Computer Science

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Your Title

Bachelor's Project

2015:xx

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This report is submitted in partial fulfillment of the requirements for the Bachelor's degree in Computer Science. All material in this report which is not my own work has been identified and no material is included for which a degree has previously been conferred.

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Approved, Date of defense

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Examiner: NN

Abstract

Put the text of your abstract here

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1 Introduction

o Project goal and motivation o Project summary and overview - the ”red thread” o Project results (brief summary) o Dissertation Layout

2 Background

On April 4th, 2012, Google announced "Project Glass".[1] Google Glass, as the device is now known, was under development for several years at Google's research and development department, Google X. As part of the announcement Google stated: "We think technology should work for you—to be there when you need it and get out of your way when you dont.".[3] Serge Brin, one of the founders of Google, gave a Ted Talk in February 2013[5] where he talked about why Google decided to produce the device. His argument was that users stayed on their smartphones for too long. Brin also argued that when users were using their smartphones they were looking down on a screen and were not aware of their surroundings. Instead Google wanted to create a device that would give the user notifications that could quickly be dealt and done with.

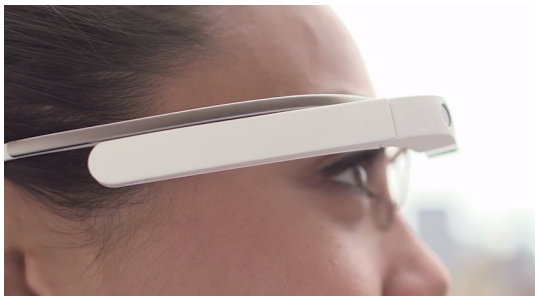
Thad Starner, technical lead/manager on Google Glass, claimed that Google Glass is supposed to be an extension of the self.[12] He compared Google Glass to a watch. Not in terms of where the user keeps his or her focus (with a watch you must look down, similar to a smartphone), but rather in terms of how a watch is easy to access and that the access is instant. Starner said that with Google Glass, Google wanted to minimise the time between intention and action.

2.1 What is Google Glass?

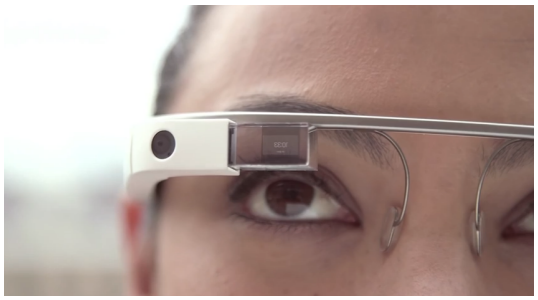
Google Glass, or simply "Glass" as the device is known within Google, is a head mounted display (HMD) that can be seen as an augmented reality device[1] designed to bring notifications to the user more easily than a smartphone does. Google Glass can be seen in Figure 2.1. According to Google "Glass is designed to be there when the user needs it and to stay out of the way when the user does not".[10] Google Glass is meant to give the user

[1] See section 2.1.4

relevant information at relevant times.



(a) The user can control Google Glass with the touchpad.



(b) The display sits slightly above the users line of sight, on the right hand side.

Figure 2.1: Google Glass is a small head mounted display equipped with a touchpad, a camera and a microphone.[4]

Google Glass is partially controlled with a touchpad, but can also be controlled with voice command. The touchpad sits on the right hand side of the user's glass frame and runs from the temple to the ear (see in Figure 2.1 (a)). When the user touches anywhere on the touchpad Google Glass "wakes up" from stand by and displays the start screen (which consists of a clock). The display is mounted above the user's line of sight, on the right hand side (see Figure 2.1 (b)). The display can be slightly adjusted so that the user can see everything that is currently being displayed.

2.1.1 Head Mounted Display (HMD)

[TODO add definition]

2.1.2 Heads-Up Display (HUD)

[TODO add definition]

2.1.3 Virtual Reality

A virtual reality is a simulated environment It replaces the actual reality with a computer generated (or otherwise simulated) reality.

Figure 2.2: The virtual reality device “Oculus Rift” is a HMD that completely covers the user’s eyes.[11]

2.1.4 Augmented Reality

Augmented reality works on top of the actual reality and gives relevant information that enhanceces the reality. Augmented reality augments realiity.

2.2 Similar Products

- Microsoft Hololens (Hologram)

- Recon Jet (HUD for sports)
- GlassUp (Sued by Google)
- Penny (Vsters)

2.3 User Interface

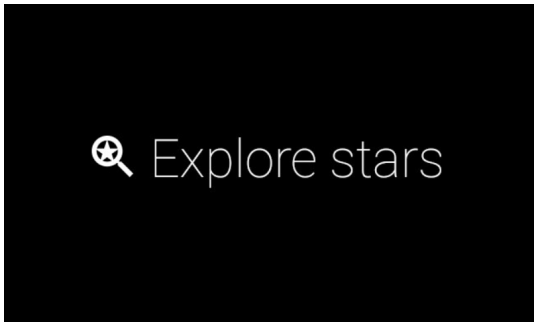
Google Glass' graphical user interface (GUI) is called a timeline (see Figure 2.3).[4] The timeline consists of a row of cards. Cards are basic applications such as a clock (see Figure 2.4 (a)) or information about the weather. Cards can also represent more in-depth applications, on Google Glass called "Immersions" (see Figure 2.4 (b) and (c)). Immersions handles activities such as browsing an image gallery or playing a game.

Figure 2.3: A visual representation of the Google Glass GUI as the GUI is perceived by the user. In reality only one card can be displayed at a time.[4]

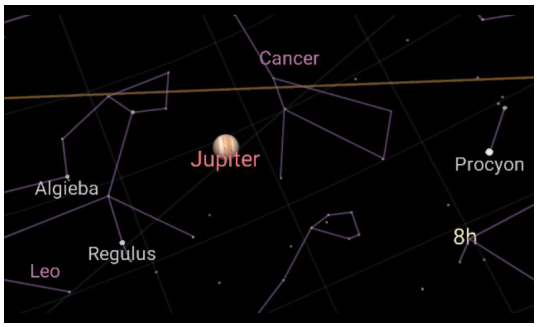
The first screen the user sees when starting up Google Glass is the home screen. The home screen displays a clock and also shows the text "ok glass", as seen in Figure 2.4 (a). The home screen is a part of the timeline and acts as the center point. Cards to the left

of the home screen are upcoming activities such as an event in the user's calendar or an upcoming flight. Cards to the right of the home screen are from the past. Cards from the past will for instance show text messages or photos.

(a) The Google Glass home screen is a card that displays a clock.



(b) The card "Explore stars" represents an immersion.



(c) The immersion "Explore stars" allows the user to look around at stars using the built-in head motion tracker.

Figure 2.4: Cards can either display basic applications, such as a clock, or represent more in-depth applications (immersions), such as an application that lets the user look at a map of stars.

In order to move left on the timeline (forward in time) the user must swipe a finger backwards on the touchpad. In order to move right on the timeline (backward in time) the user must swipe a finger forward on the touchpad. The fact that the user must swipe backwards when stepping forward in time might not seem especially intuitive. In western culture a timeline is normally represented as going from left to right. One example of

that are books. However, one might think of this action as swiping cards behind the back. Swiping forward when stepping backwards in time would then in turn mean bringing cards placed behind the back into focus. Cards in the past are behind the user while cards in the future are in front of the user.

When the user wants to turn off Google Glass the user swipes down on the touchpad. Swiping down on the touchpad will put Google Glass in stand by. If the user wants to turn off Google Glass entirely, in other words power down the device, there is a power button on the opposite side of the touchpad. Holding down the power button for a few seconds will turn off Google Glass. For a better visual understanding of how Google Glass works see Figure 2.3 as well as the video referenced in the caption.

2.4 Compared to Smartphones

Despite being two very different devices, the mobile phone and Glass, Google's design recommendations are not all that different for the two. Google ask developers who are designing for smartphones to think of simplicity and clarity. Google put much emphasis on making applications easy to use.

There are some differences however. For smartphones Google also recommend that developers keep track of what the users have done in the past. Google ask developers to remember the user's input history and customisation, all to make it easier for the user when they (hopefully) come back to the application.[8]

Google differ in how they want developers to design applications for smartphones and Google Glass respectively. Google are much more open to developers using their own ideas when designing for smartphones. Google encourage freedom and give more subtle hints of how to design. For instance Google want developers to make applications fun and easy to

use. They recommend consistency and a rewarding application.

Designing for Google Glass comes with a few more restrictions.

[TODO expand and elaborate with more examples]

2.5 Limitations with Google Glass

An early concern with Google Glass came from people who wore regular glasses every day as Google Glass seemed to require their own separate frames. Isabelle Olsson at Google responded on the issue on April 12th 2012 with the following: "We ideally want Project Glass to work for everyone, and we're experimenting with designs that are meant to be extendable to different types of frames.".[2]

Today many eyecare providers have been trained for Google Glass and Glass frames. These trained eyecare providers are however mostly located in the United States,[6] but Google points out that many eyecare providers should be able to help replace the lenses on Google Glass' frame[7].

[TODO add text about eye pain]

[TODO add text about how HMD might be too distracting if the user is not used to the device]

2.6 Information (and Ways of Presenting Information)

[TODO what is information]

Information can be displayed in a number of different ways.

2.6.1 Text

Text is one of the oldest forms of presenting information [***TODO REFERENCE***]. Text is also a simple presenting form to use that does not require much high end hardware. Other forms of presenting information require more memory, more computational power and more graphical power. Text also has the advantage that the user can read through text at their own speed. Text does not have any perception of time.

Text does however have the disadvantage of requiring attention. The person reading the text must keep the attention on the text throughout and can not look away in order to receive all the information being presented. Text is also restricted to the language the text has been written in. In order to globalise an information presentation several texts must be written so that users from different nations can read the text. [TODO look up biggest language (for instance how big is english?)]

2.6.2 Images

The advantage of using images as the form of presenting information is that one can show the viewer the information rather than telling the viewer the information. Showing the viewer could potentially mean that more information could be presented within a smaller space than text could achieve. Images also gives the same advantage as text in terms of at what speed the viewer can perceive the information—at any speed. Images, similar to text, does not have a perception of time.

Similar to text though, images require the viewers attention in order to present the information. The viewer can not look away from an image and still receive the information. Another disadvantage with images is the fact that images can be interpreted in different ways. The saying "a picture is worth a thousand words" goes both ways. On one hand images may present much information with one single images. On the other hand the

information may not be crystal clear and not as clear cut as a describing text may be.

Photos and graphics

2.6.3 Audio

Images and text both have the disadvantage of requiring full attention in order for the information to be perceived. Audio solves this problem. With audio os information presentation form the listener can look at something else while still receiving the information being presented. In other words audio is well suited for multitasking as long as the other task the listener is performing does not involve audio as well.

Audio does however have the disadvantage of not being insusceptible to time. The listener does not possess the same amount of control as he or she does with either text or images. Audio may be paused and rewinded but the fact that audio is still tied to a timeline is a disadvantage. Another disadvantage with audio is that, similar to text, audio is dependent on the language. If a information presentation were to be spread globally several audio files would be required (given that the audio contained spoken words).

2.6.4 Video

Since video consist of many images bundled together video gives the same advantages as images in terms of showing the viewer the information instead of telling. Video presents the viewer with images at such speed that the images gives the impression of movement. Video may also include audio. The inclusion of audio gives video all the same advantages as audio. In other words video could potentially give the advantages of two other forms of information presentation.

Similar to audio, video is constantly moving. The viewer are bound to the playback speed of the video. Even though a video may be paused or even rewind the viewer is

not in the same amount of full control as with images or text. With text and images the reader (or reader) can deceide the speed at which the information should be perceived for themselves. If the video does not include audio video, similar to images or text requires full attention in order for the information to be perceived.

2.7 Summary

o Introduce problem area / give relevant background info

o Introduction - Explain WHY you are doing this study

o Information - Background / your study in the wider context

o Similar work (projects, systems etc.)

o Summary - for this chapter

3 Design

3.1 Presenting Information on Google Glass

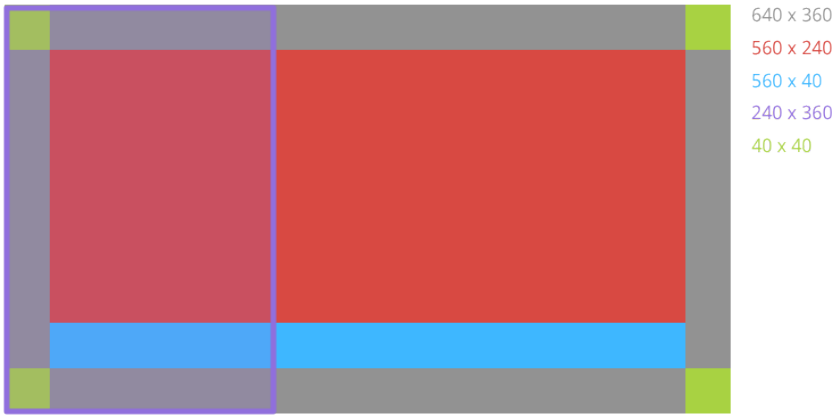


Figure 3.1: Google provide developers with strict guidelines as to how they should use the limited space that Google Glass can present information on.[9]

3.2 Summary

o Design - Present your project design in general o Information - Give details here (possibly several sub-sections)

4 Implementation

4.1 Summary

o Implementation - Present your project implemetion in general o Information - Give details here (possibly several sub-sections) o Summary - for this chapter

5 Result / Evaluation

o Introduction - Summarise your main results o Give details of the results o Best presentation? (text, tables, diagrams?) o Implementation Evaluation - your results against your expectations o Summary - for this chapter

6 Conclusion

o Conclusion o Project Evaluation o Problems - How would you do this the next time? o Future work

7 Future Work

8 Abbrevations

GUI Graphical User Interface

HMD Head Mounted Display

HUD Heads-Up Display

References

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