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

Mobiles today are used as a nervous tick. It is a distraction and something that pulls your attention away from the real world. At least that is what Sergey Brin, one of the founders of Google, claimed during a Ted Talk presentation in February 2013.[2] Brin stated that if he was a smoker he would probably light a cigarette at those times when he now uses his phone.

Brin and his team wanted to create something that would make interaction with technology easy and fast and not distract from reality. They wanted to keep the information more handy and close by than a phone stuck in the users pocket. But they also wanted to keep the line of sight free. Thad Starner, technical lead/manager on Google Glass, wrote in an article in 2013,[8] that he sought out to build something as intuitive as a watch. An extension of the self, as he stated. And so Google started working on Project Glass.

April 4th, 2012, Google announced "Project Glass". Glass was under development for several years at Google's research and development department, Google X. The idea behind the device was to make technology easier to access but also to only be available when the users wants to. Serge Brin, on of the founders of Google, did a Ted Talk in February 2013 where he talked about why they decided to produce the device. His argument was that smartphones was something users kept looking at even when they did not want to. They might have missed something. Instead Google wanted to create a device that would notify the user [TODO WTF, doesn't a phone do this!?!?!]

Thad Starner, technical lead/manager on Google Glass, claimed that Glass is supposed to be an extension of the self. He compared the device to a watch. A watch is an easy to access device that seems natural to its wearers. Starner claimed that when an individual looks at his or her's watch

2.1 How does Google Glass work?

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. 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".[5] Google Glass is meant to give the user relevant information at relevant times.

Google Glass is partially controlled via a touchpad (it 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. 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. The display can be slightly adjusted so that the user can see everything displayed.

Figure 2.1: A virtual representation of the Google Glass user interface as the graphical user interface is perceived by the user.[1]

The graphical user interface (GUI) is called a timeline (see Figure 2.1). The timeline

[1]See section 2.1.1

consists of a row of cards. Cards are basic applications such as a clock or information about the weather. Cards can also represent more in-depth applications, on Google Glass called “Immersions”. An immersion handles activities such as browsing an image gallery or playing a game.

On the timeline 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. When the user wants to turn of 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 of Google Glass entirely there is a power button on the opposite side of the touchpad. Holding down the power button for a few seconds will turn of Google Glass. For a better visual understanding of how Google Glass works see Figure 2.1 as well as the video referenced in the caption.

The principles behind designing for glass is to keep the information relevant. Google ranks different computational devices and services in terms of time periods. Google talks about how the cloud stores information “forever”, a computer keeps about a years worth of information, a mobile phone is keeping track of the last month and Glass are for the present.

Therefore Google asks developers to keep the information relevant and simple. Glass is designed not to get in the way of the user and, as stated previously, be usable when the users wants to.[5]

2.1.1 Augmented Reality vs Virtual Reality

[TODO WRITE ABOUT HUD AND HMD]

When discussing head mounted displays it is possible that the first image that pops into

ones head is similar to Figure 2.2. What is important to note about Oculus Rift (Figure 2.2) and other similar product that completely covers the user's eyes is that these are all virtual reality devices. Virtual reality is not the same as augmented reality, which is what Google Glass gives the user.

Figure 2.2: The virtual reality device Oculus Rift is a head mounted display that covers the user's eyes completely[6]

The difference lies in how much of what the user can see is computer generated. In a virtual reality the entire environment is computer generated. Augmented reality on the other hand is based in reality where computer generated elements of the environment help enhance reality. In other words: virtual reality replaces reality and augmented reality enhance reality. Since Google Glass does not remove the user from reality but rather display information that can be consumed at the same time as the user experience the real world Google Glass is an augmented reality device compared to Oculus Rift which is a virtual reality device.

TODO — ADD HUD vs AUGMENTED REALITY!!!!!!

2.2 User Interface

The main way for a user to give input to Google Glass is via the touchpanel that is mounted on the right hand side of Glass, along the frame. Users are able to swipe as well as tap, which gives them control similar to that of a Smart TV's user interface. Where with a TV controller the user would maneuver with a simple cross layout (up, down, right and left) the buttons have on Glass been replaced by a touchpanel.

The graphical interface is displayed at the top right through a projection coming from the right on a thick piece of glass. This technique lines up the image with the users sight but does not give any projection outwards.

The interface is built with cards. Each card represents an activity.

`https://developers.google.com/glass/design/`

2.3 Compared to Smartphones

Despite being two very different devices, the mobile phone and Glass, Google's design recommendations are not vastly different for the two. For mobile phones the ask developers to think of simplicity and clarity. They put much emphasis on making things easy to use.

There are some differences however. For mobile phones Google also recommend that developers keep track of what the users have done in the past. They 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. `https://developer.android.com/`

design/index.html

https://developer.android.com/design/get-started/principles.html

Google differ in how they want developers to design applications for mobile phone and Glass respectively. On mobile phones they are much more open to developers using their own ides. They encourage freedom and give more subtle hints of how to design. For instance they want developers to make applications fun and easy to use. They recommend consistency and a rewarding application.

Designing for Google Glass comes with a bit more restrictions.

2.4 Limitations with Google Glass

An early concern was of those people who wear regular glasses every day. Would they not be able to use Google Glass as it is a product worn as regular glasses. This concern got a quick respons as only eight days after the initial reveal it was announced that users would be able to use Google Glass with regular prescription glasses. Isabelle Olsson at Google responded on the issue on April 12th with the following: "We ideally want Project Glass to work for everyone, and were experimenting with designs that are meant to be extendable to different types of frames."
https://plus.google.com/110625673290805573805/posts/Nmc8LuwFw5M

Today many eyecare providers have been trained for Google Glass and Glass frames. As such they are able to help with prescription glasses suited for a specific user who is also a user of Google Glass. These trained eyecare providers are however mostly located in the United States. While Google points out that many eyecare providers should be able to help replace the lenses on Google Glass' frame it might be an issue that needs to be resolved.[3]

[4]

http://www.forbes.com/sites/eliseackerman/2013/03/04/could-google-glass-hurt-your-e

documented eye pain from looking at a screen for too long. Also conserns regarding looking at something that not both eyes can see. Can give headache and slighted eye alignment.

A study performed in 2002 regarding the effect of head mounted displays showed that head mounted displays may only be of help to the user under controlled forms. Whenever the surrounding got too distracting, for instance within a moving crowd, performance went down. The study however noted that pilots had been able to successfully turn HMD into something they could use to their advantage. Since the study was not done over a long period of time where the participants got training in using their HMD devices this could potentially play a major part.

HMD:s could potential be of great service to users as long as users take the time to get use to the HMD device.[7]

2.5 Presenting Information Within a Limited Space

Despite Glass being places close to the user's eye the amount of information that can be displayed is still very limited. Google have therefore provided developers with a few guidelines when writing text which will be presented on Glass. These guidelines, five in total,

- **Keep it brief.** Be concise, simple and precise. Look for alternatives to long text such as reading the content aloud, showing images or video, or removing features.

- **Keep it simple.** Pretend you're speaking to someone who's smart and competent, but doesn't know technical jargon and may not speak English very well. Use short words, active verbs, and common nouns.

- **Be friendly.** Use contractions. Talk directly to the reader using second person ("you"). If your text doesn't read the way you'd say it in casual conversation, it's probably not the way you should write it.

- **Put the most important thing first.** The first two words (around 11 characters, including spaces) should include at least a taste of the most important information in the string. If they don't, start over. Describe only what's necessary, and no more. Don't try to explain subtle differences. They will be lost on most users.

- **Avoid repetition.** If a significant term gets repeated within a screen or block of text, find a way to use it just once.

2.6 Similar Products

- Microsoft Hololens (Hologram)

  Microsofts offer in the augmented reality device space is a heads up display that displays over both of the user's eyes. The intention is, according to Microsoft themselfs, is not to be a direct competitor to Google Glass. Their aim is not to make the same device. Where Google Glass are meant to be worn all the time, at all times, Microsoft Hololens is rather a device the user only puts on when he or she intends to use it.

  But the mot striking difference lies in the interaction with the real world. The interface Google Glass displays is a heads up display. It is a two dimensional display that floats slightly above the users line of sight (see 2.1). The interface in Microsoft Hololens on the other hand is meant to interact with the world.

  Microsoft intends to give the user hologram and tools to work in a 3D space. Their concept video shows examples of 3D modeling with the use of kinetic handmovement

detection. This means that users will be able to see what their working on from different angles simply by walking around it, just as if the object in question was real and had a physical mass.

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

  Penny is an idustry focues device developed in Vsters, Sweden. It does not feature the same slick design many of the other virtual reality devices have (although many of them look terrible as well). One of the examples of this is that one key user interface is where the user can bite on a stick that is connected to the glasses. Probably because of the loud envornment that surronds most workers. The graphical user interface have the look of a normal PC application which comes from the fact that Penny keeps connected to a computer. However this might not be the most optimal interface since nagivation comes from head movements.

`http://www.microsoft.com/microsoft-hololens/en-us` `http://www.searchenginejournal.com/google-glass-alternatives/67018/` `http://www.penny.se`

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

android studio vs eclipse with android sdk `http://wahidgazzah.olympe.in/integrating-zxing-in-y`

API level 12 because getIntent.getExtras.getString requires it. want default value there incase of error

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

4 Implementation

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 Abbrevations

GUI Graphical User Interface

HMD Head Mounted Display

HUD Heads-Up Display

References

[1] Google (2013). *Google Glass How-to: Getting Started* [online video]. http://youtu.be/4EvNxWhskf8 [2015-02-07].

[2] Sergey Brin (2013). *Why Google Glass?* Long Beach, United States of America. http://www.ted.com/talks/sergey_brin_why_google_glass [2015-02-02].

[3] Google (2014). *Find a Preferred Provider*. http://www.google.com/glass/help/frames/providers/ [2015-02-02].

[4] Google (2014). *Frames*. http://www.google.com/glass/help/frames/ [2015-02-02].

[5] Google (2015). *Principles*. https://developers.google.com/glass/design/principles [2015-02-02].

[6] Oculus (2015). *Low Latency 360° Head Tracking*. https://www.oculus.com/rift/ [2015-02-09].

[7] Colin Ware Robert S Laramee. Rivalry and interference with a head-mounted display. *ACM Trans. Comput.-Hum. Interact.*, 9(3):238–251, sep 2002.

[8] Thad Starner. Project glass: An extension of the self. *Pervasive Computing, IEEE*, 12(2):14–16, 2013.