Augmented Reality In Reality

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Abstract- *Recent advancement in smartphone technology has fuelled the popularity of Augmented Reality in mobile devices. This paper presents an introduction to mobile Augmented Reality. We focus on the key technology required to develop a mobile Augmented Reality application. Discussing the existing problems and a generic framework required for its development. Finally, we provide an overview of the future scope and applications for Augmented Reality in mobile devices.*

Keywords- Semantics Augmented Reality, Virtual-Real fusion, Two Dimensional Displays, Analysis, of Three Dimensional Displays.

I. INTRODUCTION

Augmented Reality is an enhanced version of reality where live direct or indirect views of physical real-world environments are augmented with superimposed computer-generated images over a user's view of the real world, thus enhancing one's current perception of reality.

AR can be displayed on various devices: screens, glasses, handheld devices, mobile phones, head-mounted displays. It involves technologies like S.L.A.M. (simultaneous localization and mapping), depth tracking (briefly, a sensor data calculating the distance to the objects), and the following components:

A. Cameras and sensors: Collecting data about user's interactions and sending it for processing. Cameras on devices are scanning the surroundings and with this info, a device locates physical objects and generates 3D models. It may be special duty cameras, like in Microsoft HoloLens, or common smartphone cameras to take pictures/videos.

B. Processing: AR devices eventually should act like little computers, something modern smartphones already do. In the same manner, they require a CPU, a GPU, flash memory, RAM, Bluetooth/Wi-Fi, a GPS, etc. to be able to measure speed, angle, direction, orientation in space, and so on.

C. Projection: This refers to a miniature projector on AR headsets, which takes data from sensors and projects digital content (result of processing) onto a surface to view. In fact, the use of projections in AR has not been fully invented yet to use it in commercial products or services.

D. Reflection: Some AR devices have mirrors to assist human eyes to view virtual images. Some have an "array of small curved mirrors" and some have a double-sided mirror to reflect light to a camera and to a user's eye. The goal of such reflection paths is to perform a proper image alignment.

II. LITERATURE SURVEY

A.Augmented reality: Principles and practices.

Proposed that augmented reality (AR) has the potential to become the leading user interface metaphor for situated computing. Augmented reality has the unique quality of providing a direct link between the physical reality and virtual information about that reality.

B.Augmented Reality for Maintenance and Repair (ARMAR)

The goal was to explore and evaluate the feasibility of developing prototype adaptive augmented reality systems that can be used to investigate how real time computer graphics, overlaid on and registered with the actual equipment being maintained, can significantly increase the productivity of maintenance personnel, both during training and in the field.

C.The History of Mobile Augmented Reality.

It summarizes the major milestones in mobile Augmented Reality between 1968 and 2014. Mobile Augmented Reality has largely evolved over the last decade, as well as the interpretation itself of what is Mobile Augmented Reality.

We use an approach based on heavily modified state-of-the-art feature descriptors, namely SIFT and Ferns plus a template-matching based tracker. While SIFT is known to be a strong, but computationally expensive feature descriptor, Ferns classification is fast, but requires large amounts of memory. This renders both original designs unsuitable for mobile phones. We present evaluations on robustness and performance and discuss their appropriateness for Augmented Reality applications.

D.Real-Time Detection and Tracking for Augmented Reality on Mobile Phones.

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E.ORB-SLAM: A Versatile and Accurate Monocular SLAM System.

a feature-based monocular simultaneous localization and mapping (SLAM) system that operates in real time, in small and large indoor and outdoor environments. The system is robust to severe motion clutter, allows wide baseline loop closing and relocalization, and includes full automatic initialization. We present an exhaustive evaluation in 27 sequences from the most popular datasets. ORB-SLAM achieves unprecedented performance with respect to other state-of-the-art monocular SLAM approaches.

III. EXISTING METHODOLOGY

A. Binary Local Features:

Local Binary Pattern (LBP) is a simple yet very efficient texture operator, which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number. Perhaps the most important property of the LBP operator in real-world applications is its robustness to monotonic grey-scale changes caused, for example, by illumination variations. Another important property is its computational simplicity, which makes it possible to analyse images in challenging real-time settings.

B. Object Tracking:

Object tracking is an area within computer vision which has many practical applications such as video surveillance, human-computer interaction, and robot navigation. It is a well-studied problem, and in many cases a complex problem to solve. The problem of object tracking in video can be summarized as the task of finding the position of an object in every frame.

C. Deep Learning for Semantic Understanding

The Alex Net network for image classification, which was published in 2012, has mainly driven deep learning's recent jumpstart in computer vision. Now, deep-learning solutions are beating the competition in most vision problems, such as object detection, semantic segmentation, face recognition, and visual tracking. Although deep-learning solutions still face computational limitations, their rapid advancement is putting them in a good position for future use in in AR.

IV. LIMITATIONS OF EXISTING SYSTEM

For years, breaking the 2D restriction was a key challenge in AR because of limited computing resources. Then, in 1997, George Klein and David Murray developed a SLAM system running in real time on a smartphone. Since then, their Parallel Tracking and Mapping (PTAM) framework has influenced modern SLAM algorithms on smartphones, including the recently popularized ORB-SLAM.11 another line of work toward effective SLAM or 3D reconstruction is via the fusion of multimodal sources, which is common in newly developed AR devices.

V. PROPOSED METHODOLOGY

a) 3D EnvironmentPerception

Automatic 3D perception of the environment around an AR device (such as a smartphone or AR headset) has long been at the heart of AR. Many existing systems still live on 2D planar patterns due to the lack of practical 3D solutions.This issue has been alleviated recently by multisensory fusion or effective algorithms—or a combination of the two. Without a doubt, reliable 3D perception will greatly broaden the territory of AR and elevate relevant user experiences.

b) Semantic Perception

Semantic perception. The fast evolution of Visio based semantic understanding algorithms—such as those for face analysis and scene parsing—has a natural outlet in AR, providing content-aware guidance to augment a live visual stream. An early example can be found in Google's Translate app. Semantic information has not been extensively used in AR mainly due to the lack of practical vision-based semantic inference algorithms. With this situation improving rapidly, it is easy to forecast the popularity of semantic information in future AR products. It is not enough to recognize images and objects though. For a truly immersive AR experience, the technology needs to be able to know the meanings behind objects and surroundings. For instance, an autonomous car uses strategically placed sensors and cameras to collect vast amounts of image data. The same concepts are used to create advanced AR/VR algorithms. For computers, semantic understanding gives those objects their meaning.

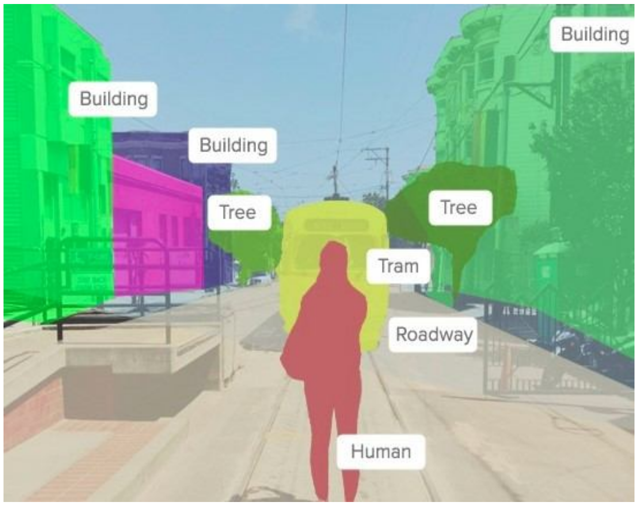

Fig 1: Semantic perception/understanding

c) Virtual-real fusion.

Although numerous AR headsets have surfaced recently, they are still far from offering a perfect user experience. Issues related to the field of view (FOV), comfort level, and cost are expected to be mitigated in the near future. Furthermore, breakthroughs in AR headsets will facilitate AR's role as next generation human-computer interface. In addition, new AR hardware systems, such as projectors and heads-up displays (HUDs), will continue to progress toward consumer markets. On the software side, breakthroughs such as eye-tracking algorithms could further refine rendering systems.

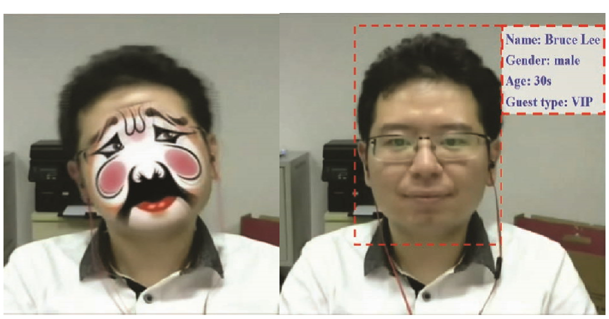

Fig 2: Examples of (a) strong virtual-real fusion and (b) weak virtual-real fusion.

d) Smart Human Computer Interaction

With the advances of environment perception and virtual-real fusion, smart and natural HCI needs to catch up as an important upgrade to AR. Hand-gesture recognition and speech recognition, and the fusion of the two, are likely to be the most important techniques along these lines**.**

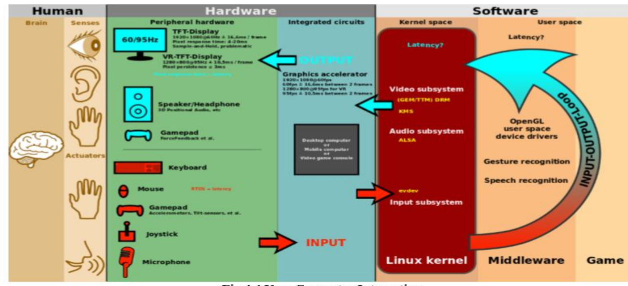

Fig 4.4 User-Computer Interaction

Fig 3: User-Computer Interaction

VI. APPLICATIONS

a) Ikea App

Aside from furniture that you need to assemble yourself, IKEA is also known in the tech world as one of the first companies to use augmented reality well.The retailer began experimenting with augmented reality back in 2012, when shoppers could use the app to see how tables and shelves would look in various places around your house. IKEA istaking it a step further with its IKEA Place App, which now allows you select anything from the store's catalogue and see how it will look to scale anywhere in your house.

This is an extremely helpful tool for people who are wondering if a certain piece of furniture will fit in a tight space, or if the colour of their prospective purchase will match the motif of the room.

In Ikea Place, customers can view 3-D renderings from different angles of over 2,000 products before reserving the ones they want in the app, which directs to the Ikea site to complete purchases. Currently, large furniture for living rooms such as sofas, armchairs and storage units are available to preview in the app, though more products are in the pipeline.

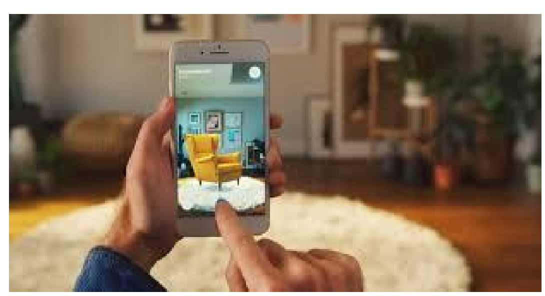

Fig 4: Ikea App

b) Pokémon Go App

Pokémon Go combines the use of AR technology with the GPS and camera functions of various smart devices. Developed by Niantic, a company specializing in augmented reality games, Pokémon Go prompts players to explore the real world in search of characters from the Pokémon franchise. After creating and designing an avatar, players view a main map that overlays real world geographic details such as streets with in-game items and destinations, called PokéStops and Pokémon gyms. As the player moves in reality, the avatar moves on the AR map.

When a player encounters a Pokémon, he has the option of viewing it in front of a digital background or superimposed over a real-world image in AR mode. In the latter case, the game utilizes the device's camera to cause it to appear as if the virtual character exists in the natural world, making the player's attempts at capturing the Pokémon seem all the more realistic.

Fig 5:Nintendo's Pokémon Go App

c) Medical Training

AR has had great implications for the medical industry; however, its more innovative apps come about because of the popular usage of mobile technology. AR is considered very beneficial in the field of healthcare training. For example, the healthcare provider can easily install a program or an application on his mobile. Such program or application may contain the main list of medical measures for the healthcare providers to select from. Once the healthcare provider chooses one of the measures from the list, the first screen will display where the tracking patterns should be situated in the sick person's body. After applying the patterns, the training model will begin.

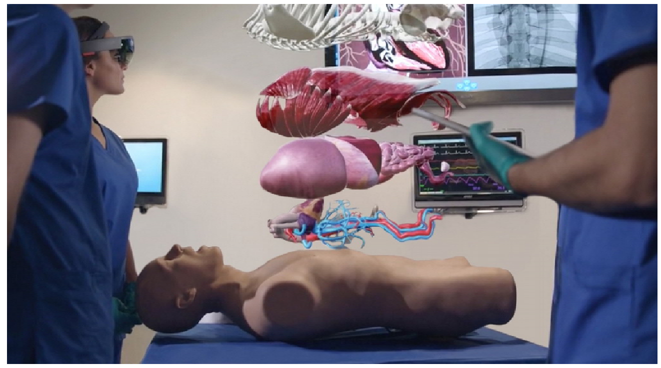

Fig 6: AR in Healthcare Systems

VII. CONCLUSION

Augmented reality is considered a competence that has been around for years. Augmented reality is still in its initial phases; and thus the upcoming possible apps are endless. A lot of AR products have been presented in several kinds and spread around the world. The layering of information over 3D space creates completely new experiences of the world, and supports the broader transition of computing from the desktop to mobiledevices, and at the same time raising new outlook concerning reaching information and new chances for learning. In spite of the fact that AR is utilized broadly in the customers sector, for example it is used in social engagement, entertainment and marketing, new forms of usage appear every day. It can be easily utilized as a tool for developing new apps. In addition, AR will be more accessible in the recently future and it will be a complementary part in our lives.

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