Partnership for International Research and Education
A Global Living Laboratory for Cyberinfrastructure Application Enablement

# Augmented Reality Technologies and Applications with focus on Using Mobile Devices

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## I. Research Overview and Outcome

**Problem Statement:**
Augmented reality research explores the application of computer-generated imagery in live-video streams as a way to expend the real-world. In this project, we first surveyed the existing technologies and applications and investigated new applications based on iPhone and iPad devices.

**Motivation and Impact:**
Augmented Reality (AR) is still in infancy stage. Current applications include advertising, where AR is used to promote new product via interactive, Web-based applications, industrial applications, military and emergency services, architecture, sightseeing, collaboration, gaming, and entertainment and education. Advanced research in AR includes use of head-mounted displays and virtual retinal displays for visualization purposes, and construction of controlled environments containing any number of sensors and actuators. MIT Media Lab project "Sixth Sense" is the best example of AR research. We believe that new mobile devices, such as iPhone, Android-based devices, and in the near future i-Pad were not yet well used in AR. Our motivation is to explore using these devices in various AR applications.

**Future of Augmented Reality Applications:**
We see social acceptance issues, privacy concerns, and ethical concern arising with the future of augmented reality applications in the industry.
Social acceptance mostly arise from mobile devices with the need for the devices to be subtle, discrete and unobtrusive as well as fashionably acceptable, but also with systems that will require retraining of the personnel and staff in order to be utilized. This might be the case with some medical applications where the health system might decide against the use of augmented reality if the retraining appears to be too costly. A system for easy integration of such AR systems will have to be developed to avoid such issues.
Privacy concerns arise not only with medical applications, but also with technologies that have the ability to detect and recognize people. A solution we have come up with for applications similar to MIT's WUW technology recognizable feature would be to create a social network within the users of this technology for them to decide whether or not they want to be recognized or what information about them they allow to be displayed. Non users of this technology should not be recognized by the system unless they allow it by joining the social network.
When it comes to ethical concerns, the apprehension mostly comes from the fact that people tend to get carried away by technologies with things they see in Hollywood movies. We do not know where to put down limits for the use of technology and keep researching as we see the potential grow. However, with augmented reality, it will be very important for the developers to remember that AR aims at simplifying the user's life by enhancing, *augmenting* the user's senses, not interfering with them or replacing them.

**iPhone Project in Augmented Reality:**
After conducting research on iPhone's current AR application, it was found that many of the most useful iPhone's applications for the user are GPS-like applications that are used to guide and provide information to the user about where the user might find the closest interest points (such as LeBarGuide). We believe that incorporating a "tag" application to such already existing application would present a great success among the customers. The "tag" application would enable the user to tag any place or spot of interest by writing a note about it. The tags could carry any sort of information and could be private or shared with all other users of this application by possibly expanding this application, in a next step, into a social network where the user can have friends and comment about public tags can be made, etc.
We believe a cultural application would also present a great success. Some of the most useful use of AR for cultural applications is done through museum guidance as it is intuitive, natural and efficient of communication. Therefore, we propose an AR mobile phone system for providing information to the user about artifacts in a museum which is not limited to one museum. For object detection, the user will take a picture of the artifact s/he wishes to learn more information about and the system will identify the object by comparing it through a database that we may have to create. Once the object is identified, the application will display multimedia information, such as text, audio, video, and/or pictures about the work for the user.
Augmented reality could also be used on iPhone as a sensory substitution device. For instance, augmented reality could augment some people's view in an unconventional manner for AR not by imposing virtual tags in the real environment, but by the use of audio tags. The application that could be developed for this use could be an application to help blind or poorly sighted people know whether cars in the street are in movement or at a stop. The problem arises from the fact that, unlike in Florida and most of the US where street signs informing pedestrians to cross the road also emits audio cues in addition to visual cues, street signs in most of Europe only make use of visual cues which are impossible to interpret for someone that cannot see them. Moreover, blind people normally had to refer to their hearing sense to determine whether cars were in movement; however, with the increasing advances, cars are becoming quieter and it is now a difficult task.

**Examples of Current and Future Augmented Reality Applications:**


## II. International Experience

Italy is well known all other the world for its delicious food, and its amazing ancient monuments that tell stories of a country over thousands of years old. As such, Italy is also known for its Roman Mythology and ancient stories.
In Italy, and I believe Europe in general, research seems to be done in the same way as in the US for the most part. However, the topics for research sometimes emerge from issues or subjects that are relevant to the Italian culture. For instance, one of the ideas for an iPhone application I came up with arose from the fact that in Italy, street signs for crossing the road are not as well adapted for impaired people as in the US.
The PIRE experience has led me to change my major for my Master from Mechanical Engineering in which I received my bachelor degree to Computer Engineering, and thus broaden my educational background.

### Food

**Pizza**

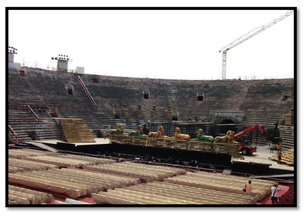

**Pasta**


**Gelato**

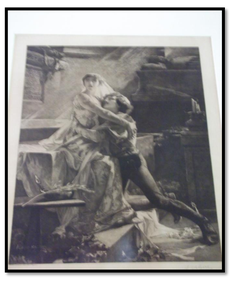

### Monuments, Ancient Stories and Mythology







### International Collaborators



## III. Acknowledgement

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