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A SURVEY OF MOBILE APPLICATION USING AUGMENTED REALITY

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Abstract:
As computers increase in power and decrease in size being more compact, new mobile phones are rapidly becoming feasible, providing people access to resources always and everywhere. This new flexibility makes possible new kind of mobile applications that breaks the barrier of the person's surrounding context. Augmented Reality with mobile applications promotes the integration of sensory input such as sound, video, graphics or GPS data and the real world physical elements through mobile phones. This paper focuses about use of augmented reality in mobile applications, various tools used, its advantage and disadvantages.

I. INTRODUCTION

Augmented reality (AR) combines and integrates real world entities and digitally augmented data. At present, AR research uses live images, which the system processes digitally to add computer-generated graphics. In other words, the system augments the image with digital data. Encyclopaedia Britannica states the following definition for AR: "Augmented reality is a process of combining or 'augmenting' video or photographic displays by overlaying the images with useful computer-generated digital data." [6]. Thus Augmented Reality (AR) integrates the digital information with live video or the user's physical environment in real time. AR takes an existing picture and fusions new and interesting information into it virtually. It works on computer vision-based recognition algorithms to augment sound, video, graphics and other sensor based inputs on real world objects using the camera of our device. Thus it provides a path to render real world information and present it in a visually interactive way so that virtual elements become part of the real world.

Fig. 1: Augmented Reality in the field of education and learning

Augmented reality is related to the concept of virtual reality (VR). Virtual Reality attempts to create an artificial world in which a person can experience and explore interactively through his or her sense of vision, but also via audio, tactile, and other forms of feedback [2]. Augmented Reality also brings an interactive experience, but aims to supplement the real world, rather than creating an entirely artificial environment [2]. This concept can be applied in diverse areas such as education, advertising, and games, bringing the concept more and more to people's life and to mobile technologies that they use at a daily basis [1].

Augmented Reality vs. Virtual Reality:

Virtual Reality	Augmented Reality
It is an artificial, computer-generated simulation or recreation of a real life environment or situation.	It is a technology that maximises experiences by including the components especially virtual such as digital images, graphics, or sensations as a new layer of interaction with the real world.
Virtual reality offers a digital recreation of a real life setting	Augmented reality delivers virtual elements as an overlay to the real world.
It makes the user feel like they are experiencing the reality by the stimulation of their vision and hearing.	AR is expanded into apps and used on mobile devices to blends digital components into the real world .
VR is typically achieved by wearing a headset like Facebook's Oculus equipped with the technology	AR is achieved by using hand-held devices like smart phones, tablets etc.

Fig 2: Example for Virtual Reality

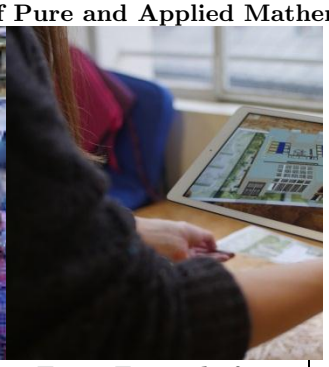

Fig 3: Example for Augmented Reality

Recently, mobile devices have become an ideal platform for Augmented Reality (AR) [4].
The aim of this survey is to enable the beginners understand and gain exposure about developing mobile applications using AR.

II. AUGMENTED REALITY WITH MOBILE APPLICATIONS

Augmented Reality (AR) is about overlaying pieces of a virtual world over the real world (in contrast to Virtual Reality (VR) that is about replacing the real world with a virtual one). On mobile devices, AR means enhancing what you can see through the device's camera with multimedia content for example we can point our mobile phone camera at a movie poster and watch its trailer, or we can point it at a star in the sky and learn its name.

To implement this concept, mobile AR is enabled by mobile media devices combining camera, screen, GPS location, accelerometer and compass, image recognition capability and internet access which become mediums of interaction between user and system [5]. By using Mobile AR, people not only can interact with it to display the related information to pose and resolve uncertainty but also can collaborate with other people. This then makes the world becomes user interface (UI) [4].

Applications generally use one of two approaches: **marker-based** and **location-based**.

Fig. 4: Example for mobile with AR – Marker-based

Markers work by having software recognise a part

when a camera points at it, and overlaying a digital image at that point on the screen. If the image is three-dimensional or animated, the effect is of a digital experience unfolding on the surface upon which the pattern is printed.

Fig. 5: Example for mobile with AR – Location-based

Location-based applications use the ability of a particular device to record its position in the world and then offer data that's relevant to that location: finding your way around a city, remembering where you parked the car, naming the mountains around you or the stars in the sky.

MARKER-BASED Vs MARKER-LESS AUGUMENTED REALITY:

In a marker-based AR application the images are provided beforehand. In this kind of application we know exactly what the application should recognize while acquiring camera data. Nowadays, most of the applications dealing with image recognition are marker-based because it is simpler to detect things that are hard-coded in our application.

A marker-less AR application recognizes images that were not provided to the application beforehand. This scenario is much more difficult to implement because the recognition algorithm running in your AR application should identify patterns, colors or some other "features" that may exist in camera frames. For example[11] if you algorithm is able to identify dogs, it means that the AR application will be able to trigger AR actions whenever a dog is detected, without providing images with all the dogs in the world (training a database for example) when developing the application.

III. REQUIRMENTS & TOOLS USED FOR DEVLEOPING MOBILE APPS USING AR

HARDWARE COMPONENTS REQUIRED:

Hollerer described important components required for creating and supporting mobile AR applications which is given below [2]:

1. Computational platform that can generate and

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the physical environment, process the tracker information, and control the AR display(s).
2. *Displays* to present the virtual material in the context of the physical world. In the case of augmenting the visual sense, these can be head-worn displays, mobile hand-held displays, or displays integrated into the physical world.
3. Registration must also be addressed: aligning the virtual elements with the physical objects they annotate.
4. Wearable input and interaction technologies enable a mobile person to work with the augmented world (e.g., to make selections or access and visualize databases containing relevant material) and to further augment the world around them. They also make it possible for an individual to communicate and collaborate with other MARS users.
5. Wireless networking is needed to communicate with other people and computers while on the run. For example, this would make it possible to report train or bus delays and traffic conditions to the busy commuter.
6. Data storage and access technology. If a MARS is to provide information about a roaming individual's current environment, it needs to get the data about that environment from somewhere. Data repositories must provide information suited for the roaming individual's current context.

FACTORS TO BE CONSIDERED:

1. Identify the use case for the augmented reality.
2. Select SDK that best suits the requirements.
3. Create the target objects
4. Create 2D / 3D virtual content objects for the augmented content.

Augmented Reality Tools for developing apps for smart phones:

Numerous AR tools exist at the moment and that can be used to develop apps for smart-phones, tablets or even smart-glasses. The following table contains information about some of the tools: [7]

Product	Company	License	Supported Platforms
ARPA SDKs	Arpa Solutions	Commercial*	Android, iOS (ARPA SDKs), Google Glass (ARPA GLASS SDK), Android, iOS, Windows PC (ARPA Unity Plugin)
ARLab SDKs	ARLab	Commercial	Android, iOS
DroidAR	–	Free and Commercial	Android
Metaio SDK	Metaio	Free and Commercial	Android, iOS, Windows PC, Google Glass, Epson Moverio BT-200, Vuzix M-100, Unity
Vuforia SDK	Qualcomm	Free and Commercial	Android, iOS, Unity
Wikitude SDK	Wikitude GmbH	Commercial*	Android, iOS, Google Glass, Epson Moverio, Vuzix M-100, Optinvent ORA1, PhoneGap, Titanium, Xamarin

V. APPLICATIONS

Education: AR applications can become the backbone of the education industry. Apps are being developed which embed text, images, and videos, as well as real–world curriculums.

Fig 6: Students can use Mobile AR app to visualize the reality of the images they study.

- *Advertising and Marketing:* Printing and advertising industries are developing apps to display digital content on top of real world magazines.

Fig 7: Industries can use Mobile AR applications to improve their business

- *Tourism:* With help of AR, travellers can access real-time information of historical places just by pointing their camera to subjects.
- *Language Interpretation:* AR is helpful in development of translation apps that can interpret text in other languages for you.
- Location based AR apps are major forms of AR apps. Users can access information about nearest places relative to current location. They can get information about places and choose based on user reviews.
- *Gaming:* With the help of Unity 3d Engine, AR is being used to develop real-time 3D Games.

VI. ADVANTAGES AND DISADVANTAGES

Advantages:

1. By using the mobile technology, the AR application can be experienced at the location where we are geographically.
2. Mobile technology using AR is well suited for ubiquitous learning.
3. Mobile-AR technology are low cost as compared to permanent or special-purpose AR technology.
4. Many people can own their own necessary hardware to experience mobile AR technology as current smartphones contain necessary hardware components to implement mobile-AR applications.

Disadvantages:

1. Because of the resources on most mobile devices are limited, it makes mobile AR applications complex to implement.
2. Limited memory: Amount of content that can be resident on mobile device limits the application usage.

VII. CONCLUSION

With Augmented Reality, visions that were seen as dreams can now becoming a reality. It has opened up the scope for limitless possibilities in games, sports, education, engineering and medicine and more. As smart phones are becoming more and more technology efficient it is becoming easier for developers to create immersive, rich augmented reality experiences through mobile apps.

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