Feasibility Study

## Cloud Group

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## The Client

Yu Cao, Professor UMass Lowell, Office 213 Olsen Hall, ycao@cs.uml.edu

## The Task to be Undertaken

For our SWEN project we will be developing a Kinect based keyboard emulator. The goal of this project is to create a system that will allow users a way to be more physically active at their desks. This system works by mapping users movements to a predefined set of keystrokes. Once the keystrokes have been captured, the keystrokes will be broadcasted to the application the user wished to type in. The usage and movement data will also be sent to the cloud where words per minute, accuracy, and other usage statistics will be calculated. The user will also have the companion app installed on their phone which will allow them to view their data in the cloud.

## Benefits of Project

1. Our Kinect Keyboard will allow for a quick, easy, and configurable virtual keyboard for a wide variety of applications, from medical to entertainment.
2. Having the ability to configure actions that correspond to keyboard strokes will allow medical patients who can only move certain parts of their body to still be able to use a computer in a fast and efficient way.
3. Kinect Keyboard can act as an exercise tool, binding keystrokes to complete body movements. This promotes a fun exercise for anyone, from young children to people who want to stand up and move while using the computer, instead of sitting down.

## Preliminary Requirement Analysis

### Database(s)

* Whatever database(s) we choose to use must be able to properly and securely store all pertinent user information, such as login information, application settings, and custom keybindings, if any.
* Our database(s) must be able to keep sensitive user information such as, at the very least, the user’s password encrypted to ensure the confidentiality of said user information.
* The database(s) must be able to quickly and efficiently communicate with the website, web UI, and potentially the phone companion app.

### Website/Web UI

* Our website and web UI must be designed in such a way that any client with basic computer skills is able to use our product with little to no support from us.
* The Web UI must feature a secure login page at which users are able to either login to an existing account or register for a new account.
* The website should contain a simple, brief guide to the pre-made hand motion bindings.

### Hosting Server

* Whichever hosting server we choose must allow full FTP access, along with having both PHP and MySQL enabled.
* The hosting server must have a bandwidth and download/upload speed which can adequately handle the amount of data that our application will require to be sent between client and server.
* Due to the lack of a budget, the hosting server will have to be a free host with a free domain.
* This free host must preferably have little to no advertisements, so as not to interfere with the clients experience.

### Optional Requirements

* The ability for users to reset their password, if forgotten, via a generated email reset link sent through an SMTP server to the user’s registered email.
* The ability for users to login by kinect facial recognition (dependent upon whether or not the kinect developer kit contains the tools necessary to do such a thing).

## Technical Requirements and Feasibility

### Hosting Server

We will need a host server(s) that allows for high traffic and bandwidth. Without a tangible budget, our group will be focused on small scale uses for our application and databases. We will be using free web hosting services for the databases and web user interface after we have tested our application on a local network amongst ten to twenty people.

### Databases

We are currently deciding on databases, with the most obvious solution being using a SQL server. Only admin (our group members) will have access to the data within these databases, though the information will be hashed to protect private consumer information.

### Website

We will have to design and program a website from scratch, as we don’t have any previous website to base it on. We plan on programming a HTML5 standard website with a PHP and MySQL back-end and a JavaScript/jQuery and CSS front-end.

### Web UI

We are going to try to create a fluid user interface, “puzzle piecing” parts of websites we think are great to make our very own unique experience. We will have a simple and secure registration page to allow users to create accounts to link them to their actions and key bindings. Once logged in, users will have access to create and change existing key binds to actions they have made, or from a pre-made selection.

## Scope

For the purposes of this project we are concerned with implementing a working keyboard which requires only a Microsoft Kinect. This will be supported by an intuitive UI and simple to understand motions which link to characters mapped to a keyboard. Development to the extent called out by the above requirements section is all that is planned. The end product will be run at several public display kiosks or in local Microsoft stores. This will allow the most exposure to both the Kinect technology and our end product.

We do not plan on integrating any kind of game associated with the keyboard. We also do not plan on implementing detailed tutorials with this release as the design for the interface should be made simple enough for anyone to understand quickly.

## Suggested Deliverables

### Management Deliverables

#### Design Document

This document will go over the overall design of the website and databased, covering most of the features that we plan to implement into the website. It will outline the files needed and describe what each of those files will do and how they will interact with each other. It will also specify the requirement we need to achieve in order to maintain the client’s happiness.

#### Mock Up

This will be a picture with layers that shows the user interface of the website. This will act as a template for our front-end programmers and help focus our features. The mock up web page will go through multiple stages in order to improve ease of use for the end-user and to improve the features we will include up front on the website.

### Technical Deliverables

#### Database

Multiple *databases* are essential to the functionality of our cloud. We will have a database that contains usernames and passwords, both hashed for our consumers’ protection. We will also have a database that contains a list of actions and the corresponding key bindings that go it with. This database will be modifiable from our users.

#### Client Interface

A *client interface* web page to allow users to create and modify actions and key bindings. This will be streamlined for our consumer’s convenience, but will still contain advanced features, such as multiple keystroke for a single action.

#### User Dashboard

This page is for fast editing and account settings. Here users can change their display name, verify their email, change their password, and other social media features. It allow users to have access to simple key and action changes, but it will link to the full client interface.

#### Navigation Menu

A *top navigation menu* that is static on our website - this will allow for fast and simple navigation to key web pages and links on our website. The top menu will contain links to the home page, a user dashboard page, a contact page, and a logout function.

## Walkthrough

Our group will present both a client and administrator walk through. These walkthroughs will not only be to show the initial clients how to use the product, but also demonstrate some of the functionality that only an administrator would be able to see.

### *Client walkthrough*

For the client walkthrough, we will begin by guiding the client through the account creation process, which should not take more than a minute as all that will be required will be a username, password, and potentially email. After account creation is complete, the user will be guided through basic recognizable kinect hand gestures, such as typing single letters at a time, and possibly multiple key combinations if any are prerecorded. At this point in our project the client should be able to, at the very least, be able to type full sentences at a time using the kinect with minimal incorrect key recognition If the feature is fully functional, the client will then be guided through mapping their own custom hand gestures to key combinations. Finally, if time has permitted to complete the password resetting function, the client will be guided through how to reset their password were they to forget it.

### Administrator walkthrough

To demonstrate the functions of the application accessible to administrators, a group member will clients a few operations such as manually resetting a user’s password, deleting and creating accounts, and possibly editing the mapped hand gesture database.

## Software Development Process

Our group believes that the incremental development process will be the most efficient for the development of our project. Due to the nature of our deliverables schedule and the fact that we will constantly be receiving feedback from other classmates and Professor Cao, the incremental development process allows us the most flexibility when changes need to be made to our project. Some of the key benefits include:

* Clients will have the ability to test the parts of the project that we have successfully implemented before the project is complete.
* Clients are able to give feedback at each presentation of our current project stage that we have.
* The amount of time and resources used every time a change to our project plan must be made will be drastically reduced compared to the waterfall process.

Some of the downsides to the incremental development process and how we plan to combat them include:

* Lack of visibility: As our group has no managers to report to and set schedules for each deliverable, Professor Cao will be getting the most updated version of our project every time we submit a deliverable.
* System structure tends to degrade as new changes are added: As our project is rather small in scale, we do not believe that we will have trouble managing the quality and structure of our software, even throughout changes.
* As none of our group members are veteran coders, we may have trouble staying on track coding in quick bursts. The set schedule of deliverables for this project should help the group to stay focused on the task at hand.

## Principal Activities and Milestones

1. Milestone 1 (March 3, 2006) – Requirements Analysis (draft). An initial draft of the requirements is Milestone 1. This will only be done after meeting with the Client and discussing his needs.
2. Milestone 2 (March 10, 2006) – Requirements Analysis (final). The final draft of the requirements analysis is Milestone 2. Additionally, we will prepare a presentation for the Client to show what we can and cannot do.
3. Milestone 3 (March 24, 2006) – Software Architecture and Design (draft). An initial draft of the software architecture and design is Milestone 3. We will also be meeting with the client to discuss his views on the presentation
4. Milestone 4 (April 7, 2006) – Software Architecture and Design (final). A final draft of the software architecture and design document is Milestone 4. This is the same as before but we will be finalizing our features.
5. Milestone 5 (April 14, 2006) – Database. For this milestone we will sort out the most logical database schema which allows for both quick delivery and room for growth.
6. Milestone 6 (April 21, 2006) – Inventory Control. As a part of the data aggregators job we will be designing an interface to control inventory of both the products and the database behind them.
7. Milestone 7 (April 28, 2006) – Map and Menu. This milestone will likely take the longest of all of the milestones. We will be designing a keyboard which tracks users motions and displays the corresponding text. This is the main portion of our application and will be where the end user sees the product.
8. Milestone 8 (May 5, 2006) – Testing, Debugging and Integration. For this milestone we will lay out jUnit tests for all back end methods to ensure that they are rock solid. Additionally, we will be performing usability tests with sample users to ensure the quality of our product.
9. Milestone 9 (May 11, 2006) – Project Deadline. The product will be set up for end users to interact with and public demos of the product will be performed as the final milestone.

## Visibility Plan

### External

It would be optimal to perform biweekly meetings with Professor Cao to ensure we are developing our application to his maximum satisfaction. If there is a situation in which one of the parties, either our group representative or Professor Cao, is unable to attend one of these biweekly meetings, we will send out an email in lieu of a face to face meeting. Though this is not optimal, we should be able to gain a sense of what is wanted by our client, Professor Cao, versus where we stand in the development stage.

### Internal

We are planning on meeting once a week after class for a few minutes to catch up with each other and explain briefly what will be required to have finished that week. We are also scheduling a weekly meeting for the entire project group to meetup to discuss problems each of the subgroups have faced in the week, as well as possible solutions. We will also discuss abstraction to allow easy modifying of code and make interaction between our groups’ code easier and discuss the design aspects, both functional and nonfunctional, so we are all on the same page during the different steps of development. As of now, we have a Google Group for our entire group so we can communicate and share ideas and solutions with each other at any time.

## Business Considerations

As University of Massachusetts Lowell students, the Group owns the copyright in the software that we create in this project. The Group agrees to transfer the copyright to the Client and to provide the Client with unrestricted license to use the system.

It is just possible that a project may develop concepts that could be patented. If such a situation arises, the Group collectively owns the rights to all patents associated with the System. We understand that the use of open-source solutions IS a viable option and that there are not any serious licensing issues to this extent.

## Risk Analysis

### Changing Requirements

#### Ris***k:***

It is clear that the client may have different ideas about the system during the course of the project. Depending on the situation, the changes that the client wishes to have implemented may require small changes to the architecture.

#### Solution:

To reduce the possibility of this occurring, we will establish a clear visibility plan with the client and ensure that we fully understand his needs.

### Incomplete Requirements

#### Risk:

In the event that the requirements are implied but not discussed or misunderstood.

#### Solution:

Frequent client updates and a high level of visibility will call attention to any misunderstandings. Additionally, we will be having weekly meetings as a group to discuss any changes that will need to be made if any.

### System Integration

#### Risk:

Depending on the level of access to the servers that the group receives, the group has the opportunity to work on the system offline and eventually integrate with the production system when it is ready and thoroughly tested. Due to different software configuration, there may be unpredictable obstacles.

#### Solution:

To ensure a smooth system integration, the group will be aware of as much about the configuration as early as possible.

### Technical Requirements

#### Risk:

The software and hardware server environment are not perfectly certain at this point. The client is not aware of the technical aspects of the project. The technical server configuration may have an affect on system architecture and design but at the time of this writing it is still unclear.

#### Solution:

To resolve this problem, the group has requested the client stay in close contact with the group so that this issue may be resolved quickly.

### Non-functional Requirements

#### Risk:

Similar to incomplete requirements, non-functional requirements is something that has not been brought up in the initial meeting with the client. These include requirements on the number of users that the system expects to support concurrently, and the response time of the database lookup.

#### Solution:

A follow up meeting is needed to specify the non-functional requirements.

### Human resources

#### Risk:

The Group is relatively small consisting of only 3 members. The concern for understanding the technologies involved will be discussed in our weekly meetings.

#### Solution:

For this reason, progress on this project may be slow. This is evident as it may take several weeks to get all developers in the group up to par with the current state-of-the-art coding implementations.

## Conclusion

Based on the analysis of the above feasibility report, our Cloud group has agreed that our proposed project is feasible and that we are willing start and complete development on this project in a timely manner. We believe that the end product will justify any development efforts. As all kinects will be sourced by Prof. Cao and any hosting server will be free, there are no predictable costs for this project. The preliminary deadline for this project is currently projected to be May 11, 2015, at which point our group plans to have a public demonstration setup in the Olsen building for users to interact with. The next stage in our development will be a final draft of our requirements analysis, which currently has no set deadline.