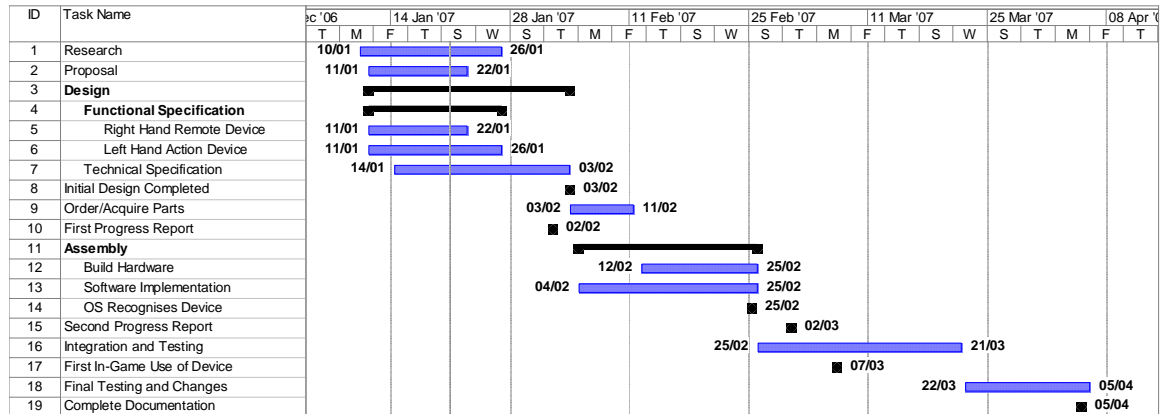
ID	Task Name	Start/Milestone	End
1	Research	10/01	26/01
2	Proposal	11/01	22/01
3	**Design**		
4	**Functional Specification**		
5	Right Hand Remote Device	11/01	22/01
6	Left Hand Action Device	11/01	26/01
7	Technical Specification	14/01	03/02
8	Initial Design Completed	03/02	
9	Order/Acquire Parts	03/02	11/02
10	First Progress Report	02/02	
11	**Assembly**		
12	Build Hardware	12/02	25/02
13	Software Implementation	04/02	25/02
14	OS Recognises Device	25/02	
15	Second Progress Report	02/03	
16	Integration and Testing	25/02	21/03
17	First In-Game Use of Device	07/03	
18	Final Testing and Changes	22/03	05/04
19	Complete Documentation	05/04	

Figure 3 - Estimated Project Timeline with Milestones Indicated by Diamonds

Team Organization

Our three person development team is setup with every group member contributing equally to the project and equally carrying the financial burden associated with the development of a new product. We have elected to structure our company as a corporation. The positions were chosen according to desire to contribute in a specific manner and strength in those areas.

Our schedule calls for an average of eight man hours per day, seven days per week. This division suits well the schedules of the team members who may alternate work days, so that on any given day a sufficient amount of time is invested in the project. It also places a minimal average burden of approximately two and a half hours per day per group member, placing it on par with many fourth year classes. Team members will therefore have enough time to rest and keep up with their other courses.

We have arranged to hold short meetings twice a week. By keeping the duration to less than forty minutes with a brief agenda, we will ensure maximal benefit for the time invested and avert the inefficiencies and fatigue often associated with longer sessions.

Company Profile

Chief Executive Officer (CEO), VP Software

W. William Walczak

Having many years of business experience and real world work experience, I chose to guide the team in a manner that would ensure on time and on budget completion of the

project. My strengths are communication, entrepreneurial experience and software design. My course experience in digital systems and FPGA design is also a strong asset to the team, having completed all digital design courses available at SFU. My coop experience at Omnex Controls also brings wireless experience to the team.

Chief Financial Officer (CFO), VP Hardware Design

Vijay Galbaransingh

I am a fifth year Engineering Physics student. I have experience with sales, marketing, and accounting. I am also an avid Warcraft player with many connections within our target market to ensure proper design, testing, and awareness of our product. My primary responsibilities will be hardware design and assembly as well as low-level programming of microcontrollers used, in partnership with Calin Plesa.

Chief Technology Officer (CTO), VP Research

Calin Plesa

I am a fifth year SFU Engineering Physics major with a strong interest in optics, microfabrication, and electronics. During my two coops at Creo I was involved in mechanical assembly, testing, and programming. Having already co-founded two companies, I will bring in experience in finance, market research, and business relations. My focus within the project will be on hardware design as well as integration within a wireless system. I will also be involved in sourcing components.

Conclusion

As you are reading this, tens of thousands of people are actively playing on World of Warcraft realms around the world. The majority of these people have had to forgo comfort and risk physical injury because they are bound to using an archaic interface which was not designed for use with current computer environments.

The InDev team aims to provide these users with a modern interface that will improve their lifestyle and long term health. We will build on lessons learned from past interfaces to build a new input device for 21st century gamers. In applying new technologies to an often overlooked part of the gaming experience we will redefine how gamers interact with virtual worlds. We have done research to define a clear target market and our product will fill a niche which is currently ripe for competition.

Our schedule provides a clear outline for the development of this project and we have allocated the manpower and skills necessary to complete the project within the time available. Financially, we have shown that the product will be priced competitively while

remaining in a viable development budget. We have also identified multiple sources of capital to ensure the projects success.

Within the next four months we will liberate the old mouse and keyboard from their two dimensional confines and bring them into a three dimensional world.

Sources and References

[1] World of Warcraft® surpasses 8 million subscribers worldwide
http://www.blizzard.com/press/070111.shtml

[2] Ulcerative "nintendinitis": a new kind of repetitive strain injury
http://www.mja.com.au/public/issues/173_11_041200/koh/koh.html

[3] Pain and musculoskeletal pain syndromes related to computer and video game use in adolescents http://www.springerlink.com/content/95r71761h7387336/

[4] Keyboard and Mouse Alternatives
http://www.abilitynet.org.uk/content/factsheets/pdfs/Keyboard%20and%20Mouse%20Alternatives.pdf

[5] Eyegaze Systems
http://www.eyegaze.com

[6] Nintendo Wii
http://www.nintendo.com/systemswii

[7] Microsoft and Sony battle in the desert; Nintendo DS leads sales
http://deseretnews.com/dn/view/0,1249,650223739,00.html