

Wearable Smart Tech Glasses Integrated With Mobile Device Functionalities

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Abstract: Mobile technology has been facing a huge hype in the current era and it is still grown at constant pace. The ultimate goal of mobile technologies is to bring all features together and make it easy to use and access. This paper deals with the concept of incorporating the cellular mobile technologies to eyeglass which are used in day to day life. The motive is to use the glasses as an alternative for handheld mobile devices. Previously, smart watches were designed to perform all the common functionalities of a mobile. Now with advancement in technology and hardware components, the same can be brought close to our eyes and can be controlled by our eyeballs. The technologies that are used in the smart glass will include Heads up display, laser projection, Iris Scanner, eye controlled pointer, bone conduction speaker system along with Wireless interconnector systems such as Bluetooth and Wi-Fi and cellular connectivity. People are looking forward to small and compact gadgets that do the work for them and the glass are perfect start for the futuristic technologies like augmented and virtual reality which are creating a lot of buzz around the world.

Keywords: Mobile technology, Heads up display, laser projection, Iris Scanner, eye controlled pointer, augmented and virtual reality, Wireless interconnector systems, bone conducting speakers.

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I. Introduction:

Mobile phone introduced with wireless transmission and reception was considered to be a great breakthrough in the field of communication. This eliminated the use of wired LAN cables running miles to connect people. Initially they were only use to make important call and not all were afforded to have one. Later many manufacturing company emerged and made it available to all. With the increasing manufacturers and network providers the technology was growing at a great pace. It led to many new improvements and standards. The companies that made revolutions include apple, nokia, samsung and many Korean companies. Services like short message service, multimedia message service were introduced.

Following that the entire concept of mobile phone were changed in the next era. With the introduction of 2G and 3G users were able to browse information on the World Wide Web. The mobile phone display got bigger in size and the bulky size of the mobile got reduced in time. The internet access in the mobile phone made the people to get connected to the world in any place and at any time. To increase the performance and efficiency of the mobile Operating Systems for mobile phone were developed. The Google's Android OS and Apple's IOS are considered to be the pioneer in mobile operating systems. As a result mobile phone was called as a mini computer and performed simple operation. The operating System also acts as a platform for the many mobile application to function. Android OS was made available to all mobile manufactures. The developers were given access to develop their own application on their platform and rollout for the people.

The appearance made a very drastic change and components too. Initially multimedia support was brought and it was followed be installation of camera, loud speakers and different sensors. With the increase in the screen size the keypad vanished and touch screen technology came to the circulation. Now more than 75% of the mobile phone has become smatter with the technologies and companies have made them more affordable. People are still looking forward to constant development in its technology and more convenience. There are also many other components that gets connected with mobile like the Bluetooth speakers fitness bands and gears (Smart watches).

The ideology of smart watch is to get connected with the world always without bothering where your mobile phone is. They did had all the functionalities of a smart phone and also did more advanced operations like calculation of heartbeat, calories burns, healthcare maintenance and much more. With the development in technology the companies are making new projects for the future. One of the promising future technologies is the Smart Glasses. The idea is similar to that of the smart watches but smart glass aims in taking the world to a

futuristic approach. This paper consists of a proposed system that has a methodology in the development of the smart glasses technology.

Related Works:

- A. T. North, M. Wagner, S. Bourquin and L. Kilcher
Brought up with the idea of compact binocular heads-up display integrated in a motorcycle helmet is presented and characterized. The use of a laser micro-projector using a 2D MEMS-mirror enables the formation of a bright image, superimposed on the user vision. A fully-functional and adjustable 3D-printed prototype, thereby fitting the morphology of most users, is presented.
- B. FUJITA Masahiko, KAWAHARA Takeshi, MORIMOTO Masayuki, KAWASE Hideyuki, YOSHINO Kazumi, HASHIMOTO Youichi
NEC TOKIN Corporation has marketed a bone conductive receiver/microphone as a mobile phone accessory that can convey sound to the auditory organs through vibration using a piezoelectric bone conductive speaker. This device has received a favorable evaluation in a field test that was provided to those who have difficulty in hearing, and also with individuals who have normal hearing but are located in a noisy place
- C. S. Patil, S. Gudasalamani and N. C. Iyer
States Biometrics recognition is the use of physiological and behavioral traits to identify an individual. Many biometric traits have been developed and are being used to authenticate the person's identity. Iris recognition systems are widely used and have been proved to be efficient at individual recognition with high accuracy and nearly perfect matching. The Iris feature of two eyes of same person are not similar making it more secured way of authentication compared to other Biometric recognition systems.
- D. L. Das
Proposed iGoggle that guided wheel chair is developed to assist the patients who are paralyzed below the neck. This iris controlled wheelchair makes use of eye movement for the control of wheelchair. Infra-red sensors are used to detect the iris movement and control the movements of wheelchair. Infra-red sensor senses the movement of eye ball and control the movement of wheel chair in different directions. The performance of iGoggle wheel chair is evaluated by measuring the eye movements.

Existing System:

There are some big technical giants and small firms already working in the development of Smart glasses. Some of them worth addressing are the Google, Intel and Vuzix.

Google Glasses:

Google, the world's largest internet company started working on the smart glass concept a long time before. The prototype was started to develop in the year 2013 and it was called as Google Explorer. It gave a start to the birth of smart glasses. Their idea was to use glass on normal functionalities such as giving direction, record video, view notifications. They used an extra lens extended out of the frame which acted as a display. The contents that display on the lens were on the top right corner of the person's eye sight. Inputs were given to the glasses using voice commands and touch panel present along the right side frame of the glass. The product was under development for a very long time period and it was rolled out for the developers. It went under many criticisms due to the lack of privacy and security. The company stopped the project in 2015 and announced it will start on 2017.

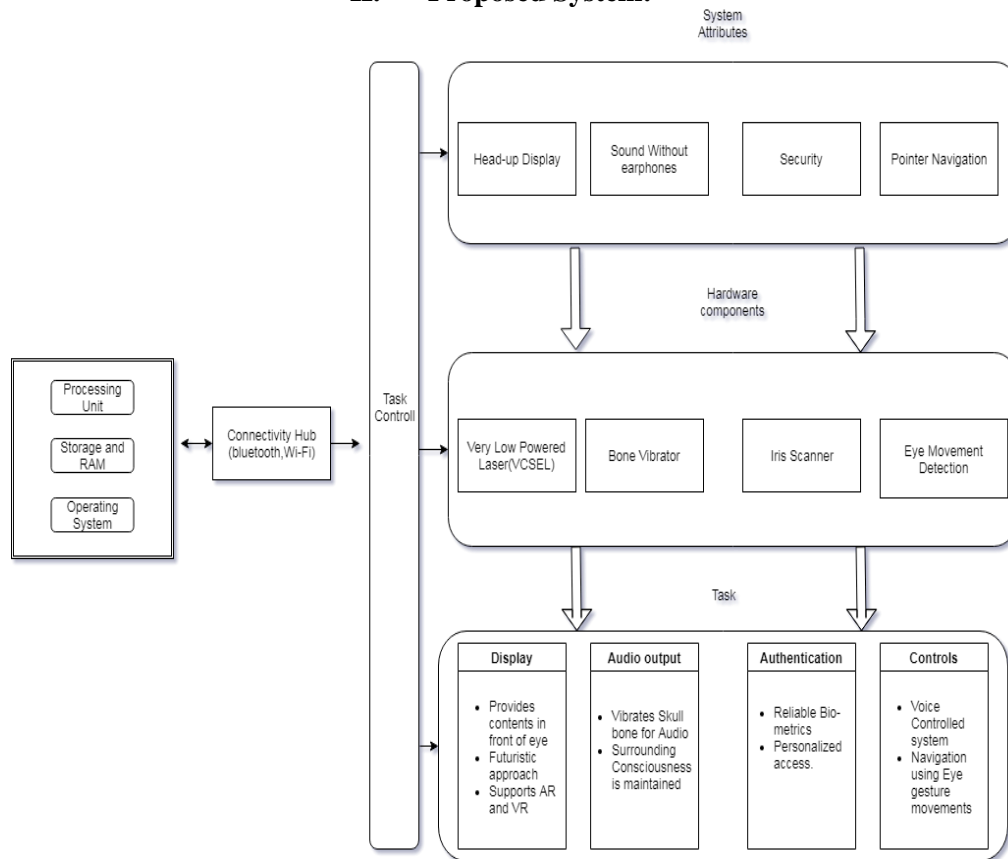
Intel:

The master in making of hardware components and chips for the computers and laptops also joined in for the race towards the futuristic glass project. They developed the prototype in 2018 that worked using the heads up display technology. Previously found glasses were bigger in size and looked awkward but the Intel glass is similar to the conventional eye glasses. Though it is not the finished product it is considered to be a first step for achieving the advanced idea. Since Intel is a huge hardware company they are planning to let the hardware component along with the developing platform for the startups and other companies to come up with their own idea.

Vuzix:

It is an American company which is been working on the Augmented reality and Smart glasses for a long time. They are the leading smart glass production company and it supplies to different companies. They first appeared with the glass technology in CES 2013. And now in CES2018 they come up with a product name vuzix blade. This smart glass use a projection technique using laser and they name it as cobra engine. They get connected to mobile using Bluetooth and Wi-Fi. They have a camera and also have checks for notifications from the application in your mobile. They are controlled using touchpad attached to the frame.

II. Proposed System:



The glasses consist of lots of components and system integrated within them. They are

A. Heads up display

This is a technology that in recent years have been widely used by automobile companies for displaying important car details on the windshield while the driver is driving the automobile. This is accomplished by using a laser projected to the inner part of the windshield. This same technique can be used in displaying the content on the lenses of the glasses. The same laser projected in the automobile can't be used in the glasses because it may be harmful to the human eye. Hence on both stem of the glasses sits a suite of electronics designed to power a very low-powered laser (technically a VCSEL). This can be helpful in projecting information on the entire lens area. This gives a feel of things being present in front of our eye. This becomes more effective while watching a movie or looking photos. It eliminates the use of large bulky Virtual reality Gears.

B. Eye controlled pointer system:

When it comes to glasses, ways of input mode is always a concern. The traditional input modes are through voice commands and touch panels or pads that are present along the sides of the frames. But it adds more complexity in accessing the system. And the users should always reach up to the head to for any changes that are to be made. This problem can be eliminated by using two low aperture cameras (f1.4 or low) on either top corners of the frame facing towards the eye. They constantly monitor the movement and blink of the eye ball. The movement of the eyeball can be related to each and every pixels present in the display. To be accurate enough the monochrome image of the eye is obtained and then processed to precisely locate the location we are looking at. In order to select a particular option double blink of the eye is used. Whenever the camera identifies a blink in quick succession the pixel focused by the eye ball gets selected. All the data and image processing are done inside the operating system of the glasses.

C. Bone conducting speakers system:

Since glasses should be able to perform all the functionalities of a smart phone it is very important to have a speaker or earphone for taking calls, listening to music, hearing instructions and much more. It is not

practical to have earphone plugged into ears day and night. And even if the earphone are plugged in the isolate the surrounding noise which creates problem during walking in a road or listening to some ones speech. This issue can be overcome with the help of the bone conducting speakers. The bone conditioning speaker vibrates the skull bone and makes the audio reach the ears. This hardware does not cover our ears, so normal sound waves can be easily reaches our ear buds. The bone conduction hardware can be mounted on either frame stem to provide stereo sound effect.

D. Security systems.

The smart glasses when gets connected to smart phone the sensitive data in the mobile phone will be able to get viewed in the glasses. It is important to give accesses only to the authorized person to use it. The authentication and security check can be carried using the Iris scanner. Similar to the fingerprint no two person in the world shares a same Iris. (i.e.) each person has a unique Iris in their eyes. So the iris scanner fitted to the inner side of the frame makes the glasses more secured personal device.

Modality	Accuracy	Easy to use	User acceptance
Face	Low	High	High
Fingerprint	High	Medium	Low
Iris	High	Medium	Medium
Palm Vein	High	High	Medium
Voice	Medium	High	High

The above table gives us the valid reason for using iris as the biometrics. Since the glass is positioned in a constant place the scanning process will become easy and it does not need any additional activity to be done by the user.

E. Software operating systems and specifications:

It is really important to provide a feasible operating system that can stand up to the performance of a smart phone. In order to get smooth and efficient output from the system the Processor chipset, RAM and ROM plays a major role. All the applications running of a mobile should be made compatible with the Smart Glasses. Sensors such as gyroscope and compose are supposed to be fixed because they come in handy during the augmented reality and virtual reality.

III. Conclusion:

As the technology is reaching greater highs every day, it will eventually take only few years to transform all the idea and concept to a working product. This paper provides a clear view and way to approach towards the future of wearable mobile technology. Thus, this proposed system, once implemented will serve as a critical game changer for all the developers in the field of AR and VR to think and bring out products in different angles and perspective.

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