

# Google Glass

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**Abstract**— Google has developed a wearable computer with an optical head-mounted display (OHMD) the research and development project Project Glass with the intension of producing a mass-market ubiquitous computer. Glass displays information in a hands-free format which can interact with the Internet through natural language voice commands. The Google Glass will have the combined features of virtual reality and augmented reality. It works on Google's Android Operating System. It also uses other technologies such as 4G, EyeTap, Smart Clothing, Smart Grid. Google Glass is a futuristic gadget we've seen in recent times. It will prove as a useful technology for all kinds of people including handicapped/disabled.

**Index Terms**— 4G, Android, Augmented Reality, EyeTap, Project Glass, Smart Clothing, Smart Grid, Virtual Reality.

## 1 INTRODUCTION

### 1.1 Project Glass:

Project Glass is a research and development program by Google to develop an augmented reality head-mounted display (HMD). It is a part of the Google X Lab. The Google X Lab works on futuristic technologies. The purpose of Project Glass products is the hands-free displaying of information currently available for most smart phone users, and allowing interaction with the Internet through natural language voice commands. Its functionality and physical appearance has been compared to Steve Mann's Eye Tap, which was also referred to as "Glass". The operating system used in the glass will be Google's Android.

### 1.2 Virtual reality (VR):

Virtual reality applies to computer-simulated environments that can simulate physical presence in places in the real world and in imaginary worlds. It connects remote communication environments which provide virtual presence of users with the concepts such as telepresence and telexistence or virtual artifact (VA).

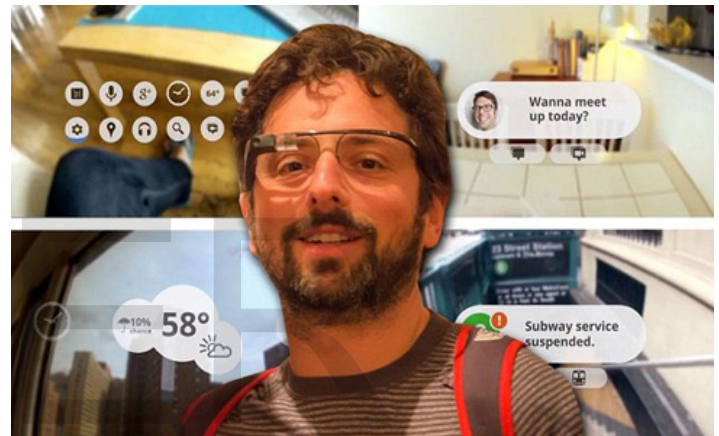
### 1.3 Augmented reality (AR):

Augmented reality is a view of a physical, real-world environment which is live, direct or indirect. It is related to a general concept called mediated reality, which means a view of reality is modified by a computer. This technology functions by enhancing user's current perception of reality.

## 2 TECHNOLOGIES USED

### 2.1 Wearable Computing:

Wearable computers are the electronic devices that are worn by the bearer under, with or on top of clothing. This technology has been developed for general or special purpose information technologies and media development. Wearable computers are useful for applications that require more complex computational support than just hardware coded logics.



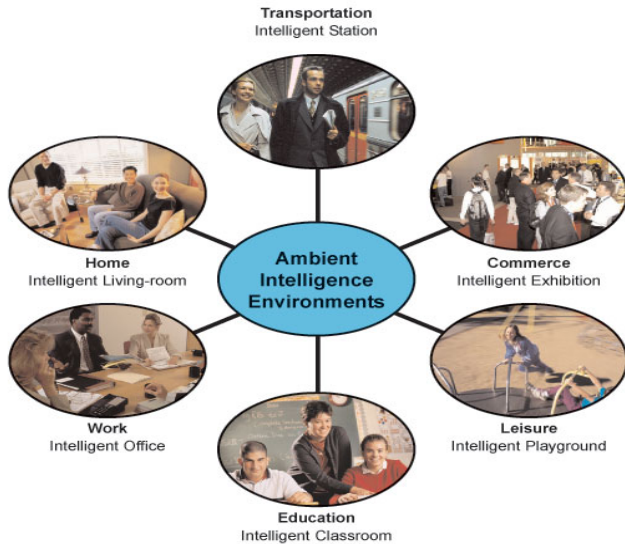
**Figure 2.1 Wearable computing**

The main feature of a wearable computer is consistency. It provides a constant interaction between the computer and user, which means there is no need to turn the device on or off. Also it has the ability to multitask. User can incorporate these devices to act like a prosthetic. Therefore, it can be an extension of the user's mind and/or body.

### 2.2 Ambient Intelligence:

Ambient Intelligence (AmI) creates electronic environments that are sensitive and responsive to the presence of people..

Devices work in harmony to support people in carrying out their everyday life activities and tasks in easy, natural way in ambient intelligence. People use information and intelligence which is hidden in the network connecting these devices.



**Figure 2.2 Ambient Intelligence Environments**

As these devices have grown smaller, also more connected and more integrated into our environment, the technology disappears into our surroundings until only the user interface remains perceivable by users.

### 2.3 Smart Clothing:

Smart clothing is the new generation of clothing. It is a combined result of new fabric technology and digital technology, i.e. the clothing is made with new signal-transfer fabric technology installed with digital devices.



**Figure 2.3 Smart Clothing**

This smart clothing is still under development so, many problems have occurred due to the absence of the standardization of technology. However, there are some techniques to show how to approach standardization. It will be valuable for developing smart clothing technology and standardization in the future.

### 2.4 Eye Tap Technology:

Eye Tap is a device that is worn in front of the eye and it acts as a camera to record the scene available to the eye as well as a display to show a computer generated imagery on the original scene available to the eye. For this device, the user's eye operates as both a monitor and a camera.



**Figure 2.4 Eye Tap Technology**

Eye Tap is a hard technology to categorize under the three main headers for wearable computing (Constancy, Augmentation and Mediation) for while it is in theory a constancy technology in nature it also has the ability to augment and mediate the reality the user perceives.

### 2.5 Smart Grid Technology:

An electrical grid which uses communication technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity is called as smart grid.

### 2.6 4G Technology:

4G is the fourth generation of mobile communication technology. Ultra-broadband internet access is provided by a 4G system, for example to laptops with USB wireless modems, also to smart phones and other mobile devices.

### 2.7 Android Operating System:

Android is a Linux-based operating system for mobile devices based on Linux. It is developed by Google. Google has made this operating system open source Android is open source and its code is released under the Apache License.



**Figure 2.5 Android Operating System**

Apparently there were approximately 700,000 apps made available for Android in October 2012 and approximately 25 billion was the number of applications downloaded from Google Play which is Android's primary app store.

### 3DESIGN

#### 3.1 Video Display:

Google Glass has small video display which is used to display hands free information in pop up form.



Figure 3.1 Video display of Google Glass

#### 3.2 Camera:

It also has the front facing 5 megapixel video camera which helps to take photos and videos in a glimpse.

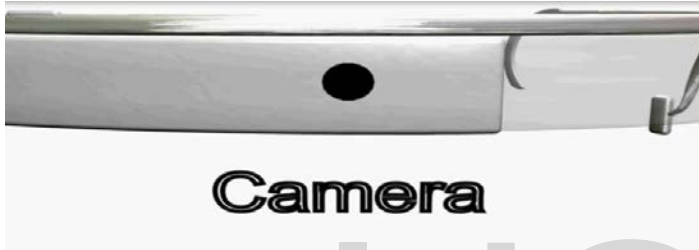


Figure 3.2 Camera of Google Glass

#### 3.3 Speaker:

Google glass is designed to be hands free wearable device which can be used to make or receive calls. Therefore, a speaker is designed by the ear for that..



Figure 3.3 Speaker of Google Glass

#### 3.4 Button:

A button is given at one side of the frame which helps the glass to work with the physical touch input.

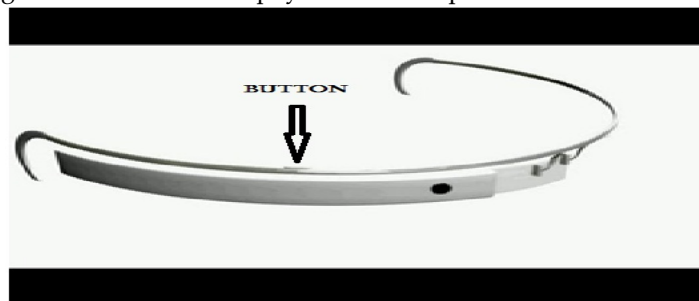


Figure 3.4 Button of Google Glass

#### 3.5 Microphone:

A microphone is provided take the voice commands of the user. It can also be used for telephonic communications.

### 4ANALYSIS OF PROBLEM

Nowadays, most of people have a smartphone, a tablet, a laptop, or other device. So it can be said that the web is a powerful tool in society for many uses such as informative, social, as well as entertaining. Therefore, with the introduction of Google Glass, a new idea of internet usage has arrived. While opponents of this revolutionary product are giving reasons such a privacy concerns as well as social faux pass, the truth is that these glasses are quite beneficial to the society in numerous ways, including public safety, social sharing, innovative educational as well as research methodologies, and improved communication.

The public can become an important factor in reducing crimes with the use of Google Glass. Glass is fast and easy because it is hands free.. If someone becomes a witness to a crime or is about to become a victim of a crime, a quick activation of Google Glass can launch the camera and provide assurance that the culprit will be held responsible. Take 26/11 attack, for example. The case of 26/11 would have been solved faster if someone had been wearing Google Glasses. Video would have been captured of the terrorists placing the bomb or implicating themselves in some other way. Thus, the terror of people, afterwards, could have been decreased. Also, it can be a very helpful product for medical students. The senior doctors can wear glass during an operation and he whole procedure can be watched by students outside. This is recently implemented by a Doctor in Chennai. In terms of increased public safety, Google's new product can be a revolutionary savior.

As with any new technology, there are bugs to be worked out and changes to be made. People's privacy will be an issue, but Google Glass is definitely not dangerous and harmful to society. As a fast speed, forward moving culture, we can get a lot of benefits from such a futuristic product.

### 5 WORKING

#### 5.1 Working:

Google Glass will communicate with other mobile phones via Wi-Fi or Bluetooth and display contents on the video screen and respond to the voice commands of the user.

The video camera is sensible to the environment and it recognizes objects and people around. Most of the working of the Glass depends on user's voice commands.

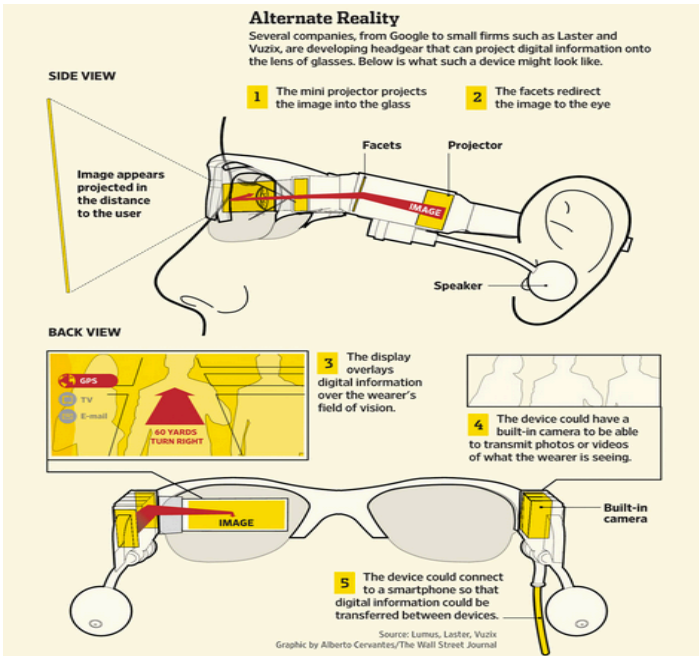


Figure 5.1 Overall working of Google glass

Google Glass has the basic features of any computer, such as a CPU, also sensors like GPS, speakers, microphone and battery, a tiny projector and a prism that directs the light to your retina. All components are neatly embedded in its frame. Most of the processing will actually take place in the cloud so that the device will be as light as possible, also a good mobile broadband signal is essential.

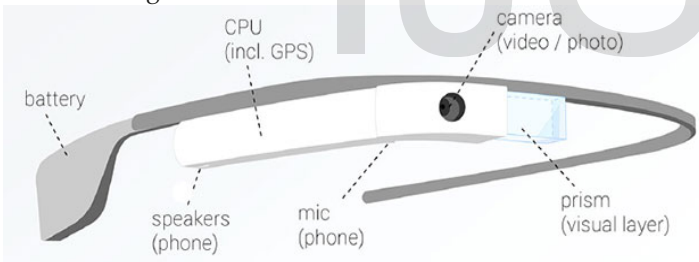


Figure 5.2 Components of Google Glass

The image below shows how the projector and prism in the Google Glass work together. Basically, Google Glass is just a tiny projector connected to a pair of glasses having frames with some tiny computing components.

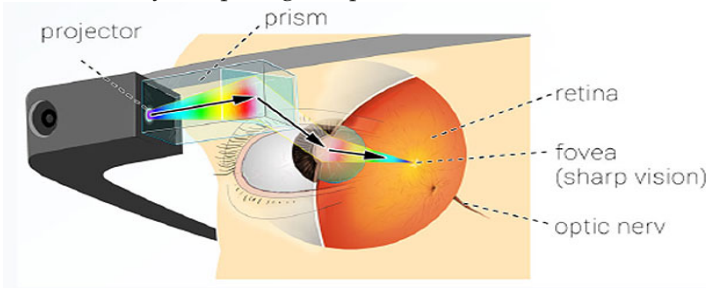


Figure 5.3 Projector and Prism Working Together

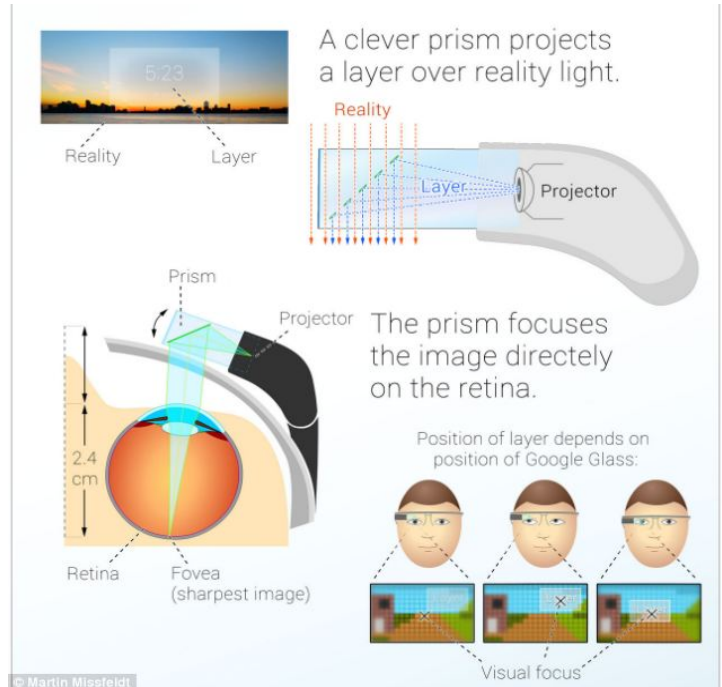


Figure 5.4 Glass is focused so the image always appears sharp

The image, in spite of being super duper close to your peepers, it is bright and clear. And it is slightly transparent, so you can place it right in front of your eyes comfortably.

5.2 Voice commands:

The following table shows multiple voice commands which can be used while handling Google Glass:-

FEATURE	VOICE ACTIVATION TEXT
Record video	"ok, glass, record a video."
Take picture	"ok, glass, take a picture."
Use Google Now	"ok, glass, [question]."
Start Google+ hangout	"ok, glass, hang out with [person/circle]."
Search	"ok, glass, google [search query]."
Search photos	"ok, glass, google photos of [search query]."
Translate	"ok, glass, say [text] in [language]."
Give directions	"ok, glass, give directions to [place]."
Send message	"ok, glass, send a message to [name]."
	"ok, glass, send [name] that [message]."
Display weather	"ok, glass, send [message] to [name]."
	none/automatically (Google Now)
Give flight details	"ok, glass, how is the weather in [location]?"
	"ok, glass, do I need an umbrella today?"
Give flight details	none/automatically (Google Now)
	"ok, glass, when does flight [flight number] depart from [airport]?"

Table 5.1 Voice Commands Used for Google Glass

## 6 BENEFITS AND LIMITATIONS

### Benefits:

- Easy to wear and use.
- Google glass responsive and sensitive to presence of people.
- It provides fast access of maps, videos, chats, documents and much more.
- It is a new trend for fashion lovers within an innovative technology
- Being a spectacle based computer, it resides directly on your eyes so that you don't need to keep it in your pouch or pocket.
- It is a useful technology for handicapped and disabled people.

### Limitations:

- It can be easily broken or damaged. Though Google is trying to make it as modest as possible, it is extremely breakable.
- Glass shows data in front of user's eyes so it will be a tough experience for him/her because the/she will focus on data and will possibly miss the surroundings.
- Users wearing spectacles won't be able to wear Glass.
- Privacy of people may be violated with Glass.

## 7 FUTURE SCOPE

With the invention of Google Glass, we have got a futuristic gadget. Presently it is in limited scope, but Google believes its future is bright and the device itself is "incredibly compelling".

Google is trying their best efforts to pass the Project Glass through the FCC this year. As per reports, Google is trying to get FCC's approval this year but there are already several hundred glasses made internally for testing.



Figure 7.1 Future Scope of Google Glasses

## 8 CONCLUSION

Google glasses are wearable computers which use the familiar technologies that bring the sophistication and ease of communication and information access even for the physically challenged class of people who cannot use palmtops and mobiles.

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