

# Enactment of AR Based Mobile App in our University

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**Abstract:** Recently, because of the rapid development of mobile devices, augmented reality has extended from personal computers to mobile devices. They are getting popular as a platform for Augmented Reality (AR) application. The highly interactive nature of augmented reality with its user has given rise to various augmented reality applications for mobile devices, ranging from mere interaction to marketing, gaming, navigation, and so on. Mobile AR is mainly available whenever people require an informational support for a focused task.

The combination of mobile applications and collaborative Augmented Reality into a single system makes the power of computer enhanced interaction and communication in the real world accessible anytime and everywhere.

The objectives of the proposed work include the development of augmented reality based mobile application which gives students the information about schedule of the study hall. Markers for particular study halls are prepared and placed at the doors and when the mobile camera is placed at the marker, it shows the schedule on daily and weekly basis. We implemented this in our university in 3 study halls; in a block which gives information about particular block like the name of the block and name of department. We also implemented in professor's cabin which gives information about professor and his/her time of availability in the cabin. Paper starts with the basic concepts of augmented reality, brief introduction of markers, process of application development, and explanation about system design explaining the components and structure of system, working of the system, then the drawbacks and limitations, and finally discusses the results.

**Keywords:** Augmented Reality, Virtual Reality, Scientific Visualization, Application Development, Windows Phone App Development.

## 1. INTRODUCTION

Augmented reality is the technology that enhances the real world with virtual (computer-generated) objects that appear to co-exist in the same space as the real world.

The roots of Augmented Reality dates back to 1962 while AR based application development for mobile devices started around 10 years back.

The first application of the augmented reality is in the field of the army in the helmet of the pilot, he can see several pieces of

information, overlaid on the current view. Then, some medical applications appeared, helping doctors to understand some phenomena, or helping with high risk surgery operations.

Augmented Reality has entered into its mobile era through the emergence and advances of geo-tagging. AR can redefine the way of those geo-tags as information can be displayed into users' real-world view more cognition-effectively [1]. With the emergence of advanced and affordable head-mounted display such as Google Glass, AR can be made more accessible and effective to the general public.

## 2. GENERAL CONCEPTS

### A. What is Augmented Reality?

Augmented Reality (AR) is the augmentation or superimposing of elements by computer generated sensory such as video, GPS data or graphics over the real world environment. It can be understand more precisely by a concept called mediated reality in which artificial information can be add or subtract or manipulate or overlaid on the real world.

With the help of advanced AR technology, information about the real world becomes interactive and manipulable to/by the user.

Augmented Reality in Mobile applications lets user interact in real time by overlaying digital information onto the real world. Mobile Augmented Reality application projects explores utilizing camera equipped mobile devices as platforms for sensor-based, video see-through mobile augmented reality. The project also investigates new and exciting applications enabled by this technology, and UI solutions and paradigms motivated by the restrictions of the mobile devices.[2]

### B. How Augmented Reality works?

Video games have been entertaining us for nearly 30 years, ever since Pong was introduced to arcades in the early 1970s. Computer graphics have become much more sophisticated since then, and game graphics are pushing the barriers of photorealism. Now, researchers and engineers are pulling graphics out of your television screen or computer

display and integrating them into real-world environments. This new technology, called augmented reality, [3][4] blurs the line between what's real and what's computer-generated by enhancing what we see, hear, feel and smell.

On the spectrum between virtual reality, which creates immersive, computer-generated environments, and the real world, augmented reality is closer to the real world. Augmented reality adds graphics, sounds, haptic feedback and smell to the natural world as it exists. Both video games and cell phones are driving the development of augmented reality. Everyone from tourists, to soldiers, to someone looking for the closest subway stop can now benefit from the ability to place computer-generated graphics in their field of vision.

Augmented reality is basically of two types: Marker based and Marker less.

#### **Marker Based AR:**

Markers in Augmented reality are nothing but images that can be identified by camera to know where to place the virtual object or image. Most markers are black and white though the color can be varied as long as it is properly identified by the camera. Similarly markers can be of different shapes.

Camera is used to identify the markers and after doing so, the digit asset is placed on the screen where marker is located.

Though markers can be of different shapes, it is recommended to keep them simpler for error prevention. Simplest markers are black and white images with 2D barcode. When marker is recognized, image unwrapping is necessary.[9]

Basic marker detection process consist of following steps:

#### **1. Image acquisition**

- a) acquisition of an intensity image.

#### **2. Preprocessing**

- a) low level image processing
- b) undistortion
- c) line detection/line fitting
- d) detection of the corners of the marker.

#### **3. Detection of potential markers and discard of obvious non-markers**

- a) fast rejection of obvious non-markers
- b) fast acceptance test for potential markers.

#### **4. Identification and decoding of markers**

- a) template matching (template markers)

- b) decoding (data markers).

#### **5. Calculation of the marker pose**

- a) estimation of marker pose
- b) iterative pose calculation for accurate pose.

#### **Marker less**

In marker less augmented reality the image is gathered using internet or by the help of mobile GPS and information is displayed on the screen. No marker is required in this hence it is more user interactive.

In our work, we used marker based augmented reality.

#### **C. Handheld Augmented Reality**

Handheld Augmented reality is the interaction between users and real world through overlaid augmented information onto the real environment in handheld devices such as mobile phones, tablets.

- Augmented reality is categorised into 3 display technologies in which Handheld display technology has better advantage over other. The reason is:
- Handheld technology is extremely portable and widespread.
- Handheld technology adequate processing power and local network makes it a suboptimal platform for rich and unambiguous Augmented Reality applications.
- As the touch screen input mechanism is familiar, Users finds it effortless and socially acceptable.
- Handheld technology can be used in both indoor as well as outdoor environment.

Handheld Augmented reality is an exciting perception for AR gaming, Navigation, learning in handheld devices. It uses the computational/graphical power, compass, tilt, GPS, integrated camera and such of Handheld Devices.

#### **3. RELATED WORKS**

Many scientist like Tobias Domhan[10] has worked on marker based augmented reality application on android platform.

There are many mobile AR applications for iphone like : **Cyclopedia**: adds Wikipedia information to your reality. When you move your iPhone around, the app will automatically dig up information and display it on your screen.

**Star Chart**: Just point your iPhone to the sky and this app will tell you what you are looking at.

**4. SYSTEM DESIGN**

Our application is for window mobile phones implemented through SLARToolkit.

**About SLARToolkit**

SLARToolkit is the Windows Phone and Silverlight library to make real time AR apps. It employs simple squared markers to make AR apps. The markers are pattern images with .pat extension. SLARToolkit is a free OpenSource library based on ARToolkit[5] and NyARToolkit[7].

**Setting up the environment**

SLARToolkit for Windows Phone is supported on WindowsPhone 8. We set up the environment by installing the Windows Phone 8 SDK [8]. Our project is inspired from the sample provided by the official developers [6] but we have created our own marker. SLARToolkit is an Open source project, the source code and binaries for which can be downloaded from CodePlex <http://slartoolkit.codeplex.com>.

We created a Windows Phone project and add references to these libraries in our project

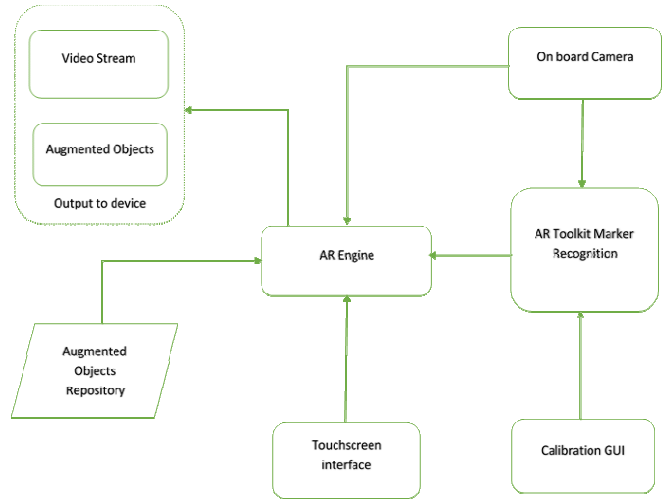
- SLARToolkitWinPhone.dll
- Matrix3DExWinPhone.dll

**Markers of 80x80 are used.**

Application coding is done in C# on .NET framework using Visual Studio. When application finds a marker it is processed and finds the marker and its image or text in the database. Application recognizes the marker and superimposes the image which is synchronized with that particular marker. Two radio buttons are provided to switch between image and text superimposing.

**Working**

Whenever marker is placed at the camera it finds the related image or text in database and superimposes it on the screen. We have implemented this in our university in study halls, entrance of block, and at professors cabin. Markers are placed at the doors of study hall. Whenever camera is placed at the marker it recognizes the marker of that hall and superimposes the schedule of that study hall. Daily and weekly schedule are provided which can be switched using the radio buttons provided on the screen. We have implemented it in 3 study halls. Then one marker is placed at the entrance of the block. When camera is placed at the marker, it recognizes it in the same way and superimposes information about the block, name of the block, departments in the block. Then we have placed marker in professors cabin, which superimposes the information about the professor, courses he/she teaches and the timings when professor is available in the cabin.



**Fig. 1: Flowchart**

**5. RESULTS AND DISCUSSION**

The application detects the marker when placed in front of mobile camera. Marker is detected every time the camera is placed at it and then the image related to that marker is superimposed on the display screen above the marker.



**Fig. 2: Marker on Study Hall door**



**Fig. 3: Capturing marker through app's camera**

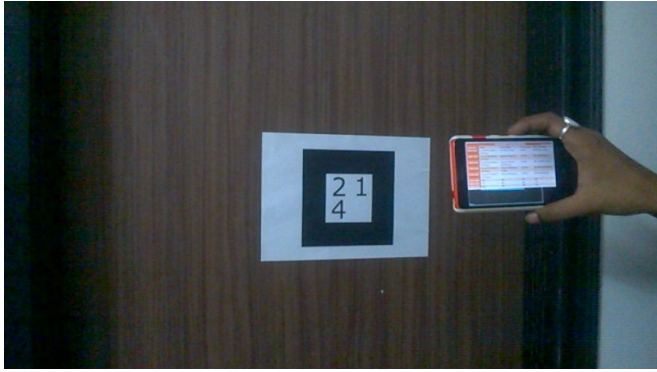


Fig. 4: App displaying time table of that class

## 6. FUTURE ASPECTS & LIMITATIONS

At present, augmented reality is just in its initial phase. And its future scope in mobile application is never-ending. Detailed studies suggest that it's the beginning of an era where information is just at your mobile glance. Our application can be implemented in many other areas like getting the information about the products in the marker. Also it can be used in place of QR code scanner replacing the whole system with just a simple application. Though, much information cannot be shown at a time because it is a phone application. The main limitation to be considered is its toolkit. There is only one main AR toolkit and all others are merely its derivatives which are not satisfactory when it comes to perfection. The application often get confused with multiple markers. Further work on its toolkit and marker detection is a vast open area of research.

## 7. CONCLUSION

Augmented reality can ease everyday life in scenarios one cannot even think. Simple application like ours is a live example of this. Application is well working showing good

response to the markers. The applications detects the marker and schedule of study hall is shown when on the display screen. We will try to improve its scope and implementation, increasing its database limit by storing its database on cloud and will find a new way so that the chances of error are mitigated.

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