

# AUGMENTED REALITY INTERFACE FOR PC

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**Abstract:** Augmented Reality (AR) and Virtual Reality (VR) headsets are becoming more accessible and cheaper, especially headsets that allow mobile phones to be used as a display for VR/AR applications. VR is being utilized heavily on platforms like Google Cardboard. Whereas AR applications which use the camera of the mobile device for situational awareness with virtual elements overlaid on top of the camera view are useful for productivity and commercial applications. We propose an Android mobile application made using Unity3D that provides additional virtual displays for PC that can be used as large virtual workspace instead of large monitors. It is implemented with the AR display which is on top of the viewport. The user can record the screen and work anywhere while connected to the same local area network.

**Keywords:** Virtual Reality, Augmented Reality, Socket Programming, Unity3D

## I. INTRODUCTION

Virtual reality uses just virtual elements rendered by the computer and not real world objects and Augmented reality combines rendered images, audio, and multimedia with real world objects. This provides the user with the ability to discern what is happening in the real world while they are using AR applications. It is also useful in multitasking and situational awareness.

While virtual reality uses just virtual elements and not real world objects, augmented reality combines images, audio, and multimedia with real world objects. This provides the user with the ability to discern what is happening in the real world while they are using AR applications. It is also useful in showing the real-time analysis of world. While laptop screens and monitors have been used for decades as the primary output device, AR goggles such as Google cardboard which is a device where you put a standard android mobile and have it turn into a cheap and effective VR/AR goggle. We have used the new Augmented Reality Paradigm to create an AR application that replaces the monitor, this can be used to have multiple users working on the same monitor or have a large display that can show results more clearly and the user can zoom in on any part of the image to have better visibility.

## II. LITERATURE SURVEY

C.Raju, K.Yugandhar, D.V.N. Bharathi and N. Vegesna, 2019. 3D Based Modern Education System Using Augmented Reality, Visualization is very much needed in present day education but many students are lacking it. So to improve visualization, augmented reality(AR) is used. The augmented reality provides interaction for the students so that they can learn more excitingly. Implementing this results in drastic change in present day education system. To change the present way of learning in classroom we are going to new technological advancements using augmented reality. In this paper we are proposing a new project in the unity we have to import the vuforia unity interfacing package into the unity setup. On importing this we get assets from vuforia to unity which contains the AR components which are used to develop AR applications.in this work we have more better one when compare to previous computer based application like 2-D. in this application all the teaching topics can observe in 3D graphical image and video format.

M. Singh and M. Singh, 2013. Augmented Reality Interfaces, Augmented reality (AR) user interfaces have improved tremendously in the past few years. AR is drawing considerable interest not only because it involves novel

or “cool” technologies, but also because it promises to help users manage today’s information overload. AR helps present information succinctly, in its “natural” home, where users can easily benefit from and act on it. We define AR as follows: AR presents a view of the real, physical world that incorporates additional information to augment this view. Of course, all the ways we view the world are just that, views. An implicit intuition is that the first view is somehow direct or canonical in that we can treat it as reality and further augment it with additional information. Such augmentations are “information” in the broadest sense, might include nonsense or false information, and can express any data type (text, image, video, and so on). A baseline example according to our definition would be a bird’s eye view or satellite picture of a city overlaid with street and building names. AR is most naturally associated with settings in which the aspect of reality considered is current and proximal to the user; the augmenting information can likewise be current and proximal, or not, depending on specific settings.

A. Kumar, S. Singh Yadav, S. Kumar and P. Johri, 2021. Augmented Reality Systems In Gaming And Multimedia, In this paper we discuss about how the Augmented Reality enables us to make games and use the real world as playground and further use of AR feature in the multimedia area by image processing and tracking. This paper mainly focuses on how Augmented Reality can improve the World with Gaming and Multimedia with effective utilization of the Augmented detail that is hidden from the view of our eye. In this paper we are going to see how we can use some of Augmented Reality technique to implement the use of image tracking process to track objects in Augmented world. We are going to see some example use of the Augmented Reality image of 2D object to Real-time 3D object in Augmented Reality, we have used Unity engine as it the one of the best free and open license Software (open source) to be able to implement our work and demonstrate the use.

S. Gadre, V. Rawalgaonkar, M. Warde, D. Balasubramanian, G. Gore and J. Joshi, 2018. Implementation And Design Issues For Augmented Reality Applications On Mobile Platforms, There are certain implementation and design issues that are critical to the success of an AR application. The trigger response time (TRT) and mobile platform battery consumption are the two main parameters that are looked at in the research presented. The test application was designed using a combination of Vuforia, Unity and Blender platforms, and the mobile platform used was an Android based One Plus 3T phone. The results discuss the impact of trigger image complexity, 3d object complexity and ambient light on the response time and battery life.

Y. Bahuguna, A. Verma and K. Raj, 2018. Smart Learning Based On Augmented Reality With Android Platform And Its Applicability. Since last few decades, AR technology has visualized fabulous growth, now it is ready to be used in consumable electronic items like PCs, computer and android phones. Here the aim is to showcase an overview of basic aspects of Augmented Reality and the main concepts of this technology. Now a day AR finds its involvement in various fields along with its smart application software which can be used in different fields including education, medical and many more. Augmented reality, better known as AR is a step towards latest technology enhancement program which enables us to experience virtual things in real world. By the introduction of Augmented reality into the education system teachers can convey their knowledge more preciously and in a very attractive manner. Students will understand more easily if this technology is introduced to them. Hereby in this manuscript, we are proposing an idea to use AR on Android platform which is more widely used now-a-days.

C.N. Shafareen Afera and R. B. Hod, 2020. Mobile Augmented Reality Application With Virtual Buttons As User Interaction And Stereoscopic View For Medical Learning, This paper presents an interaction method for wearable AR (augmented reality) by using VR box with virtual buttons. It is introducing an Android application that could help medical students in their learning. Anatomy education is traditionally performed by the dissection of cadavers. This AR technology could offer an additional teaching method for anatomy education, depending on how it is implemented. Studying AR in medical education could provide benefits for medical education and provide students a more personalized and exploration in learning experiences.

### III. PROPOSED METHODOLOGY

#### A. EXISTING SYSTEM

While Virtual Reality uses just virtual elements and not real world objects, Augmented Reality combines images, audio, and multimedia with real world objects. This provides the user with the ability to discern what is happening in the real world while they are using AR applications. It is also useful in showing the real-time analysis of world. Existing Augmented Reality and Virtual Reality apps on mobiles can only use multimedia and files available on the device to display virtual elements on screen. These apps are focused on playing multimedia in VR. They can only play video and images that are prerecorded, It is not possible for them to display live video from a PC. The AR apps make use of the camera as the background and put virtual objects in the foreground.

#### B. MOTIVATION AND PROBLEM STATEMENT

When using traditional monitors the size of the display and the amount of screen space might hinder the ability of the user to do work effectively. So additional monitors are used along with primary display in order to increase the screen space and multitask effectively. With this project people can use affordable VR glasses that utilize mobile phones as a display. Thus the mobile phone can serve dual purpose as a mobile as well as a monitor screen without being limited to the small screen of the mobile by using the mobile as an AR goggle. The non-customizability of the traditional monitor screen is also a disadvantage compared to the AR mobile screen.

#### C. PROPOSED SYSTEM

The Proposed system is a Augmented Reality Android app that displays the live display from a PC. The PC screen is transmitted to the android app via Wireless LAN/WiFi and the app displays the PC screen as a virtual object in the AR screen of the app. Thus the mobile can be used as a additional monitor. This system is versatile because all work that can be done on the PC can also be done in AR but using the same input devices. We have used the new Augmented Reality Paradigm to create an AR application that replaces the monitor, this can be used to have multiple users working on the same monitor or have a large display that can show results more clearly and the user can zoom in on any part of the image to have better visibility. First the QR code from PC is scanned by the mobile client. The IP address of the server of the PC is decoded from the qr code and a Connection request to the PC is sent by using the TCP protocol to the appropriate destination address and port number. The PC sends a acknowledgement back with a frame of the PC's screen. This process is repeated 30 frames per second to produce a clear video of the PC's screen on the mobile client.

#### D. MODULES

##### SCREEN CAPTURE

By using the Windows Graphics Library in C# the PC's Screen can be captured by a Windows forms application in a Bitmap Image format. This process is repeated 30 times per second to achieve an smooth live video of the PC screen. The cursor is also drawn on the screen with the windows user32.dll.

##### IMAGE COMPRESSION

The captured Bitmap image can be compressed so that it is efficient to transmit. The compression is a lossy compression method that uses the JPEG image codec to reduce the size of the bitmap image captured by the screen capture module. JPEG compression uses Discrete Cosine Transform method for encoding the image transformation. It allows a trade off between packet size and the degree of compression can be adjusted.

##### TRANSMISSION

The compressed image is then transmitted to the mobile device by using the C# Socket Programming library and with the TCP/IP protocol. The image is split into multiple byte arrays so that it can fit within the 65 KB packet limit in TCP and then the packet is transmitted to the router and the router redirects it to the exact destination IP and port number.

## IMAGE DECOMPRESSION

The received image file is then reassembled from the transfer packets on the mobile device by collecting each consecutive packet. When the entire image file with the size of around a 100 kBs is reassembled, the resultant image is decompressed by using the same JPEG image codec so it can be changed into a format fit for rendering.

## RENDERING

The Image Texture is then used by the Unity Rendering Algorithm to display on the screen. This Algorithm takes the positions of the in-world camera and the relative positions of the objects in the rendered scene to give the final output to be rendered and displayed on the mobile screen. The Image from the back camera of the phone is also rendered behind the PC's display.

## E. IMPLEMENTATION PROCESS

### UNITY3D

The mobile application is implemented in Unity3D, It is a cross platform game engine developed by Unity Technologies. It is particularly well-liked for creating mobile games for iOS and Android, is thought to be simple to use for new creators, and is well-liked for creating independent games and applications. It also supports a wide range of platforms like desktop, mobile, console, and especially virtual reality platforms, as such any application made for one platform can be adopted to another platform with minimal changes. So the VR mobile application can be adopted to any number of different VR headsets available in the market.

Unity is able to offer many of the most crucial built-in elements that are necessary for a game to function since it is a game engine. It includes features like collision detection, 3D rendering, and physics. This implies that there is no need to create the wheel from the standpoint of a developer. Instead of beginning a new project by building a new physics engine from scratch and computing each material's tiniest movement or the way light should reflect off various surfaces.

Unity is both an IDE and a game engine. The term "integrated development environment," or IDE, refers to a user interface that provides access to all the programming tools you require in one location. Creators may easily drag and drop items into scenes with the Unity software's visual editor and then adjust their settings.

### VISUAL STUDIO

Microsoft created the Integrated Development Environment (IDE) known as Visual Studio to create GUIs (Graphical User Interfaces), consoles, Online, mobile, cloud, and other services. You can produce both managed and native code with the aid of this IDE. It makes advantage of Microsoft's many software development platforms, including Windows Store, Microsoft Silverlight, and Windows API, among others. It is not a language-specific IDE because you can use it to write code in many different languages, including C#, C++, VB(Visual Basic), Python, and JavaScript.

### ANDROID DEVELOPER TOOLS

An Eclipse plugin called ADT (Android Development Tools) offers a number of utilities that are integrated with the Eclipse IDE. Unity3D requires Android development tools in order to compile the code into a APK (Android Package Kit) file that can be read by an Android device. Unity3D API for Android is built on top of Android Development tools so it can offer all the features available in Android devices like gyroscope and accelerometer support which is necessary for VR applications.

### SOCKETS

A socket is a nameable and addressable communications connection point (endpoint) in a network. The usage of socket APIs to create communication channels between remote and local processes is demonstrated via socket

programming. The processes that use a socket may run on the same system or may be spread over various networks on various computing devices.

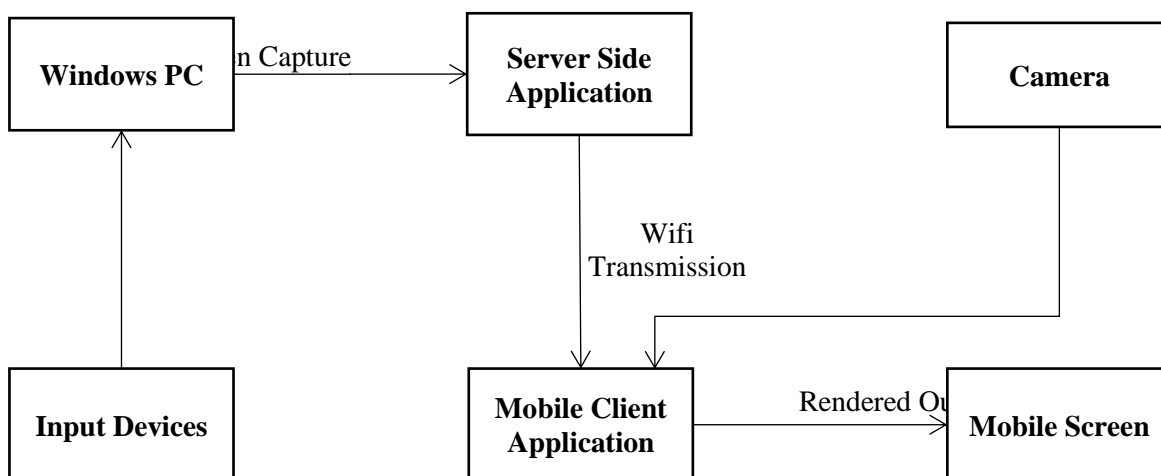
Sockets are useful for communication between two devices in a same Local Area Network. A port is a endpoint in a LAN device which can be opened and incoming connection requests can be accepted by listening the port number. The devices refer to each other with a local IP address which is assigned to each device on a network by a router Dynamic Host Configuration Protocol (DHCP). Some devices can also act as a router to form an ad-hoc communication network such as a hotspot on a mobile phone. Most platforms support socket programming natively as such no additional libraries or APIs are needed.

## ARCORE

ARCore is a framework created for augmented reality applications is called ARCore which made by Google. An Android phone can perceive its surroundings, comprehend the outside world, and interact with information with ARCore, which makes use of many APIs to enable shared AR experiences. To combine virtual material with the real environment as seen through your phone's camera, ARCore relies on three main features.

The phone can comprehend and track its position in relation to the outside world thanks to motion tracking. Using environmental knowledge, the phone can determine the size and placement of any kind of surface, including inclined, horizontal, and vertical surfaces like walls, coffee tables, and the ground. The phone can assess the amount of light present in the surrounding area.

## F. PROPOSED ARCHITECTURE



**Figure 1: Proposed Architecture**

## G. ALGORITHMS USED

### UNITY RENDEREING ALGORITHM

In Unity, the Sprite Renderer is used to render images in a 2D scene. This component lets you display images as objects that can be addressed separately and transforms the data to be suitable for rendering in the graphical processing unit of the computer. Rendering is the process of generating a 2D image from 3D geometry, lights, materials, and camera information.

The process of rendering involves getting Geometry calculations, surface treatments, lighting, textures, and viewer perspective are all factors in rendering. Rendering in VR also involves moving the rendered 3D view in accordance to the movement of the VR headset in the real world.



## JPEG COMPRESSION ALGORITHM

The Joint Photographic Experts Group, or JPEG, was a team of experts in image processing who created a standard for compressing images (ISO). Therefore, JPEG (or JPG) is more of an image compression standard than a file format. The JPEG standard is complex due to its numerous options and restrictions on colour spaces. The image compression algorithm is called "JPEG compression." Even though the underlying method is (strictly speaking) JFIF compression, the file extensions .jpeg and .jpg have persisted. The JPEG algorithm is designed to work on Human sight. It exploits the following properties of human sight and they are Humans are more sensitive to the luminosity of colour than the chromatic value of an image and in terms of sensitivity, Humans are not particularly sensitive to high-frequency imagery. A 2D discrete cosine transform on 8x8 blocks, A quantization (filtering) stage, Huffman encoding.

## IV. EXPERIMENTAL ANALYSIS

The PC's display is thus transferred to the client application after connecting by scanning the QR code displayed on the server side. This is occurring 30 times every second to achieve transferring live video from the pc screen to mobile. Recording and storage options are displayed on the screen.

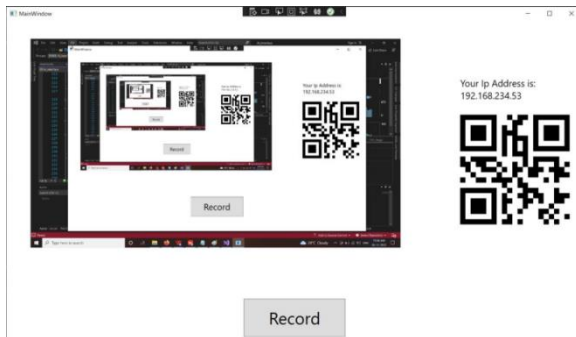


Figure 2: Application window

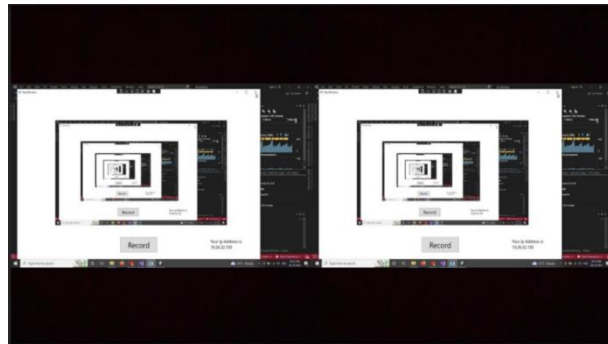


Figure 3: Final Rendered Display

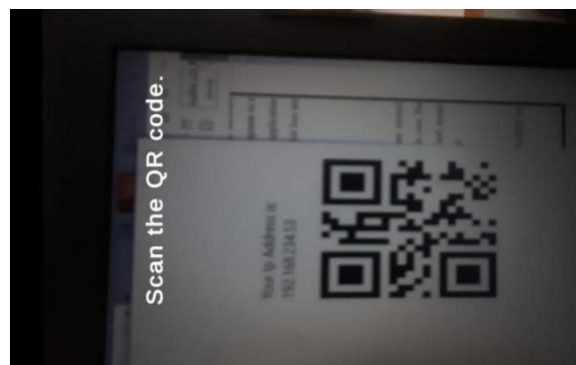


Figure 4: QR Code Scanning

## V. CONCLUSION

Thus AR applications that make use of video streaming techniques and remote input to the PC can be very useful in productivity tasks. This method of using the PC from a computer is similar architecture to that of a mainframe computer and its terminals that were used in third generation of computers and thus can be used to consolidate the processing of a small number of mobile devices to the PC and can be used to display the screen bigger and up close in the AR screen and this can be adapted to a dedicated AR headsets as well. In the future the bit rate of the transmission can be improved by using better compression methods. Google's ARCore can be used to adapt the software to dedicated VR goggles like HTC Vive, Quest 2. The Audio Output of the PC can also be compressed using mp3 compression and transmitted to the mobile device.

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