

Interactive Faculty Display: Giving AR Experience

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Abstract- Augmented Reality is the fusion of Real and Virtual Worlds enhancing the physical information by exact super-imposition of Computer generated content on it. This paper presents our AR application developed with AURASMAAR software. We briefly describe the project named as Faculty Display as an aid to students or visitors or other college faculty to know about / track the faculty of the college. Augmented reality techniques have been of great use in education [1], engineering [2] and entertainment [3]. We have designed it for our college, but the same can be designed in another way to be used in other educational institutes, schools, government offices, or any of the private offices.

Keywords- Marker-based Augmented Reality, Aurasma, Image Acquisition, Interaction Techniques, Layar, ARToolkit.

1. Introduction

AR is the superimposing of digital information on the top of physical world. Aurasma is a free mobile application that enhances users experience by revealing the digital content from the world around using any hand-held device [4].

Out of our experience we noted that there is always difficulty for a new comer in locating any teacher in a college/ institute if he/she just know him /her by face or knows their name. In the college itself sometimes the students are unable to track in which department the teacher is. Not only in colleges we encounter such problem, also this problem is in all the big institutes or government offices. In government offices too we see that knowing the person by face we are unable to find him/her easily. How do we explain someone whom we need to meet if we don't know his complete information?

Considering the problem in our institute we thought about an idea of developing a faculty display at the entry of each department on which the teachers pictures would be placed. The student/new comer can just scan the picture of the teacher he/she wants to know about or meet with the Aurasma app in his phone. Now the question is what would happen next?

Scanning the image with Aurasma, the picture would just appear as it comes to life. The teacher would give his/her introduction. Also there would be some options given so as the person can interact with

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the virtual information as displayed. The options are:

- i. Viewing the time table of the teacher
 - o We propose an application of AR Faculty display with following objectives
 - 1) Locating any teacher in a college/ institute by just knowing him /her by face
 - 2) Creating awareness about the Augmented Reality concept in the college students
 - 3) Students would try to explore many other softwares for doing such work themselves.
 - 4) If used in other government offices or institutes it may bring awareness among the people about Augmented Reality concept.

The usual way is that we start asking some or the other person in the college about the faculty we want to meet. So sometimes it becomes a little tiring. As the concept of Augmented Reality is advancing day to day, we thought about using the concept in our college too.

2. Artoolkit , Metaio Creator and Layar

There are various softwares for developing AR applications. We worked with some: ARToolkit, Metaio Creator and Laya. The reason we chose to make our faculty display using Aurasma as discussed below:

A. Working with ARToolkit®: Markers play an important role in marker-based AR applications. It used 2D black and white symbols similar to QR or Bar codes as markers.

B. Working with Metaio Creator® : Although it accepted images as markers but it has limited functionality as of coding is required to change the in-built functionality of a particular function.

C. Working with Laya®: Although Laya could take up other images as markers and also works quite similarly to Aurasma Studio. But the difference is that Laya application phone cannot be used to create AR application - it is just for scanning purpose, whereas using Aurasma we can make a small application on phone itself[5].

3. System Setup

In this setup, we are using a hand-held device like a tablet that may be phone or a tablet acting as user

interface AR device. We got the pictures of faculty members clicked that would act as markers for our Faculty Display Aurasma.

Markers play a very important role in Marker based Augmented Reality. Usually Markers are black and white patterns but we required to use teacher's picture as a marker. So we used Aurasma Software that has a marker system that uses natural (colour) images as markers. Image markers are typically recognized using template or feature matching. The application detects natural features and calculates the relative pose of the camera by matching features to the actual reference image. Natural images are in a way "imperceptible", as they can be built in the environment in such a way that they are part of the environment and do not divert user's eye.[6]

Block Diagram of AURASMA FACULTY DISPLAY: In this setup, there is a handheld device like a tablet that would act as user interface AR device. The handheld device has a camera that would capture teacher's picture. The acquisition module captures the image from the device camera. The tracking module calculates the correct location and orientation for virtual overlay. The rendering module combines the actual image and the digital components using the calculated pose and then renders the augmented image on the display [7].

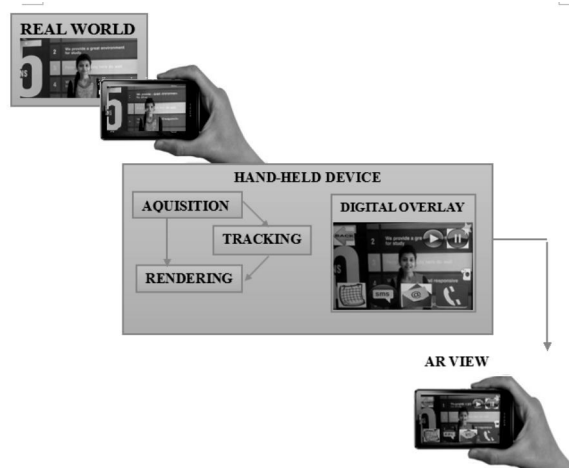


Figure.1 Block Diagram

A. IMAGE ACQUISITION: Image acquisition is the first step for creating AR experience. In Aurasma, Trigger image is the real world image or object that is recognized and acquired by Aurasma to activate digital overlay. Using a good trigger image is the most important step in creating a perfect Aurasma experience. Your overlay might be very good and

informative but without a good trigger the performance of Aura would not be effective. There are some specifications of the trigger images as follows:

It must be a jpeg or png image.

It must not be more than 500,000 pixels when uploaded to the Studio

Aurasma does not take those images that don't follow these specifications.

We also had many problems taking the trigger images. Although we knew the specifications still our trigger image was not accepted by the Studio several times. Every time the message would be displayed "Your image is too sparse" and sometimes the accepted aura when scanned performed poorly and did not track image well. We tried each and every possible image that we could take but Studio would not accept.

So while uploading a trigger image we have to keep in mind the following qualities that a trigger image must have (figure 2):

Tonal variation and contrast.

Unique shapes: Unique images are must or else the wrong overlay may be displayed of the other matching image.

Non-repetitive patterns: The reason is that if there are repetitive images, Aurasma will not always know which part of an image it is looking at. When that happens it will not always know where to place the related Overlay in relation to that image. This will result in slow loading times and a very jittery overlay experience.



Figure.2 can be used as trigger image

Images that must not be used (figure 3):

- Sparse images
- Dark with no tonal variation
- Repetitive pattern/text

Blur/gradients [8]

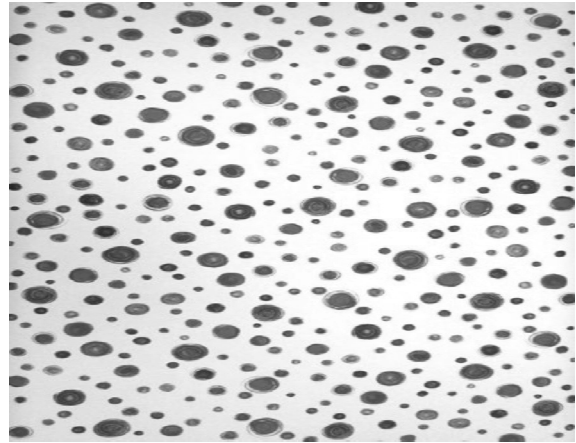


Figure.3 Cannot be used as trigger image

Also we found some other points to keep in mind:

- i. Test the Trigger Image to make sure it works well. It can be tested using phone application of Aurasma that has a check bar which when turns green means the image will be accepted.
- ii. Consider the error messages that appear in the Aurasma Studio seriously. If it says your image is too large or too sparse, then make changes or reconsider your Trigger Image accordingly
- iii. After the Trigger Image has been uploaded, you need to print exactly the same image. If the printed image is modified (e.g. Cropped or stretched) it may not be tracked by Aurasma.

For our project the trigger images were the pictures of the faculty members our each department. Taking the pictures was quite a difficult task. The pictures needed to be taken in a bright background filled with several colours. The problem in developing the app was that Aurasma did not take images with plane background. Also the major problem in it is that it does not work with face detection rather it works with feature detection. Our project was based on face detection of each teacher detecting which the corresponding digital information would be

displayed. But what Aurasma did it tracked the background instead of the teacher's face due to which if we took each of the teacher's pictures in front of same background it displayed the same overlays.

So we found out a solution to it by taking the image of each teacher in with a different background. Now it worked so well.

B. IMAGE TRACKING: After we are done with the trigger image, half of the work is done. The next step is to place an overlay on the trigger image. Tracking is an important step [9]. The objects in the real and virtual worlds must be properly aligned with respect to each other, or the illusion that the two worlds coexist will be compromised [10]. In Aurasma, an overlay is the digital information/content that we place over the image so as to give user an experience of Augmented Reality. It can be images, videos, 3D scenes or models. Single /Multiple overlays can be placed on an image. Uploading an overlay is a just a simple step of browsing it from your system. Formats include: MP4, FLV, PNG, JPEG and .TAR (3D).

In our project we needed to give a real experience to students of interacting with teacher. So we took the video of the teacher in the same pose and background as we took the trigger image and overlaid the same over each of the trigger image so that when a picture is scanned Aurasma just gives an experience such that the person sees the picture image coming into life and speaking to them.

You can opt an another simple way of taking the snapshot from the video and using it as trigger image ,but only after testing it as discussed above .

Some specifications for overlays are as discussed:

A. Image overlay specifications:

Table 1 Image Overlay Specifications

	JPEG	PNG
Dimensions	512x512 pixels minimum. 500,000 pixels maximum.	512x512 pixels minimum. 500,000 pixels maximum.
Size	Upto 100 mb	Upto 100 mb

B. Video overlay specifications:

Table 2. Video Overlay Specifications

	MP4(h.264 formatting)	FLV
Dimensions	512x512 pixels minimum. Remember to maintain the aspect ratio you require, making sure that the smallest dimension is no less than 512 pixels.	512x512 pixels minimum. Remember to maintain the aspect ratio you require, making sure that the smallest dimension is no less than 512 pixels.
Size	Upto 100 mb	Upto 100 mb
Length	3 minutes or less	30 seconds or less

C. Image Rendering: After the image is acquired and tracked, the rendered image is displayed to the user giving him/her AR experience. In our application the picture of the faculty with all the overlays (buttons, videos) will be displayed to the user for interacting. Rendering refers to the process of generating an image from a 2D or 3D using computer programs.

D. Interacting With The Digital Information: AR technology creates opportunities for exploring new ways to interact between the physical and virtual world[10]. There are several interaction methods that can be used to provide a better user experience, including tangible user interaction [11], multimodal input and mobile interaction[12]. Tangible technique helps user to manipulate digital information with physical objects. Adding speech and gesture to the same we jump to multimodal technique making interaction better [13]. In the same way if we use tangible technique in mobile interfaces they are easier to carry and work with. Aurasma uses both Tangible and Mobile/Hand-held interaction techniques. In Aurasma, an AURA is the unique augmented reality experience that occurs when a real world trigger launches digital overlay(s). Creating an aura is an another major task that depends on what is the working of our project. After adding your Overlay to your Trigger Image, select any Actions or commands that would help user to interact with the application. Actions can be added on events such as on single tap, on double tap etc. as we require. They can be:

- i. Start an overlay
- ii. Stop an overlay
- iii. Pause an overlay
- iv. Make overlay full screen etc.
- v. Load a URL: which allows you to add commands eg., for making a phone call, sending a text message etc.

In our project we created a highly interactive Aura using multiple sequenced overlays differentiating the project from a virtual reality project. As discussed in the introduction, the user can interact with the overlays. The interaction technique includes single tapping or double tapping on the hand-held device. The options displayed for interaction are:

1. Viewing the time table: Clicking on this option, the user can see the teacher's time table. Also we have linked the time table with the teacher's database as in college so that even if the time table changes we don't have to again upload the new time table it would be changed along the database itself. Aurasma software does not provide us with the option of linking our app with the database but we found a way out for the same. We created a separate web page to place the time tables of each of the faculty of the college in the form of pdf. Aurasma gave us the option of giving a link address so we created a link address of each of the faculty making it possible to connect the time table of each faculty to the application dynamically.
2. Sending him/her an email: Instead of asking for an email-id from the teacher and then opening mail account and composing an email to him/her, with just one click on this option the user can send an email to the teacher.
3. Sending a text message: Same as sending an email, text messages can also be send to the teacher.
4. Making a phone call: Making a call is made easy by the application. Instead of asking the contact numbers of the teachers from here and there just clicking on the option can make a call to the teacher.
- E. Creating A Channel: Channels are alike folders containing collections of Auras. We need to give our Channel a relevant name, description and image. You can set up Universal Aura so as other people are able to

search for your content inside the Aurasma app then you need to set your Channel to 'Public'.

Our project is to be used by each and every person of /outside the institute so we made it as public Aura.

4. Conclusion And Future Scope

Although the proposed system is helpful for the institutes, several suggestions for future work are based on experimental results and user responses.

The application can surely be enhanced and used in a better way in future by adding various other functions such as face recognition instead of feature detection. Secondly, using GPS facility to track the teacher's current location when his/her picture is scanned. Also it can be modified and used in various others places as discussed in the introduction like government offices or other big institutes. Our primary direction of future work would be making some improvements in the application as per user's experiences and technology advancements.

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