

AUGMENTED REALITY AND ITS IMPLEMENTATION USING GAME ENGINES

Seminar Report submitted in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

By

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BONAFIDE CERTIFICATE

This is to certify that the seminar entitled “**AUGMENTED REALITY AND ITS IMPLEMENTATION USING GAME ENGINES**” submitted by B.Maneesh Kumar (17UECS0079), B.S Maneesh (17UEAG0009) and K.Uma Sudan (17UECS0773) in partial fulfillment for the requirements for the award of the degree of Bachelor of Technology in Computer Science and Engineering is an authentic work carried out by them under my supervision and guidance.

To the best of my knowledge, the matter embodied in the project report has not been submitted to any other University/Institute for the award of any Degree or Diploma.

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DECLARATION

We declare that this written submission represents our ideas in my own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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APPROVAL SHEET

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ABSTRACT

With the start of the 21st century many technologies were developed to make human lives easy. This includes in rise of technologies like machine learning, virtual reality and augmented reality. Augmented reality can be best defined as a Visual experience of computer generated 2D/3D objects to interact with the real-world environment. This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment.

Augmented reality has found application in various fields such as in medicine, military, visual arts, commerce, archaeology and architecture etc. Augmented Reality has experienced a tremendous success economically and culturally in the ever-growing video game industry with designers finding various creative ways to implement augmented reality into a user-friendly competitive environment.

In the past decade alone video game industry has underwent tremendous growth with the increasing powers of processors and the constant progress of rendering technology and as its markets expanded not only in the United States and Western Europe but also many more, such as the massive markets of Eastern Europe, Central Asia and Russia since the fall of the Soviet union. The newly liberalized countries of South America, Africa and the middle east and finally the massive and newly developed East Asian and South Asian markets

This seminar gives a brief introduction about augmented reality, how it works, basic functions and working of a game engines, and finally explore various ways and platforms enabling people to implement augmented reality in video games and finally measure its impact on society as a whole.

CHAPTER 1

INTRODUCTION

Augmented reality is an Visual experience of computer generated 2D/3D objects to interact with the real world environment .This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment. It can be experienced through any smartphones, tablets or augmented glass. Many kind of Independent External Applications are in existence in both Android and IOS Market. Mainly mobile video games are entering a whole new level these days where augmented reality plays a major role in the entertainment division.

Augmented reality is generally used in many fields such as Medicine, Surgery, Military, Simulation, Entertainment etc. It has made many of the difficult tasks of visualization and data collection which were unthinkable in the past possible and easy today. Augmented Reality is also best used in the Video game industry to create various Games for different platforms such as mobiles, consoles, personal computers etc. Developers have given innovative ideas and various ways to implement virtual reality and augmented reality to enable a user interactive and competitive world. It hold great potential in future markets and is an promising field destined to revolutionise the entertainment industry into an highly innovative and competitive for the future.

1.1 Components of Augmented Reality based Systems

Components of AR systems consist of Hardware, Software and a Remote server.

An Hardware can be defined as a set of physical components used to serve and fulfill certain necessary features. Key hardware components in AR-based devices are a processor, display, input devices and sensors. The display is either a monitor, handheld device, eyeglass or Head Mounted Displays (HMD). The input device is either the camera of a Smartphone or a webcam connected to the internet. Sensors are gyroscope or accelerometer of a mobile device or it could be an infrared sensor. Nowadays, a Smartphone consists of all hardware requirements of augmented reality.

An Software can be defined as a set of instructions, program and data used to operate certain systems and to execute specific tasks. Special 3D augmented reality programs like

D’Fusion are used in AR-based applications. Virtual images, used for overlapping over the real live image, can be generated using 3D modelling software's such as AutoCad3D, StudioMax or Cinema4D.CT and MRI data can also be added to the Real world. Also, to experience augmented reality, end-user has to download a software application or browser plug-in.

A web or cloud server also plays an important role in storing the database of virtual images. Based on the request received from AR application, virtual images are retrieved from web or cloud server and sent to application. This allows the application to operate efficiently without any interruptions and lag errors [1].

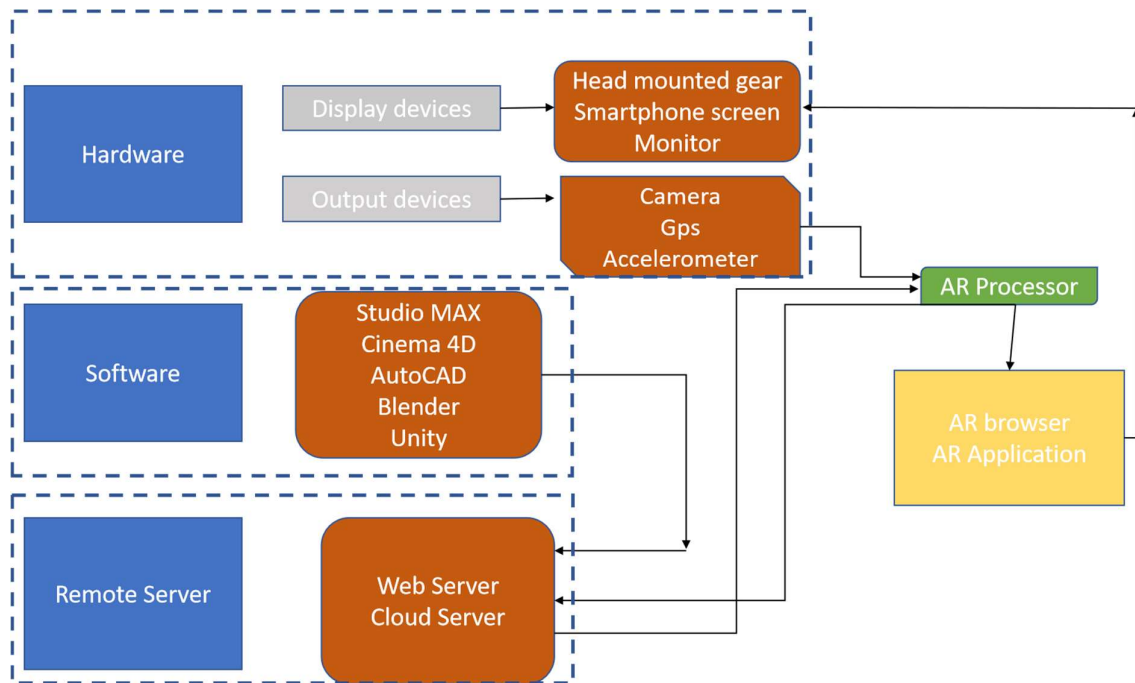


Fig 1: Components of AR systems

1.2 Marker-Based Augmented Reality

Marker based augmented reality is one of the basic concepts augmented reality is based on, Which involves the System/device scanning the environment and identifying an set of markers that is used to define the target object.

The system camera is usually used to obtain data from the real world and it undergoes a series of steps of 3D processing, rendering and finally the 3D model is superimposed into the environment often replacing the markers specified. [2]

2D bar-code is the simplest type of AR markers. The more complex type consists of bright color and meaningful pictures. When a Smartphone having Marker-based AR application scans a pattern such as a bar-code or a symbol through the camera of it, the software recognizes it and superimposes a digital image on the screen. 3D or animated digital image is used for a better experience. The Marker-based AR approach is also called as Recognition-based augmented reality.

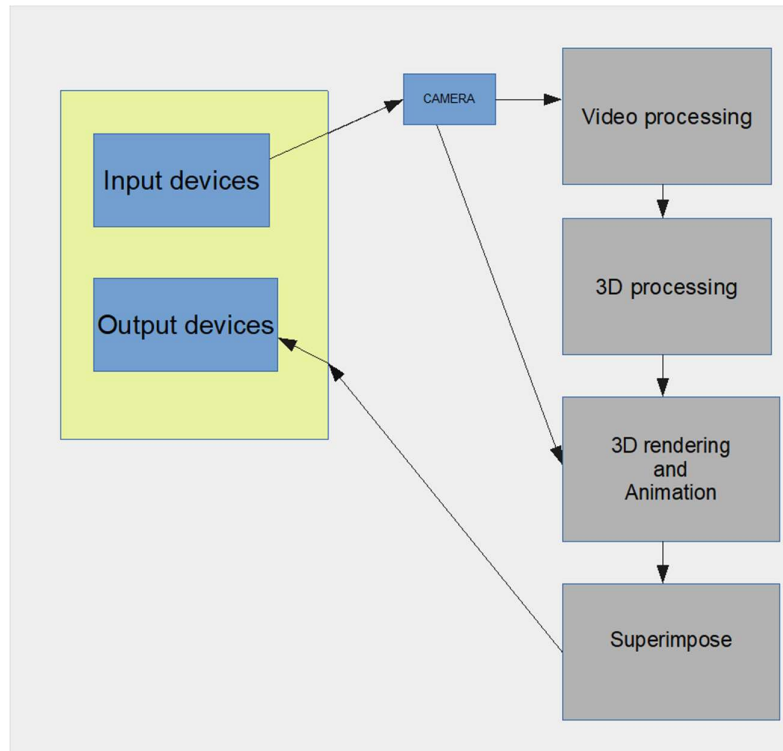


Fig 2: Marker based Augmented Reality

1.3 Location-Based Augmented Reality

When camera of a Smartphone having Location-based augmented reality application is pointed towards a real scene, inbuilt GPS software recognizes the location of the device in the world. Based on this recorded location and orientation of device recorded through inbuilt sensors, like accelerometer and gyroscope of the device, the application offers data, relevant to that specific location, towards which user is looking for. These digital informative data are then

superimposed to the real scene, visible with device camera. Most widely implemented AR applications are having location-based AR approach.

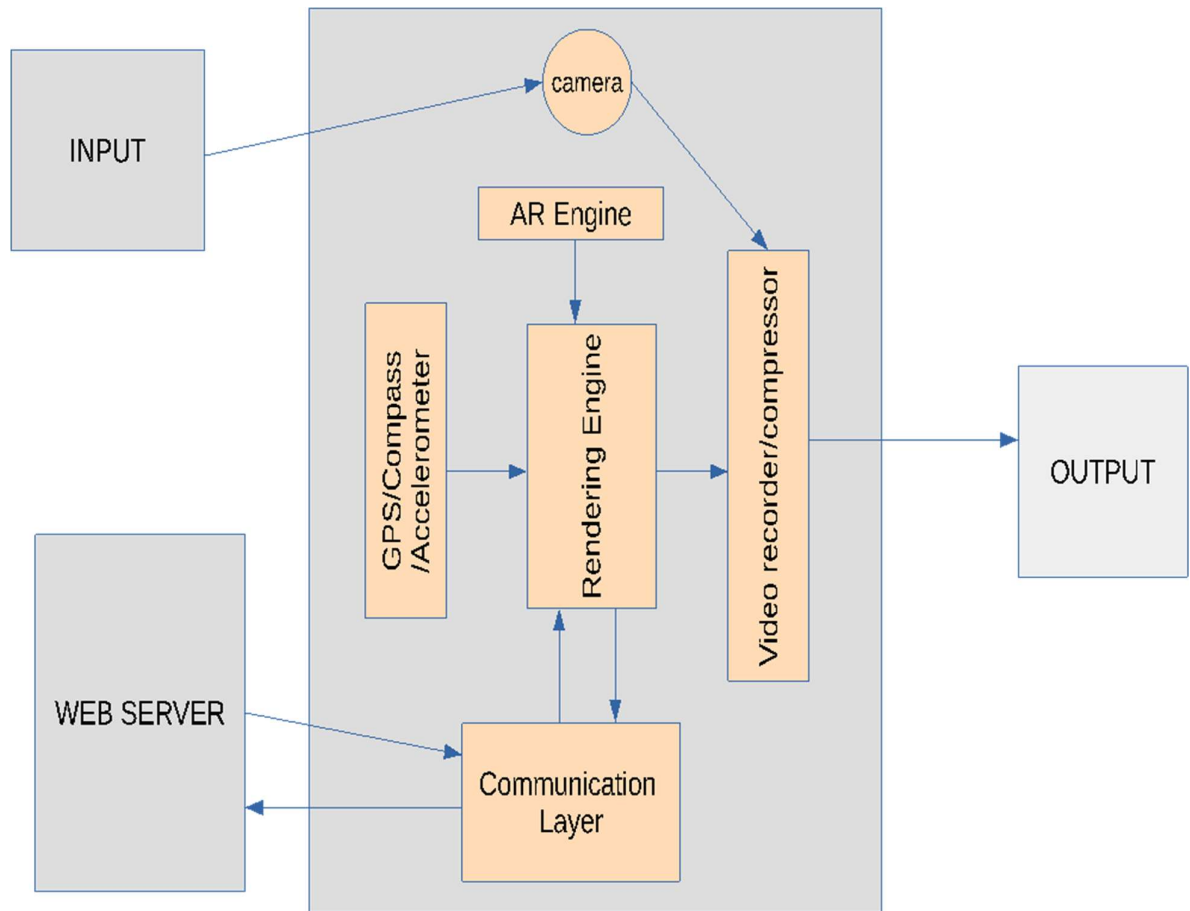


Fig 3: Location based Augmented reality

1.4 Game Engines

A game engine is best defined as a software development environment designed for building videogames. Developers use them to make games for various platforms including consoles, mobile devices, and personal computers and on online websites [11].

Game Engines have many inbuilt features built into it such as Rendering engines for 2D,3D graphics, physics engine, sound, scripting, Animation, Artificial intelligence, networking, Streaming and some support for cinematics, memory management,

threading, localization. In present day most used game engines are unity and unreal game engines.

Unity is a cross-platform game engine and is used to develop games. Unity has offered support for over 25 platforms for developers to choose from. Unity primarily uses C# and JavaScript. It provides a user with the necessary tools and access to various assets and community guidance.

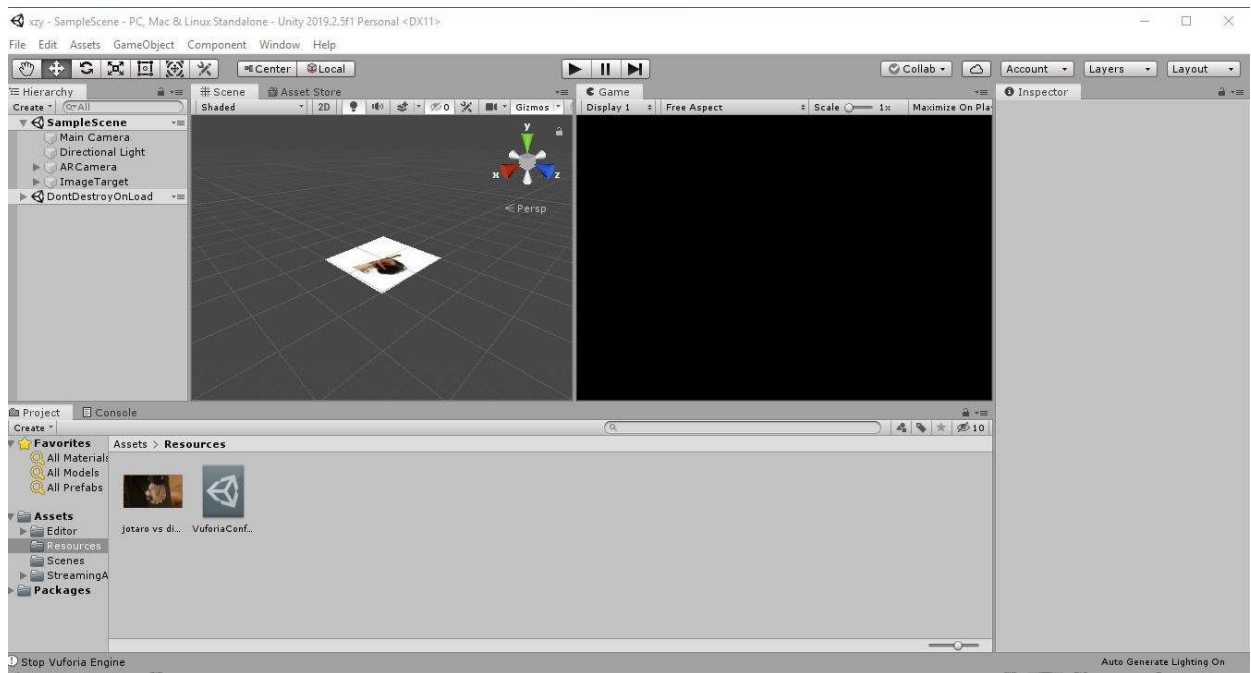


Fig 4: User interface of unity engine

CHAPTER 2

LITRATURE SURVEY

a) Introduction to augmented reality

Author: Dr. Paul Hindenburg et-al (2017)

As per the survey done up till now, most of the people are trying to analyses the aspects on how the Augmented reality is working and more than 47k websites are working on the updates of current situation to help everyone learn more about Augmented reality.

Developers have given innovative ideas on the application of augmented reality with multiple techniques using Video games engines, visual holograms and Native mobile Applications. With current literature on the virtual model environmental interactions analysis of augmented reality people are headed towards the more real life applications over many cross platform executable files.

b) Video games and Virtual reality

Author: Dr .Eric Alexzander Baryshnikov (2012)

Video game industry is a great pioneer of the 20th century and a leading force in the start of the twenty first century. Developers have given innovative ideas and various ways to implement virtual reality and augmented reality to enable a user interactive and competitive world. It hold great potential in future markets and is an promising field destined to revolutionize the entertainment industry into an highly innovative and competitive for the future.

c) Future of Video gaming

Author: Dr .Harold Randolph (2009)

The video games industry is one of the most successful and vibrant industry to flourish in the late 20th century. With the dawn of the 21th century video games give out new and interesting aspects of computer technology to explore and develop.

One such field is augmented reality. It provides the basis required to bring the distinct virtual and real worlds together.

d) Augmented Reality in Mobile Device

Dr..Sinha Kasey Sudershen (2007)

Recent advancement in smartphone technology has fueled 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.

CHAPTER 3

METHODOLOGY

3.1 Augmented Reality Software Development Kit

The Augmented Reality SDK is the core technological software engine that powers the development and creation of new AR apps and experiences. The role of the AR SDK is to perform tasks of fusing digital contents with the real world information. The ultimate aim of an AR-SDK is to give developers the power to underpin the features and functionalities within the application. Some of the well-known SDK are Vuforia, AR core, AR kit. An SDK is generally imported into a game engine to create a necessary applications then the final product is built on the required platform.

3.2 AR-kit and its features

AR-kit is an augmented reality SDK created and used exclusively by and for apple. This sdk offers many features including tracking many objects, images, faces, positions and orientation it also offers many rendering features to merge the physical and digital worlds. It additionally provides us users with some features with multiusers, audio and custom tracking and recognition. [4] It is primarily based on swift. AR-kit runs smoothly and efficiently on the apple ecosystem but cannot be used on any other platform.

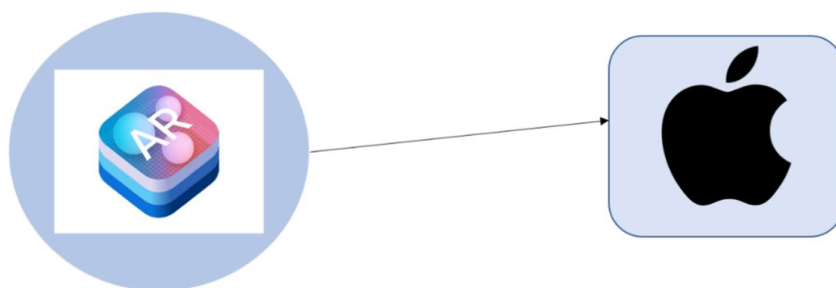


Fig 5:AR-kit and its supported platforms

3.3 AR-Core and its features

AR-core also known as Google play services for augmented reality is a software development tool used primarily to build augmented reality applications.

It is completely dependent on three basic features being motion tracking, environment understanding and light estimation. It is able to track the motion of an image target with a deal of proficiency it also has an constants with each consecutive input gain an even more detailed understanding of the environment, it also has an ability to measure and manipulate the light value providing us with an color correction and average intensity is returned . It provides many features for developing an AR application such as to create an illusion of user interaction, oriented points which allow the user to place virtual objects on surfaces with angular inclination.[5] Anchors and trackers are used to spot the virtual object and to mark its location. AR-core is used by developers to create applications or games for either android or iOS platforms.



Fig 6:AR-Core and its supported platforms

3.4 Vuforia engine and its features

Vuforia engine is the most widely used platform to develop AR applications. It provides an interface to develop marker based augmented reality applications with general ease. Unlike AR-core and AR-kit Vuforia is not exclusively bound to an single set of platforms, but gives the developer choice to develop for an wide variety of platforms .Vuforia has many inbuilt features such as image targets, multiple targets

Vuforia enables single image or multiple images at a same time and able to immerse a virtual component. [6]It is also able to track images on a cylindrical targets to immerse a virtual object.

Vuforia also enables object and model recognition which allows the game engine to immerse a 3D model when a certain model or object is found. Vuforia also enables the use of Vumarks which enables the developer to add content to a serial of objects [8].

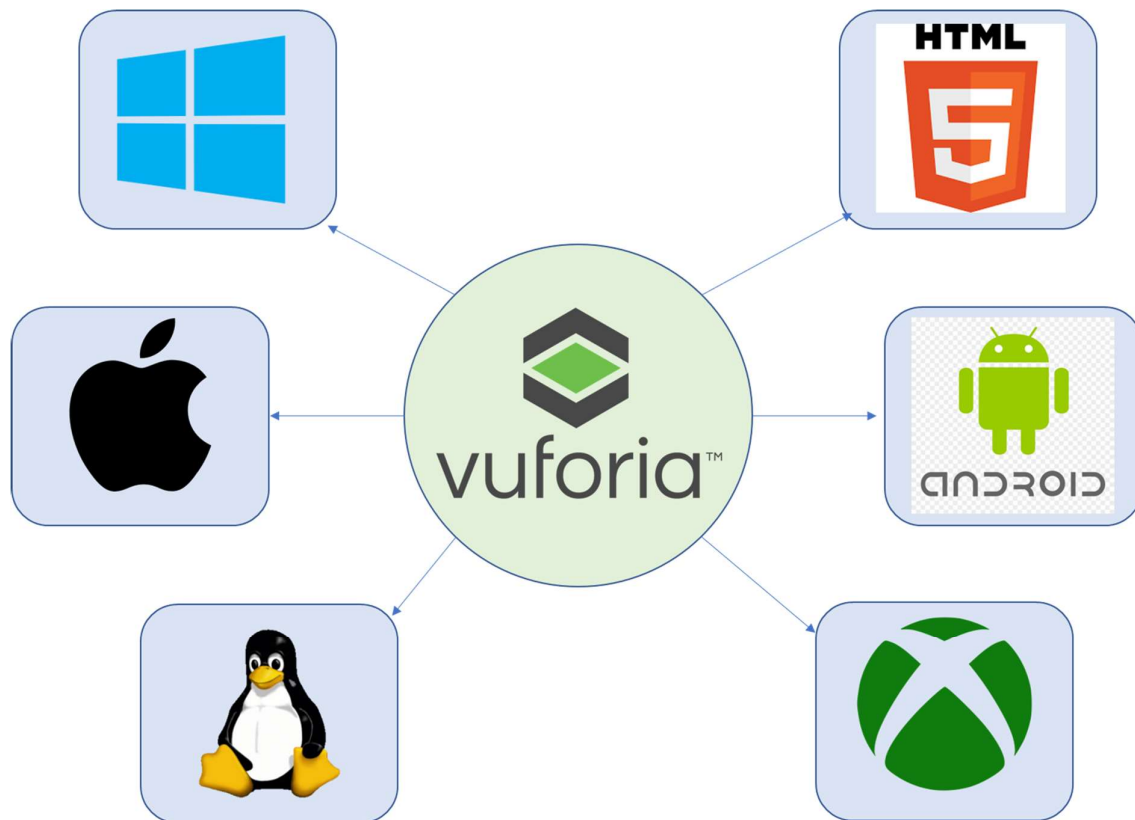


Fig 7: Vuforia and some of its supported platforms

3.5 AR-Kit vs AR-Core vs Vuforia

When all three SDK are compared side by side we obtain quite resounding results. AR-core and AR-kit have almost the same features and properties. AR-Kit and AR-core have more abstraction and inbuilt features but they are less flexible and are quite hard for developers to understand. Some unique features available for AR-core and AR-kit are its ability to recognize

and understand its environment to a certain extent and the ability to manipulate lighting .AR-kit and AR-core are also only available for developing on mobile platforms such as android and iOS. [12] In contrast to that Vuforia is a marker based augmented reality engine and specializes in image and model recognition is available for a large number of platforms. Unlike AR-kit and AR-core it is far more flexible and versatile allowing the developer to have a greater control over the development of an application. Extra API and plugins can be used in complement with Vuforia to achieve many more features which were previously unavailable [9]. A Survey also showed that Vuforia although having less features is more favored by developers due to its flexibility and universal availability to all platforms [7].

CHAPTER 4

CONCLUSION AND FUTURE ENHANCEMENTS

4.1 Conclusion

With comparing all the most famous sdk used with unity we have concluded that Vuforia is the best AR-SDK available for developers. Although AR-CORE and AR-Kit provide relative stability in their respective platforms .It is comparatively hard to learn when compared to Vuforia .Vuforia is very flexible and can be used to develop software in different platforms. Vuforia can easily be expanded to include new features which may not have been available before hence can always outperform AR core and AR kit.

4.2 Future Enhancements

AR-SDK are required to be made more flexible and volatile. It should hold compatibility with various platform and not to be restricted to a few. The Increase in interactivity and the degree of superimposition also needs to be improved.AR is also required to be used complementary to other fields such as data analyzing, machine learning, Artificial intelligence to provide improved quality to its users

Appendix 1

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Appendix 2

LIST OF ABBREVIATIONS

ABBREVIATIONS	EXPLANATIONS
2D	2 Dimentional
3D	3 Dimentional
API	Application Programming Interface
AR	Augmented Reality
AR-SDK	Augmented Reality-Software Development kit
CT	Computer Tomography
GPS	Global Positioning System
HMD	Head Mounted Display
iOS	iPhone Operating System
MRI	Magnetic Resonance Induction
SDK	Software Development Kit

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