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A Survey of Mobile Augmentation for Mobile Augmented Reality System

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Abstract— In past decades, the hardware and software for mobile devices has been rapidly increase. Mobile devices perform like ubiquitous computing from combining of wireless networking and augmented reality. In this paper, the survey about mobile technologies impact on mobile augmented reality system. Main goal is that to clear about immerging mobile technologies using mobile augmented reality systems. In last, the paper describes looks ahead about future technologies.

Keywords— Mobile Augmented Reality, Mobile Systems, Mobile Computing, Mobile Learning, Wireless Networking.

I. INTRODUCTION

Mobile Augmented Reality System (MARS) is a growing occurrence on various mobile handsets; it shows the progress in mobile computing during recent years and common way of internet access to the whole world. Interactive graphics showing using virtual reality is added to augment the reality with visual fields after adding necessary information. In this paper definition, architecture and layered approach is described. Azuma [1] included description of virtual reality (VR), augmented reality (AR), and Augmented Virtuality (AV) (Figure-1).Mobile phone and embedded camera mainly used for capturing live image, tracking and displaying the image with adding necessary details. It is the combination of camera image, graphics as well as wireless network.

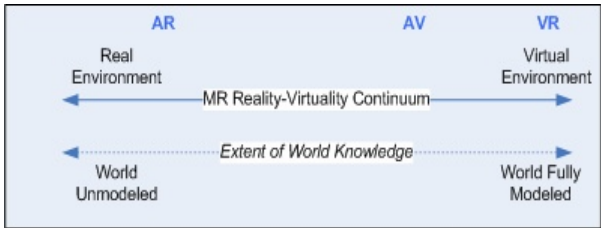

Fig.1 Augmented Reality Virtuality and Virtual Reality

At the past decade time during the 1990s research Wiser [2] gives the idea of "Ubiquitous Computing". In last, the mobile device which is known for simple communication increased their capability to wearable network platform. MARS is junction between AR, ubiquitous computing and wearables.

We define MAR system which is: 1. what your eye can see through camera blends it with digital sources of information about what you are seeing; present both to you in a composite view, 2.Combination of reality and virtuality, 3. Execute in mobile mode real time.4.Object which are real and virtual registers (aligns) each other.

Azuma (1997) defined AR as "Virtual objects real time integrated with real environment "but this definition is not enough. The fundamental components of mobile augmented reality are (1) Hardware computational platform, (2) software, (3) Wireless network, (4) Tracking, (5) Display, (6) Wearable input, (7) User interaction.

II. RELATED WORK

Augmented reality was first represented in 1960, but now we have many technologies that are widely used to represent mobile augmented reality. Smartphone camera with high processing power and interactive graphics present various mobile augmentation reality applications and it provides an inexpensive and versatile platform for MAR application.MAR works on several areas like social networking and location based services.

D. Schmalstieg et al. Describes In the year 1990s the first invention is geo referenced in augmented reality. The touring

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machine used mainly for providing guidance for tourist is the first mobile augmented reality application used worldwide. It shows virtual detail in real university building [Fei-97].The mobile processing power is then rapidly increased as well as computing capability of mobile device made it possible to develop various mobile augmented applications. Nokia's touring machine is the example of this. Wikitude is the first commercial application to show locations tagged augmented reality content in smart phone.

There is continues progress in mobile hardware platform as well as its software platform. In recently four or five years number of handheld mobile augmentation applications like multiuser games. Translation visual tracking, navigation developed and widely spread all over the world. Final application is developed in social media. There are many social applications. The continues development includes sensors, authoring, tracking, displaying, software and hardware architecture to develop user interface and design.

III. ARCHITECTURE

[3] Layered approach architecture of mobile augment reality as shown in figure. As shown in layer 1 data generation capture the scene/object and the position using capturing device, supplementary details also adding by sensor. After that temporary data stored and forward in augmented unit. Data generation layer after mixing virtual and augmented environment sends data to augmentation layer .Finally display environment generated and display it.

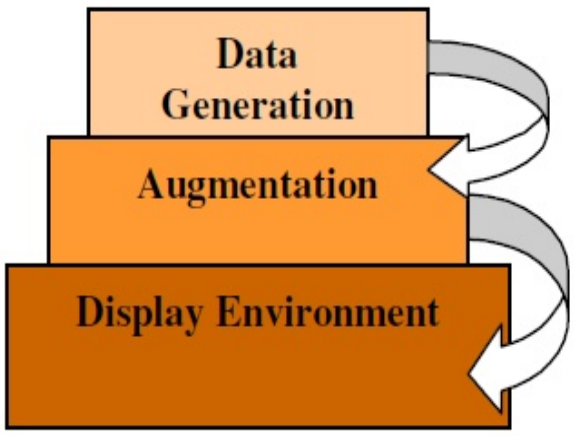

Fig.2 Layered Architecture of MARS

IV. ALGORITHM

1. Select the platform.
2. Data generation using mobile. (capturing image, audio, video through mobile)
3. Augmentation of data.
4. Creating and uploading a file in central medium.
5. Accessing it from different location.
6. Display it.

V. MAR APPLICATION

This section describes application areas in the field where mobile augmentation used. Main area where these applications used are:

- Construction
- Education
- Cultural Heritage
- Gaming
- Character based application
- Navigation
- Tracking and path finding
- Industrial inspection and maintenance
- Archaeology
- Architecture
- Art, Commerce
- Industrial Design
- Medical
- Military
- Office work place

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- Sports and Entertainment
- Task support, Television
- Tourism and sightseeing
- Translation

VI. MAR LIMITATION

There are some limitations and challenges like high cost, accuracy and computational power like following.

- Computing power
- Accuracy
- Size
- Weight
- Battery power
- Sensible equipment easily damaged
- Tracking
- Graphics with real performance
- Media used in network

VII. MAR CURRENT TRENDS AND FUTURE

At present mobile augmentation support learning activities like problem solving, visualization. The future market with estimated size of 400 million downloads in 2014.The Main application used in future will be object recognition. Another one is improvement in display techniques.

A. Tracking Techniques

Mobile Augmented reality requires complete orientation and fixed position to align Virtual details with physical object. Tracking is the fundamental task when we used MAR because changes in viewing situation reflected properly in rendering graphics [4].There are three fundamental techniques describe below. In computer scenario the whole techniques are of two parts: feature based and model based. The first one feature based technique mainly finds the correspondence 2D image and 3D world frame coordinates. The capturing image found pointing 3D coordinates feature into image 2D coordinates and reduce the path between correspondence 2D features. While model based Technique build their models using lines and edges in model

1. Sensor-based Tracking: This technique is based on various sensors like optical, .acoustic, magnetic, mechanical as well as inertial. All have their merits and limitations. For example Magnetic sensors provide high update rate and light but it is easily distorted by nearly metallic substance which is problematic for magnetic field.

2. Vision-Based Tracking Techniques: sensor based tracking systems output is perceived to have error because the system is analogous to open loop. Now this vision based tracking techniques purely based on image processing to count camera pose which is relative to actual objects so closed loop analogous errors correct automatically. Camera pose also puts naturally being their features like points, lines, edges or textures.

3. Hybrid Tracking Techniques. Hybrid Tracking Techniques combines many sensing techniques because other techniques can't provide proper solution. Azuma [1] mentioned that augmented system mainly focus on outdoor tracking through GPS.

B. User Interactions and Interfaces

The main aspect is properly user interaction and interface is developed for Mobile Augmentation Reality that provides directly interaction the end user to virtual content.

1. Tangible MAR.

Mobile Augmented reality joined the real and virtual contents so the real world objects used MAR elements for interface very intuitively to the virtual content. This tangible MAR is very strong because the real objects have their characteristics, affordances and limitations to easily use.(Affordances show how object really used).One challenge for this is how to map the real objects. Tangible MAR interaction shows the combination of real object's input with gesture and voice interaction.

2. Collaborative MAR. This is mainly used for enhancing physical work space and create 3D interface.

3. Hybrid MAR Interface. It combines several different interfaces. So input and output devices automatically change its set to allow new operation.

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C. Display Techniques.

MAR display techniques mainly focus on three preceding way of seeing head mounted, handheld and projection-based.

1) Head Mounted MAR: It permits the user to see the actual scene with virtual supplemented objects by optical or video technologies. In this user see video through graphics with combining real world objects. The benefit of this technique is consistency between real and augmented world via using various image processing techniques like correction of intensity.

2) Projection based MAR displays: It's a good option because it does not require wearing anything and provides intrusiveness. It displays graphical information directly on actual scene.

3) *Handheld MAR Displays:* It is another way of displaying and widely accepted because minimal intrusive, socially acceptance, easily available and highly mobile follows the level-3 heading in the same paragraph. For example, this paragraph begins with a level-3 heading.

VIII. CONCLUSION

We present brief survey of mobile augmentation for mobile augmented reality system. First the basic concepts what the actual mobile augmented reality is discussed. Then architecture shows how data passed between layer and algorithm shows the occurring of augmentation. We also shows the usefulness and criticism. Finally present revolution and future of mobile augmentation discussed.

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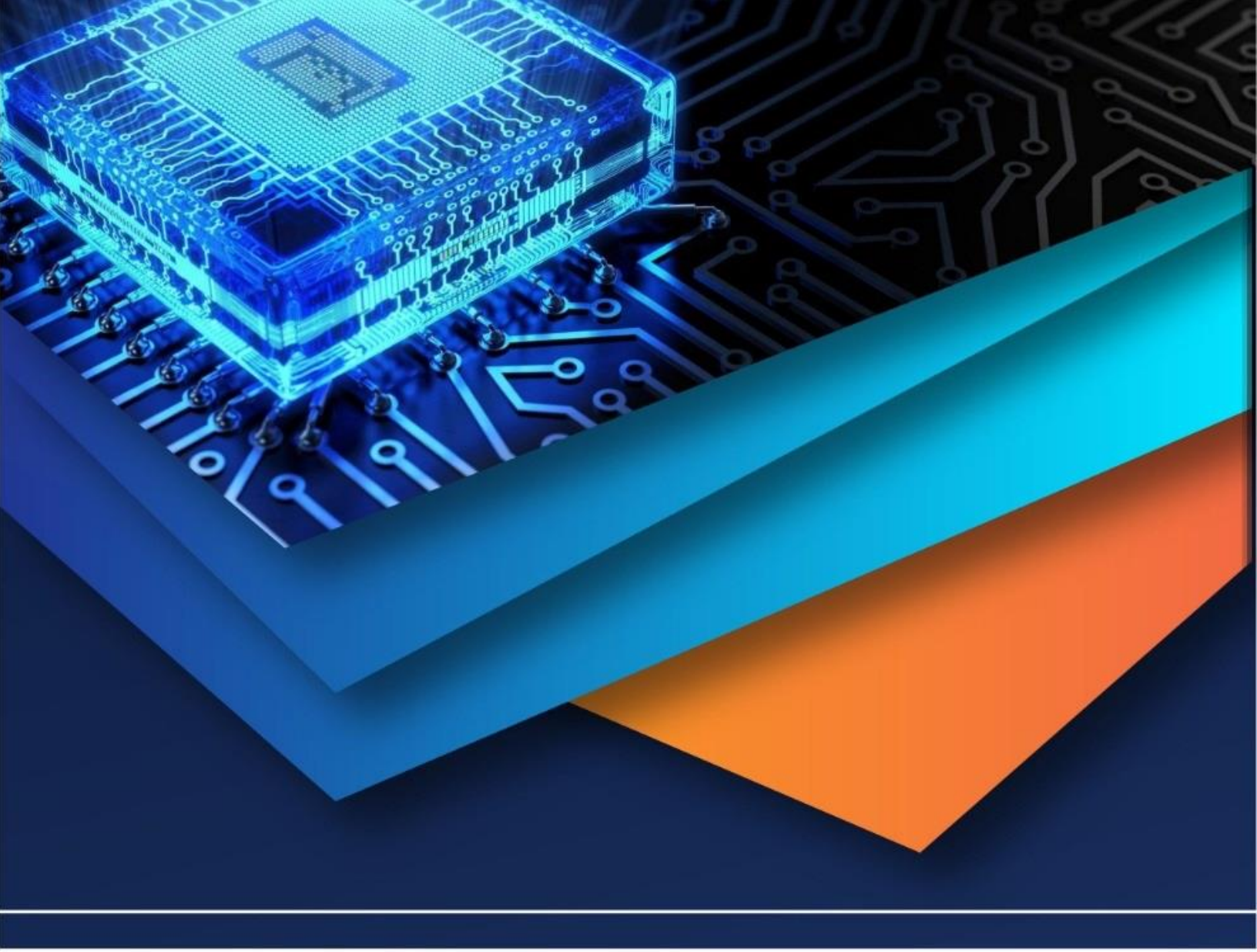

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