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Scope and Challenges in Smart Glasses: A Comprehensive Study on Present Scenario

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Abstract -- Smart glasses are wearable computer glasses that display real-time information directly in front of users' field of vision by using Augmented Reality (AR) techniques. Generally, they can also perform more complex tasks, run some applications, and support Internet connectivity and able to change their optical properties at runtime. There are various companies coming up with new varieties of smart glasses and also improvements are done on the existing ones. Google glasses is also an example of smart glasses. Smart sunglasses are also available, which are programmed to change tint by electronic means are an example of the latter type of smart glasses. In the present paper the author will present a detailed study of smart glasses and its working principle, developments, comparison between different smart glasses product, its benefits, risks, and also its future scope.

Keywords: Smart glasses, Augmented Reality, Google glasses, Smart sunglasses.

I. INTRODUCTION

In the current years, technology has perceived increasing advances in mobile and wearable technologies. Predominantly, smart glasses are one of many wearable computing technologies developing nowadays. Therefore, it is critical to study the design factors and impact of the new smart glasses technology. Smart Glasses generate new augmented reality experiences to improve the perception and communication of the user, thus generating new research opportunities and challenges for security and privacy. These challenges may arise from the facts that a smart glass has several sensors that can always be on. Some of them are camera, microphone, GPS, accelerometer, gyroscope and compass. Multiple output devices (heads-up display (HUD), speaker). In addition to the capability to execute multiple applications in the background and wireless communication with other devices, as well as connection to the Internet. Consequently, new security and confidentiality risks need to be addressed while the technology is still at its early stage. Furthermore, while it is well-known that smart glasses developers could terminate privacy concerns of their technologies, as their mainstream is to harvest consumers digital trails and behavior for their tailored applications, such as advertisements and search results. Smart Glass can push this limit such that intellectual services will be easily available anytime. [1]

Figure 1. The 2013 Google Glass used to communicate with the user's phone using Bluetooth device.

Augmented Reality: Augmented reality is a live direct or indirect view of a physical, real-world environment whose elements are improved by computer generated sensory input such as sound, video, graphics or GPS data. It is related to a more general concept called mediated reality, in which a view of reality is improved by a computer. As a result, the technology functions by enhancing one's present observation of reality. In contrary, virtual reality replaces the real world with a replicated one. Augmentation is conservative in real-time and in semantic context with environmental elements, such as sports scores on TV during a match. With the help of advanced AR technology, the information about the immediate real world of the user becomes interactive and digitally manipulable. Artificial data about the environment and its objects can be overlapped on the real world. [2]

II. LITERATURE REVIEW

"Smart-glasses," "Digital Eye Glass," "eye glass display," or "Personal Imaging Systems" are wearable devices that demonstrate images to the visual field of a user. They are considered to add visual elements to the visual experience of a person without significantly twisting or distressing the person's normal vision, qua use, communication with the actual world and qua experience. The devices involved differ but they do not just display virtual elements that stand apart from the direct living environment. They often feature processing measurements that is similar to a smartphone or GPS. This shifts smart-glasses beyond the group of passive head-mounted displays. Moreover, devices like these do not only display information, but can also use the variation of sensors to track, analyze, distribute, and store data about the surrounding environment as well as the user. Among sensors and input devices are: accelerometers, magnetometers, GPS, microphones, touchpads, eye tracking cameras etc. Information from these sensors can be used either by smart-glasses' own processing unit itself or by a computer, usually a smartphone, connected to the glasses. These features allow using smart-glasses in a variety of situations (Steve Mann 2014).

Smart-glasses can connect to the Internet and can access a wide range of data sources, e.g., maps, news, messages, and emails. They can track eye-movements and present marketers with a heat-map of goods the customers look at the most. They can distinguish places and faces and display information and social media profiles of people, the smart glasses user is looking at. Smart-glasses are already applied in medicine, and are intended to have a wide range of applications in this field (Singh et al. ; Moshtaghi et al. 2015; Hetterich et al. 2014; Mentler et al. 2015; Klein et al. 2015; S. Mitrasinovic et al. 2015; Maas et al. 2015; Rankin et al. 2015), education (Ikonen and Knutas ; Labus et al. 2015; Freina and Ott 2015), tourism (Harasymowicz 2015), social science research (Paterson and Glass 2015), navigation (Ostendorp et al. 2015; Higuchi et al. 2015), crowd steering (Borean et al. 2015), activity recognition (Zhan 2014; Betancourt et al. 2015) including diet recognition and food behavior control (Gemming et al. 2013; Farinella et al. 2014), mood (engagement) measurement (Kunze et al. 2015), forensics (Karabiyik 2015), promoting cultural sustainability (Irving and Hoffman 2014), promoting teamwork and safety (Moshtaghi et al. 2015) and they can also be used for military resolutions. Models and applications exist in several of these fields. E.g., within health care, a wide range of applications have been recognized, such as hands-free photo and video documentation, telemedicine, Electronic Health Record retrieval and input, rapid diagnostic test analysis, education, and live broadcasting (Stefan Mitrasinovic et al. 2015), as well as health promotion (Edington et al. 2015). [3]

Smart-glasses have a extensive range of potential users. Similar to smartphones, they are intended to be versatile. They are a multiuse platform with multiple applications. Smart-glass users can be divided into two main groups: regular consumers or professional consumers. Common to both groups is that smart-glasses provide extended capabilities.

Regular consumers are intended to use smart-glasses mainly for entertainment and experience enhancing purposes. A regular user may wish to stay connected to other users, browse the Internet, and consume digital content. As conflicting to smartphones, smart-glasses are purposely designed for continuous use and for multi-tasking, e.g., consuming media and using social networks while concurrently doing something else. This approach was taken by a number of smart-glasses such as Google Glass, Recon Jet, Microsoft HoloLens, or Cast AR.

The other main group is professional consumers, who are intended to benefit from the technology's 'hands-free' features. There are several attempts to bring the smart-glasses technology to logistics, automotive, retail, and many other industries and services. What makes smart-glasses useful in these fields is the potential to display, filter, and interact with the data generated by the activities taking place on the workplace, while, again, freeing the user's hands, e.g., making a fire fighter able to navigate even if visibility is low because the device can display the position and the route to a given target. Smart-glasses systems that are being developed for the professional group of users are, for example, the Epson Moverio series, Vuzix M100, Kopin Golden-i, or ODG R7. [4]

III. EQUIPMENT AND SOFTWARE DETAILS

Equipment: The Smart Glass (shown in Fig. 2) is a mobile wearable computer that is able to record the user worlds from a first-person view and shows data through a built-in HUD. The device also has implanted mobile processor for implementing codes and processing data, sensors for a variety of applications, as well as wireless connectivity. It should be initialized and used through a smartphone via Bluetooth connectivity.

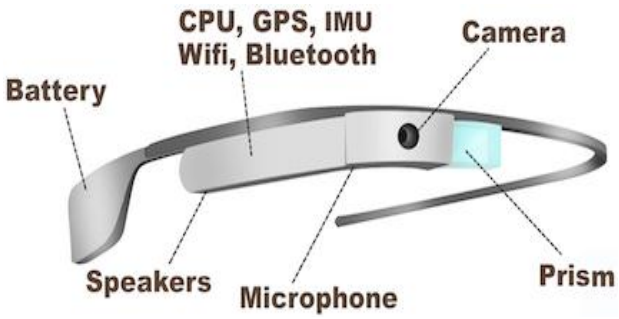

Figure 2. Smart Glass Hardware Components [5]

The main features of the glass are as follows:
1) A dual core CPU alike to what is being used in modern Android smartphones.
2) GPS Sensor for locating geolocation.
3) Inertial Sensors such as accelerometer, gyroscope and compass that are accessible by default in modern smartphone and can be used for numerous applications.
4) Speaker and Microphone for Audio Input / Output.
5) Camera for recording videos and capturing pictures.
6) Prism and Projector (HUD) for exhibiting pictorial content to the user (640x360 pixels).
7) Wireless connectivity through Wi-Fi and Bluetooth.
The most interesting part of Smart Glass is the Heads-up Display shown in Fig. 3 that sort of empowers augmented reality by projecting an image on a see-through display. Through this design, it is possible to overlay digital information on the user field of view. [5]

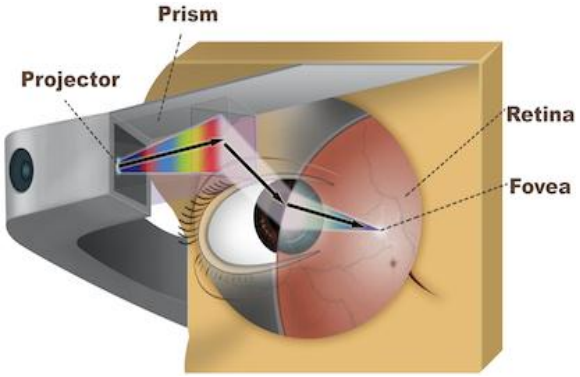

Figure 3. Smart Glass Heads-up Display [5]

Software Details:

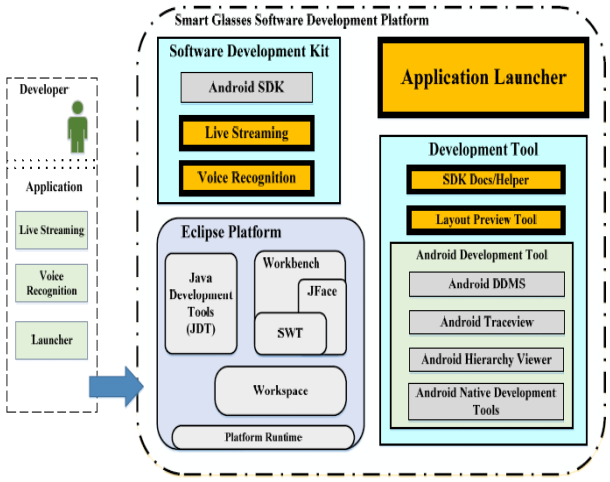

Figure 4. The software architectural overview of Smart Glasses Application Software Development Platform (SGASDP). [6]

This section defines the expansion of SGASDP, which includes the design, its architecture and its implementation. SGASDP was considered with the application development platform of Android systems in mind. The reason is not only that Android system has a large, and is still growing, market share in the ground of mobile platforms, but also it is comparatively stable such that hardware diversity in smart glasses products would not impose impact upon emerging application software. [6]

A. The Design

Figure 4 depicts the architecture overview of SGASDP and shows the main design consideration. The dotted boxes at the left-hand side in the figure shows some functionalities that might be commonly desirable in applications of smart glasses, such as live streaming and voice recognition. These functional requirements and other potential ones, such as gesture-based control, might suggest that a mechanism of this platform to support applying functionality specific to smart glasses applications is helpful and necessary. SDK would be suitable to serve as package of functionality while an SDK manager is designed to join the flexibility in adding and removing SDK. The launcher box, the box of voice recognition in Figure 4 stands for a personalized application launcher which is intended to replace the native Android Launcher (also known as Android launcher app.) because the user interfaces of smart glasses are very different from those of Android smart phones or tablet devices. A new application launcher is thus essential and therefore it is involved in the design.

B. *The Architecture*

Based on the design defined above, the big chain block in Figure 4 shows the main architecture of SGASDP, which is composed of four main parts:

- Software Development Kits: These components include not only the SDK required to progress Android apps, but also the SDKs executing desirable functionality of smart glasses applications.
- Eclipse Platform: Eclipse is adopted as the base of SGASDP. The components are Java Development Tools, Workbench, Workspace, and Platform Runtime.
- Application Launcher: This a light weight UI comprised exactly for smart glasses applications. It takes as reference the concept of "timeline cards" from GDK to fit the horizontal view of smart glasses.
- Development Tools: These components are intended to provide handy assistance to developers, which contain a design aid for the display layout of application, preview utility, usage guide and other Android development tools. With the built-in ability of Eclipse, components can be added or removed as needed. SGASDP therefore features expandability as well as flexibility. [6]

C. Working

To start using Smart Glass, one just need to tap the frame of the glasses and are taken to the home screen. There are not a

bunch of icons like on smartphone home screen, just a simple intersection box that carries any data and the wallpaper is actually the real-life scene that one is looking at. [7]

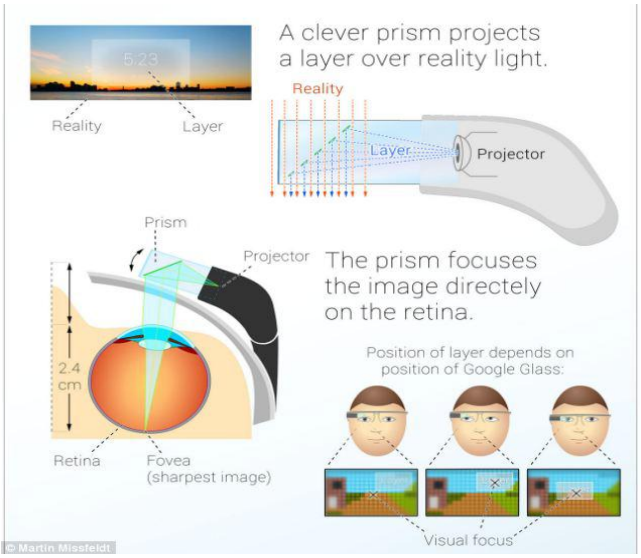

Figure 5. How layer is formed in Smart Glasses. [8]

Smart Glasses will interact with other mobile phones via Wi-Fi or Bluetooth and display contents on the video screen and respond to the voice instructions of the user. [8] Or by using the capacitive touch pad along the right side of the glasses. The touchpad responds to changes in capacitance, which is basically a weak electrostatic field produced across the screen. When the user's finger makes interaction with the panel, a controller chip senses the resulting change in electric capacitance and registers it as a touch. Swiping finger horizontally allows to navigate menus on the device. Swiping downward on the touch pad backs out of a choice or, if at a top-level menu, puts the glasses in sleep mode. [9] The video camera is sensible to the environment and it identifies objects and people around. But most of the working of the Glass depends on user's voice commands. [10]

IV. RESULTS AND DISCUSSIONS

Developments in Smart Glasses till date:

Google Glass: One of the examples of smart glasses with one display is Google Glass which runs the Android operating system. Google Glass is supposed to be used in combination with a smartphone and one of its main usages is to exhibit notifications in a appropriate and rapid way. It is supposed to be valued similarly to a high-end smartphone but there are no authorized declarations regarding the exact price or release date. [11] It has all the specification that a typical smart glass has and works exactly as mentioned above.

Smart Sunglasses: Smart sunglasses which are able to change their light filtering properties at runtime usually use liquid crystal technology. As illumination conditions change, for example when the user goes from indoors to outdoors, the brightness ratio also changes and can cause unwanted vision diminishing. An attractive solution for overcoming this problem is to integrate dimming filters into smart sunglasses which control the amount of ambient light reaching the eye. An innovative liquid crystal-based constituent is used in the lenses of smart sunglasses is Polar View by LC-Tec. Polar View offers analog dimming control, with the level of dimming being adjusted by an applied drive voltage.

Another sort of smart sunglasses custom adaptive polarization filtering (ADF). ADF-type smart sunglasses can change their polarization filtering features at runtime. For example, ADF-type smart sunglasses can modify from horizontal polarization filtering to vertical polarization filtering at the touch of a button.

The lenses of smart sunglasses can be manufactured out of multiple adaptive cells, therefore different parts of the lens can display different optical properties. For example, the top of the lens can be electronically arranged to have different polarization filter features and different opaqueness than the lower part of the lens.

Others: There are also other varieties of smart glasses developed over the years by different companies. And many new features are also added. Some of it is discussed in the following figures.

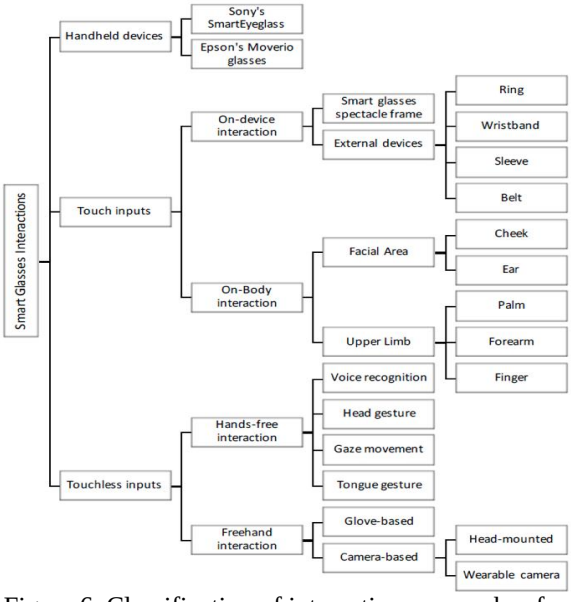

Figure 6. Classification of interaction approaches for different smart glasses [12]

Smart Glasses \ Sensor	Camera	Microphone	GPS	Accelerometer	Gyroscope	Magnetometer	Light Sensor	External Controller	Trackpad / Button	Eye Tracker	Optical display
Google Glass	✓	✓	✓	✓	✓	✓	✓		✓		✓
Epson BT-300	✓	✓	✓	✓	✓	✓	✓	✓			✓
Recon Jet Pro	✓	✓	✓	✓	✓	✓	✓		✓		✓
Glass up	✓	✓		✓	✓	✓	✓		✓		✓
Microsoft Hololens	✓	✓	✓	✓	✓	✓	✓				✓
META	✓	✓	✓	✓	✓	✓					✓
Optinvent Ora-2	✓	✓	✓	✓	✓	✓	✓		✓		✓
Laster SeeThru	✓	✓	✓	✓	✓	✓	✓		✓		✓
MAD GAZE X5	✓	✓	✓	✓	✓	✓			✓		✓
Vuzix M300	✓	✓	✓	✓	✓	✓	✓	✓			✓
Sony Smart Eye-glass	✓	✓	✓	✓	✓	✓	✓	✓			✓
ODG R9	✓	✓	✓	✓	✓	✓	✓				✓

Figure 7. Sensors on different Commercial Smart Glasses [12]

Maker	Google [2][18]	Chipsip [19]	Jorjin [20]	Sony [21]	Epson [22]	Lenovo/Vuzix [23]
Product	Google Glass	SiME Smart Glasses	Jorjin Smart Glasses Solutions	SmartEyeglass	Moverio	Lenovo Vuzix Smart Glasses
Model	X1	SiME	JGK-S101	SED-E1	BT-200	M100
Date	2014/04	2015/03	N/A	2014/09	2014/12	2014/09
CPU	OMAP 4430	Newton37 SiP (Dual Cortex-A9)	OMAP 4460	N/A	OMAP 4460	OMAP 4460
RAM	1 GB	1 GB	1 GB	N/A	1 GB	1 GB
Display	Monocular	Monocular	Monocular	Binocular	Binocular	Monocular
Resolution	640 × 360	800 × 480	800 × 480	419 × 138	960 × 540	400 × 240
Wireless	1. Wi-Fi 2. Bluetooth 4.0 3. GPS	1. Wi-Fi 2. Bluetooth 4.0 3. GPS	1. Wi-Fi 2. Bluetooth 4.0 3.GPS	1. Wi-Fi 2. Bluetooth 3.0	1. Wi-Fi 2. Bluetooth 3.0 3. GPS	1. Wi-Fi 2. Bluetooth 4.0 3. GPS
O/S	Glass OS / Android 4.4	Android 4.4.2	Android 4.2.2	Android 4.1 or later	Android 4.0.4	1. Android 4.0.4 2. Customized Android
SDK	1. Android SDK 2. GDK	1. Android SDK 2. SiME SDK	1. Android SDK 2. Jorjin SDK	1. Android SDK 2. SmartEyeglass SDK	1. Android SDK 2. Moverio BT-200 SDK	1. Android SDK 2. Vuzix SDK
Support	Developer Web site	Company team	Company team	1. Stackoverflow 2. Developer Web site	Developer Web site	Developer Web site
Notes	1. Developer is Google X 2. H/W maker is Foxconn 3. Discontinued 2015/01		Jorjin provides BSP as the maker SDK	1. Developer Edition 2. H/W spec. are not all publicly shared.		Cobranded by Lenovo and Vuzix

Figure 8. Comparisons of some smart glasses products. [13]

Benefits of Smart Glasses

- Smart-glasses may become an extension of human body and mind (Huang 2013) and improve our communication with the environment (Benessia and Pereira 2015)
- Alter (progress) health behavior (Doherty et al. 2013).
- Block unkind experiences and avoid nervousness (in a hospital setting) (Tse et al. 2002) and to support patients with precise requirements (of care) (Hetterich et al. 2014)
- Making learning more well-organized or creating new learning methods (Koper 2014). However, the consequences of learning with smart-glasses are miscellaneous (Sapargaliyev 2015)
- Provide protection and security, e.g., for persons with various forms of impairment, such as detecting hazards for persons with visual impairment (He et al. 2015), or in the industry (Neira Millan 2013)
- Smart-glasses may rise situational awareness (Ackerman 2012), multitasking abilities (Nikolov 2013), and orientation (Muschiol 2015)
- Support recognizing and remembering (Iwamura et al. 2014) as well as impede forgetting (Jacquemard et al. 2014)
- Be a valuable extension of the human brain (Bendel 2014) and forecast intellectual states (Henderson et al. 2013)
- Upsurge power through the collection of data, e.g., images (Bendel 2014).
- Smart-glasses are intended to improve security (Sehgal et al. 2015), e.g., of elderly by avoiding crimes (by saving events in the could)
- Reward for impaired functions, such as landmark identification for persons with reduced visual ability (Ugulino and Fuks 2015) growing their quality of life (He et al. 2015)
- User empowerment, self-support and inclusion in decision making, and new professional models through open hardware, open software, and open data (Romano and Cangiano 2015)
- Opens for multidisciplinary association (Ranck 2012)
- Ease communication across language and culture barriers (Kaeri et al. 2015)
- Provide evidence and simplify trial (Bergman 2013) [14]
- Easy to wear and use.
- Google glass reactive and sensitive to presence of people.
- It offers fast access of maps, videos, chats, credentials and much more.
- It is a new trend for fashion enthusiasts within an innovative technology
- As a spectacle-based computer, it resides directly on one's eyes and don't need to keep it in pouch or pocket.
- It is a useful technology for handicapped and disabled people. [15]

Risks of Smart Glasses

- Make people feel uncomfortable (Wolf et al. 2014) and result in "cyber sickness"
- May make people dependent (Bendel 2014)
- Psychological and health risks with smart glasses have been pointed out (Jacquemard et al. 2014)
- Security aspects are also identified in the use of smart-glasses, e.g., in (pervasive) gaming (Valente et al. 2015) or navigation (Jones 2014)
- Smart-glasses are intended to threaten security (Boissier and Castelfranchi 2015) as material about a person and his or her behavior may become reachable by others (Nyang et al. 2014).
- Interruption and material overload (Ranck 2012)

- Potential manipulation and steering (Borean et al. 2015), leak of sensitive data (Shen et al. 2015)
- Uncomfortable to wear (Page 2015; Ajmi and Robak 2015) (physically and socially)
- Potential non-sustainable augmentation or Enhancement
- Negative reactions (verbally or physical) by people in public spaces (Wolf et al. 2014).
- May reduce some intellectual measurements as they are "outsourced" to technology, e.g., navigation skills, or represent crucial tasks to less skilled personnel. [16]
- It can be easily broken or damaged. Though companies is trying to make it as modest as possible but still it is extremely breakable.
- Glass shows data in front of user's eyes and will possibly make it difficult for him/her because he/she will focus on data and will possibly miss the surroundings.
- Users wearing spectacles won't be able to wear Smart Glasses.
- Confidentiality of people may be spoiled with Glass. [17]

V. FUTURE SCOPE

In this segment different possible applications that can be classify as documentation, productivity, universal remote control, medical, education, entertainment, commerce and sports. The motive is to show how beneficial smart glasses could be. It is expected that hardware to appreciate the applications will occur in the future.

Documentation: Pictures and videos occupied by smart glasses are taken from the point of view of the user and can be taken hands-free without blocked sight. This is perfect to capture individual experiences of the wearer. In addition to pictures taken manually a device could also take pictures mechanically. It could realize when the user is nervous or excited and take more pictures or even videos in those times automatically. All the images could be uploaded to generate a documentation of the person's life. It could be used as a remembrance aid, to increase safety by creating visual evidence of crimes, as proof in court or simply for personal use. If many people used such a device for documentation, information of calamities and other major events would spread even faster due to the increase of pictures and videos taken in circumstances where the user might not have time to manually take pictures like an earthquake.

Productivity: Even though there are already many solutions used for navigation, smart glasses could be used to create a better involvement. In cars they could be used to highlight the way and suggest a speed for the driver. In warehouses they could be used to navigate employees to the stuffs they need to transport highlighting those with some color. Audiovisual streams could be used to ask specialists or support questions while doing work. Visualize having to do a tough maintenance task once a year. This could be done while being associated to an expert from that products company seeing exactly what you do, giving advice and in case something goes wrong maybe even being liable for compensations. This is a lot cheaper than having a professional travel to once location. Smart glasses could be used to keep track of eye movement of employees. Analyzing this information could help determine when an employee is overworked and needs a break or when an employee runs out of work and starts working slower. Another possible application would be to augment construction sites with architectural plans helping in finding mistakes made in the planning phase and also preventing accidents like drilling through a water pipe.

Universal remote control: The user could issue an augmented control of any companionable device at any time and use this to interact with the device through gestures. Examples would be an augmented television remote, music, heat, light, oven, security system or camera control. It would also be possible to remote control any computing device with a simulated display and a virtual or physical keyboard and mouse or touch interface. This could be understood by streaming video to the glasses and control material to the device. If the device which should be controlled has little computational power or the bandwidth is limited it would also be likely to only send the information to be displayed to the glasses and let the glasses generate the visualization. Of course, this would not be as appropriate as using an actual desktop PC but it would enable the user to use the PC from remote location and use computing devices which do not have a screen or any physical boundaries.

Medical: At first the use of smart glasses for blind or visually impaired people might seem meaningless. But they could be very useful in supporting those people as a sighted companion. Many blind people use a wicker to get information about their environments. This method only gives information about items below the waist which doesn't prevent accidents with objects placed higher like tree branches. Smart glasses could caution blind people from such accidents. They could also be used for navigation by giving them information about the distance to predefined breakthroughs. Another possible application would be to use the smart glasses as a sighted aid to create night vision or show objects in a distance. Virtual reality has been used in physical therapy. Studies prove that the individual pain consciousness of patients during aerobics can be reduced by disrupting them with a virtual reality set up. It would also be possible to have captions for deaf people. Speech recognition would have to progress and the glasses would have to be able to discriminate different voices. It would however be comparatively easy to only differentiate certain noises like a vehicle horn, somebody screaming: Watch out! or simple instructions like turn around or come to me.

Education: Virtual reality glasses could be used to explain history by permitting the students to view historical sites not only through textbooks but in a virtual 3D world in which they could move around freely. Those glasses could also be used to create reproductions for training. Examples would be driving simulations, flight simulations, military training or surgery training. It is advantageous to be skilled in those events in a safe atmosphere where nobody can be hurt until the skills required to perform are developed.

Entertainment: In 3D cinemas users wear glasses. By substituting those glasses with smart glasses, the cinema experience could be enhanced. Individual captions could be announced in the language of choice. Smart glasses could also be used for a virtual reality film understanding. The users could regulate what they see liable on their head position. The environment might be accustomed according to the conditions in the movie. For example, when it is breezy in a scene there could be a ventilator in the cinema hall generating similar circumstances. Such an arrangement would be very hard to reconstruct for anyone at home therefore pirate copies would not generate a similar experience to a cinema. This could help the industry in creating a lot more income. Another great market would be virtual and augmented reality games. Especially augmented reality games could reach a broad spectator than the people who play games today because they can be played outside and be based on communication with other people in addition to augmented virtual substances. One example of such a game would be playing tennis with a virtual ball.

Commerce: Commercial billboards and advertisement posters could be improved with video. A movie billboard for example could be improved with a trailer of the movie if the user is wearing a companionable smart glass. Smart glasses with facial recognition software could help employees distinguish customers and display information about them. Customers in stores could be given smart glasses to exhibit information about products and to help them direct through the stores quicker. At the same time the glasses could track their eyes collecting information about where they look. This data could be used to regulate the value of publicity space. This data would then be used to sell the space at a more proper and maybe higher price.

Sports: During most sports one does not have a lot of time to dedicate to a computing device and it is impossible to use one's hands to interact with the device. These restrictions make use of smart phones during sports very unrealistic. This is even true for endurance sports where you would not have the cerebral capacity to interact with a smart device. Smart glasses are perfect for demonstrating information during a sport activity. The information that is useful for a person during sports would be performance measurement, performance comparison, maybe navigation, notifications about weather or messages and so forth. The information can be displayed to the wearer in his exterior vision without distressing the sports activity. The smart glasses could also be used to take pictures or video during sports initiated by a speech command. Custom software and sometimes hardware for each sport would be essential as smart glasses for surfers would vary a lot from smart glasses for snow sports. [18]

VI. CONCLUSION

There are a lot of fascinating applications that can be a lot easier to be implemented with smart glasses than with traditional computing devices. It is feasible that there will be large reserves into research and development of smart glasses because the entertainment industry, military and businesses can benefit from smart glasses. The hardware associated with the device will be accessible in the near future still has its drawbacks and will probably need a few years and recurrences to be fixed.

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