GESTURE BASED SOCIAL MEDIA AND NEWS INTERFACE

By

Steven T. King Jr.

A DISSERTATION

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ABSTRACT

GESTURE BASED SOCIAL MEDIA AND NEWS INTERFACE

By

Steven T. King Jr.

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DECLARATION

I hereby certify that this dissertation constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

I declare that the dissertation describes original work that has not previously been presented for the award of any other degree of any institution.

Signed,

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# Introduction

New technologies for interacting with computers are changing the way we consume social information and news media. While touch devices such as the iPad and Kindle have changed media habits and website interaction by using gesture controls and touch interfaces, gaming systems such as the Xbox 360 have integrated motion and depth detection.

At the same time, HDTV flat screens are becoming more prevalent throughout homes and business and better way to interact with those devices is needed. Motion and depth sensing technology is rapidly developing and with the mass release of the Xbox Kinect in MONTH of 2011 by Microsoft, this technology can be found in millions of homes and businesses.

While the hardware is developing and price falls there are efforts to bring this technology to the personal computer and not have it limited to tablets or priority gaming systems. Microsoft enabled the ability to develop motion-based interfaces by releasing the Kinect Application Programing Interface (Kinect API). Open source projects such as DepthJS worked to integrate the Kinect API and the universal web browsers but have seen little adoption.

All of these developing technologies, both hardware and software are now converging into gesture controlled, large screen experience. Users in public places no longer have to use a touch screen kiosk but can not begin interacting with an application simply by stepping forward or swiping a hand. In homes, users a no longer limited to a remote control or a keyboard and mouse but can control the cursor with the wave and push of their hand.

This project will integrate the most common hardware configuration to test some current news and social websites as well as develop a custom-designed interface for gesture control and interaction with news and information.

Scope

This dissertation will explore the necessary design and user experience concerns publishers and developers should consider when developing for the emerging technology. It implements the most common hardware configuration and integrates gesture enabling software design for the browser. This project will provide qualitative analysis of existing desktop and mobile interfaces as well as custom designed experiences. It will also provide lists of design and development best practices for future development of gesture-based interfaces and applications.

The research and physical user testing is limited to the use of Xbox Kinect and DepthJS though other hardware and software solution are emerging in the market. The interfaces tested include a single website in the social (Facebook) and news (New York Times) category.

Usage of the word “interface” in this work refers to a browser-based user interface such as a webpage.

Problem Statement

Gesture based, non-touch user interfaces are becoming more common in console gaming and other specialized industries such as health care but has yet to become a common and useful way to navigate the Internet, specifically news and social media sites.

This project will seek to answer the question of, “Can gesture-based interfaces using motion tracking sensor technology be used to consume news and engage with social and current events content?” In order to answer this question the project will design, develop and test a software interface and a hardware installation that enables users to interact with news and social information using gestures without requiring touch or extra peripherals in order to understand the common usage.

Approach

### Research Methodology

To discover if gesture-based interfaces using motion tracking sensor technology can easily be used to consume news and engage with current events content through a custom-designed user interface, an analysis of existing technologies was preformed, contribution to an open-source project was developed, two custom-designed gesture interfaces we developed and existing websites and the new interfaces were tested.

Qualitative analysis research methodology of the interfaces as well as technical observations was adopted. This approach provided input from typical users as well as important technical analysis of the current implementations of the technology and the issues associated with current interfaces.

The main body of research consists of qualitative user tests of news, social and custom interfaces using gesture-based interactions.

### Project Conduct

This project required the implementation of consumer available hardware with the development of new software and user interface in order to compare the effectives and usefulness of this new technology with existing interfaces. The project took on the three major phases of exploration, development and testing.

Exploration

The first task was to determine the most useful and most common hardware configuration for using gesture-based non-touch interfaces in a home environment. Screens, computers and sensors were compared to determine the most likely and most useful consumer implementation of gesture technology. The ideal implementation was tested documented and acquired.

Once a hardware solution was determined then the software options were explored. Various consumer products and open-source applications were compared and tested through informal developer experimentation. It became apparent the non of the products or applications available at the time of development would be sufficient to provide the ability to not only test existing web interfaces but to be able to innovate a new user experience.

The most viable and contributive solution to the industry and the project was to partner with developers in the Massachusetts Institute of Technology Media Lab and contribute to the open-source project DepthJS.

Development

The development stage required two major coding endeavors. The first was contributions to make the hardware work through the DepthJS browser plugin work properly with Google Chrome, a multi-platform browser. Once complete, development of two web-based interfaces were created to demonstrate and test various commonly seen user interface elements.

Testing

Once the interfaces were developed a five-person user test was conducted. The

task-driven user evaluation required users to complete a series of navigational tasks on six different interfaces of social and news websites. Each test was monitored by the researcher and recorded with multiple cameras so the actions could be reviewed after the test.

Five users or evaluators were recruited through a university-wide email list to find users who were familiar with the Internet.

Prior to the evaluation, users were instructed on how to use the system and be allowed time to interact a website not being tested. This allowed the user to become familiar with the new experience of non-touch gesture control as well as gave time for the “wow factor” to wear off.

The user evaluation script, Appendix I, details the steps of the user evaluation. The researcher administered the user test each time directly following the script and all users were tested within 24 hours to ensure consistency in the test.

During the tests, the order of the tested interfaces was random and each task was timed.

After completing the user test, the evaluator was asked a series of questions regarding the three different experiences through a web-based survey. This survey found in Appendix II, in addition to observations and timed tasks provided the data necessary to draw conclusion as to the effectiveness of non-touch gesture-based interfaces.

Outcome

This project contributes to the computer science industry as well as the journalism and social media industries by providing multiple usable, public and open-source non-touch gesture interfaces, which can be used as a starting point for further development. Code has been contributed and merged with the open-source DepthJS project.

In addition to the code base, a series of best-practices and a summary of insights and observations will help future development of gesture applications. As gesture sensor technology progresses, these insights should enable a more rapid release of new gesture interfaces by social and news publishers.

The application and findings has already been presented to researchers, journalists and developers at the Journalism Interactive Conference hosted by the University of Florida and to faculty researchers of the School of Journalism and Mass Communications and the School of Information Sciences at the University of North Carolina at Chapel Hill.

Document Structure

This document provides detailed analysis of background research and current literature in Chapter 2 – Background and Review of Literature. Chapter 3 – Analysis and Design provides information regarding the development and testing of the application.

# Background and review of literature

Related Work

Non-touch gesture based user interfaces are a fairly recent development in the personal computing world. Must of the research available refers to touch-based gestures which is valuable and comparable in many situations. Those writings regarding non-touch gesture interfaces have been used in specific fields of study such as medical sciences and geography.

It was not until Microsoft released Kinect for Xbox360 that the sophisticated motion sensors reached many households. Kinect still holds the record for the fast selling electronic product ever. Microsoft took the technology farther by making providing an open API which has allowed developers to create new uses for the motion sensor technology and gesture based interfaces are being used for many unforeseen purposes such as security, health care and consumption of information (Schramm, 2010).

Periodical writings regarding non-touch gesture based interfaces provide details into the technical sensor, hardware, integration and usage of the technology.

Kam Lai, in his presentation to IEEE Southwest Symposium (2012) provide necessary scientific documentation that the Microsoft Kinect product was able to detect eight common hand gestures with 99% accuracy in a typical home environment. Lai’s research scientifically established the fact that the Kinect product is dependable allowing for further research on the next layer of integration, the application programing interface.

Mark Doulos (2011) wrote a journal article about how to use Kinect in GIS along with Google Earth. The piece explained how to integrate the sensor with the existing Google Earth Application but did not critically analyze the usage and user experience. The must useful part of Doulos’s article is the systematic explanation of integrating the hardware and the application.

The dissertation by Marcel Aarts (2012) not only demonstrates an application that integrates the motion sensor technology but also provides a detailed analysis of existing Kinect integration services and APIs. For example, Aarts provides valuable insights into the problems associated with the popular KinectJS which was technology considered for this project. Aarts’ work is focused on his specific application and the issues faced in development of his specific usage.

In Long’s Human Factors presentation on gesture interfaces in 1999 foretold many of the concerns and issues facing the industry today such as standards and inconsistencies but despite being dated offers insights into important human interaction interfaces.

Dan Saffer’s book, *Designing Gestural Interfaces* (2009) is the most comprehensive and applicable resource on the subject. This complete technical volume explains the broad implications of using gestural interfaces and the physical and psychological considerations. This book while providing a valuable introduction is limited in the technical detail regarding these interfaces.

Each of these peer-reviewed sources and published book provide some insights and establish a basis for further research but the most helpful insights come from periodicals with are making new and recent articles as the technology progresses. This is especially true concerning development and design of gesture-based interfaces where there no academic writing was found concerning the usability of gesture-based interfaces.

For example, Izkovitch (2012) wrote about the various considerations to take into account when designing for this technology for Mashable.com and App-side provided a list of top five considerations when designing gesture user experiences.

An explanation of the workings of the Microsoft Kinect sensor array can be found in the article by Mike Schramm (2012), which provides both an insightful view of PrimeSense, the company that designed and built the technology licensed by Microsoft, as well as a look at the technology inside the case. This article is one of few that profile PrimeSense as most focus on Microsoft.

In addition to providing design and technical insights the periodicals also provide a view of the future of non-touch computing. For example, in an article about the future of mobile phones for *The Atlantic,* A. Madrigal predicts the use of non-touch gesture interfaces for uses currently services by mobile phones. And an article on GTV shows a patent application Microsoft filed that has direct implication to a gesture home environment.

Advancing the current body of research must be built on previous established technical implementation while pushing the interface into new uses and designs that can be tested. This previous work both peer-reviewed and periodical is the basis of the new design that will further researched in this project.

Industry Sources

# Analysis and Design

{Documentation of the analysis and design containing full details of the design. The design documentation should also be supplied (possibly as an appendix).}

Hardware

There are several gesture enabled motion tracking technologies available on the consumer market but by far the most popular is the Microsoft Kinect which set a record for the “fastest selling consumer device” with over 10 million sold. Typically, the Microsoft Kinect is used with the Xbox360 gaming console but Microsoft released a publically available API that enabled desktop applications to interface with the sensor.

B

C

# Methods and Realization

{How the design was implemented? Changes made to the design in the course of the implementation. How was the data collected? How was the implementation tested? Typically code listings, screen shots and test runs will appear as appendices}

A

B

C

# Results and Evaluation

{Description of the results followed by their review. These may include, where appropriate, feedback from test groups, users and the project sponsor.}

A

B

C

# Conclusions

{A summary of the project as a whole. Lesson learned. Possible applications and extensions of the work}

Lessons Learned

Future Activity

Prospects for Further Work

REFRENCES CITED

{This section will demonstrate the Harvard-style bibliography for the entire dissertation. It must use the required format described <http://www.liv.ac.uk/library/ohecampus/ref.htm>. We have included some samples so that the use of cross-references from citations to the bibliography entries is illustrated.}

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APPENDICES

###### User Evaluation Script

Adapted from Rocket Surgery Made Easy by Steve Krug

<http://sensible.com/downloads-rsme.html>

Hi, \_\_\_\_\_\_\_\_\_\_\_. My name is \_\_\_\_\_\_\_\_\_\_\_, and I’m going to be walking you through this session today.

Before we begin, I have some information for you, and I’m going to read it to make sure that I cover everything.

You probably already have a good idea of why we asked you here, but let me go over it again briefly. We’re asking people to try using a new way of interacting with websites that we’re working on so we can see whether it works as intended. The session should take about an hour.

The first thing I want to make clear right away is that we’re testing the *technology*, not you. You can’t do anything wrong here. In fact, this is probably the one place today where you don’t have to worry about making mistakes.

As you go through the tasks, I will sometimes ask you to try to think out loud: to say what you’re looking at, what you’re trying to do, and what you’re thinking. This will be a big help to us.

Also, please don’t worry that you’re going to hurt our feelings. We’re doing this to improve the technology, so we need to hear your honest reactions.

If you have any questions as we go along, just ask them. I may not be able to answer them right away, since we’re interested in how people do when they don’t have someone sitting next to them to help. But if you still have any questions when we’re done I’ll try to answer them then. And if you need to take a break at any point, just let me know.

You may have noticed the microphone and the cameras. With your permission, we’re going to record what happens on the screen, your actions and our conversation. The recording will be used to help us figure out how to improve the technology and demonstrate the different actions. And it helps me, because I don’t have to take as many notes.

If you would, I’m going to ask you to sign a simple permission form for us. It just says that we have your permission to record you, and the recording could be published along with the written analysis.

|  |
| --- |
| Give them a recording permission form and a pen  While they sign it, START the SCREEN RECORDER |

First, I would like to show you how to use the gesture-based interface.

[Demonstrate: Wave, Click, Swipe Left, Swipe Right, Scroll Up and Scroll Down]

You can practice to get used to the motions.

[Give a few minutes to allow user to feel comfortable]

Now I’m going to ask you to try doing some specific tasks.

TASKS:

**On New York Times**

* Please find and view the main news story about [ENTER NEWS TOPIC OF TOP STORY FOR THE DAY]. Then return to Homepage.
* Go to the Sports Section and then return to Homepage.
* View a video at the bottom of the page.

Repeat Steps using mobile NYTimes

**On Facebook**,

* Please select any photo in the news feed to view. Return to the news feed.
* Like any item in your news feed.
* View your Facebook Messages (email-like page)

Repeat steps using Mobile Facebook

**On** **Gesture News**

* Please find and view the top news story about [ENTER NEWS TOPIC OF TOP STORY FOR THE DAY]. Then return to Homepage.
* Go to the Sports section. Return to Homepage.
* View the Top Headlines Video

**On** **Photo Slider**

* Please select view and read the first story.
* View other stories
* Go back to a previous story.

Thanks, that was very helpful. Now, I need you to please complete this survey. Thank you for your help and your time.

###### User Survey

The users tested were asked to complete a survey about the experience. The image below shows the form they were asked to fill out.

