

Glassiest and Tele operation Using Google Glass for Classroom Management and Structural Inspection

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Abstract: Google glass is a hands-free, head-mounted quick device that can be worn as a wearable conniving eyewear. This work discusses its potential in education by proposing an application, the Glassist, aiming at helping teacher's organization tasks. This paper proposes the use of a wearable device for visualization and control in association with an UAV applied to the structural inspection of buildings. More specifically, an AR. Drone is controlled through head positions and gestures performed by the operator wearing a Google Glass, and the images captured by the drone are visualized on Glass's screen. We discuss the problems that arise when such a solution is developed, along with the limitations that come from today's available technology and how to overcome them.

1. INTRODUCTION

The insertion of technology is a topic widely discussed in the field of ducation. Investigators have shown that when used properly, technology has the potential to improve learning. Mastering how to use technology became as important as many different abilities, such as reading, writing and counting.

In a globalized, interconnected world where information and knowledge are just a click away, it is impossible to think about schools disconnected from technology since it can and should be used as a strategy to improve the quality of classes as well as to call students attention and enhance their creativity. heories of knowledge, learning, teaching, and technology are shifting. Knowledge is more than just memorization and recall; it is an active, situated, and engaged process of making meaning, interpretation, and developing deep empathetic.

Inspections to some areas of the structure may be limited by safety or site conditions, with the most common limitations related to direct access at the roof or entry to the crawlspace. In order to alleviate such inherent difficulties, teleoperation-based solutions could be applied. According to tele operator devices enable human operators to remotely perform mechanical actions that usually are performed by the human arm and hand. In the context of this work, it replaces the human vision capability and mobility. Thus, tele operators, or the act of teleoperation, extend the human capabilities to remote, physically hostile, or dangerous environments. Compared to telecommunication, teleoperation conquers space barriers in performing manipulative mechanical actions at remote sites, while the former conquers space barriers in transmitting information to distant places. This work proposes the use of a wearable device for visualization and control in association with an Unmanned Aerial Vehicle (UAV) [5] [6] applied to the structural inspection of buildings. We discuss the problems that arise when such a solution is developed, along with the limitations that come from today's available technology and how to overcome most of them.

2. RELATED WORK

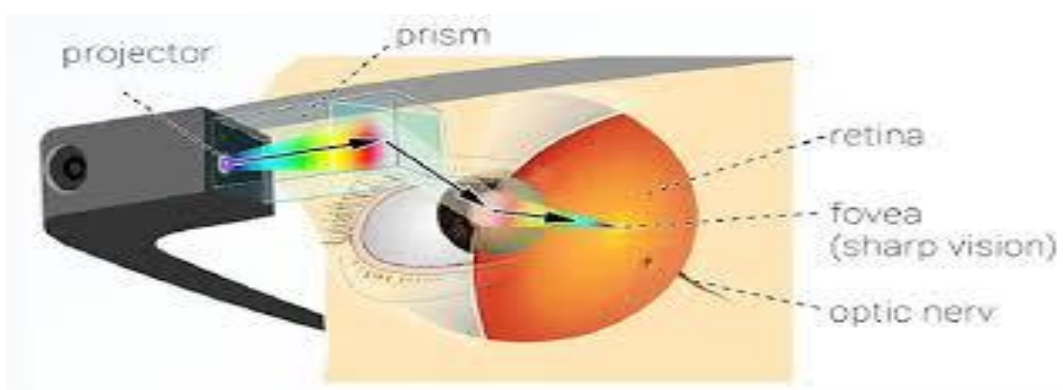
Google Glass has been heralded to be a revolutionary tool to class. Although it was not created with this purpose, there are many speculations on how to use this tool in class. Currently, there are lots of apps available and the power of the technology in schools is limited to mostly video and image capturing purposes. Students can now turn into documentarians. Likewise, teachers can record their own lesson for training purposes. Many websites, especially

technology blogs and some researchers have pointed out some uses for Google Glass in the classroom as can be seen in the list as follows:

- **Learn new languages:** One of Google Glass features is to present text based translation in real time. This can be particularly helpful in language learning courses as students would be able to decode and interact with the new language in real time.
- **Help creating presentations and research materials:** Google Glass allows users to shoot quick videos and images. These features may be helpful for both teachers and learners when they need to prepare presentations or document research.
- **Quick on-the-go research:** With Glass, students and teachers will have a web browser available at all times; this will enable them to search information, make notes, bookmarking important pages for later use and much more.
- **Distance learning:** With Google Glass, courses are constantly accessible. People can watch videos, read discussion posts and see what is happening in class in real time. Students will have the opportunity of being in class without being physically at the same location.
- **Personalized studying:** Learners will have the opportunity to learn in the style they prefer. Whether it is through listening to an audio lecture, watching a video, reading a paper or combining different activities. Google Glass allows learners to learn and explore in a personalized way.



Google has also given Google Glasses to college students in order to explore it in filmmaking. The participating schools are American Film Institute, California Institute of the Arts, Rhode Island School of Design, University of California, Los Angeles and University of Southern California. According to, the company says the schools will explore how to use Glass for documentary filmmaking, character development, location-based storytelling and other projects people have not considered yet. Another pair of glasses was given to Assistant Professor Meghan Corbin. She works at Mercyhurst University and intends to use it in High Education. Her experience will be shared at the weblog Glass in Class. Technology coordinator at a pre-K-2nd grade school, Margaret A Powers, also won Google's competition "If I Had a Glass" and earned a pair to use in her school. She created a blog in order to share her experience using the device in school.



3. THE GLASSIST CONCEPT

(A) Product Design

Our proposal was to generate ideas for children's education focused on the teacher's activities using wearable devices. In order to reach a solution to the problem at hand, we conducted a quick design process based on the traditional design method. The design process included: data collection, generation and selection of ideas, and alternative detailing.

As part of a user-centered design, an interview with a 25 years old preschool teacher was performed in order to analyze a typical day of this professional. We executed an interview based on the Day in the Life method, in which the designer follows the subject through a typical day, observing and recording events to collect data. Then, the interviewee answered questions and was encouraged to tell us about her day. The main goal of this process is to collect data about the teachers activities, their difficulties and challenges, and other daily aspects.



(B) Solution Description:

My product, named Glassist, consists of a teacher assistant on Google Glass that allows the creation of profiles for each child, entering and viewing information about them. By using Google Glass with AR features, the application aims to help day-to-day main activities of teachers, in a seamless, non intrusive way. Glass does not natively correctly align virtual and real worlds, a necessary step to turn it into a complete AR experience device. (left) illustrates how Glass works, exhibiting on its screen the image captured by the camera overlaid with the virtual objects. On the right, it can be observed how our Glassist application works, using the Google Glass as a see-through display for the AR application.

4. APPLICATION DEVELOPMENT

Glassists first implemented prototype contains two of its main features, which are face recognition of the students and access to their respective portfolio. Having the applications concept described earlier we will focus more on the Glassists code-level architecture. Basically we have three classes, two Android activity classes with one of them being the main one, and a class that represents an object that is instantiated as an attribute on another class. A few modules were used to motivate the idea of the possibilities that the use of Google Glass can bring in combination with AR. Each module will be described as follows.



Face Detection Activity: The Face Detection Activity is the core class of the application, being responsible for managing the camera activity, image processing and face recognition methods. We used the open source computer vision and machine learning software library Open CV for the image processing techniques. Although the library has many image handling examples it lacked a face recognition algorithm. To overcome this obstacle we used its face detection algorithm, which uses an adapted idea of Haar wavelets and a simple yet sufficient comparison algorithm. The Open CV library gives us the position and boundary of the faces on screen coordinates, next we extract the face image from the current frame onto an Open CV object (Mat), and then fondly compare it to a set of face images stored in the applications database. The implementation of the comparison algorithm was done by comparing byte by byte and checking if the sum of the squared differences of each byte pair is small enough to be a valid candidate.

J View: J View is a class that has the sole purpose of being an attribute of Face Detection Activity. It extends Java Camera View, an object from the Open CV library which holds a listener for controlling the camera states.

Profile Activity: This module holds the methods for visualizing each student's portfolio. On the contrary to the previous modules it doesn't use external libraries, only native Java and Android components such as fragments.

The integration of these modules gives us Glassist's first prototype.

5. CONCLUSION

Although technology can have a great impact in education, sometimes, this purpose is not achieved because there is no efficient integration of new tools into the educational system. About the use of Google Glass, it is important to note that its introduction can be scary for many teachers since they may not be comfortable in a classroom with students wearing glasses that will tell and show them anything they want to know. It can also be startling for school managers since this piece of technology allows to live broadcasting anything that is going on in a school building. Finally, everything will be open to the public and there must be a change in the educational process. Hence, there is a need to think about teaching in a learner-centered way. We believe our application, the Glassist, may benefit education in a variety of ways; some of them are described as follows.

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