AR ACCESSORIES TRY ON APP

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AR Accessories Try on APP

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ABSTRACT

The "AR Accessories Try-On App" is an innovative augmented reality application designed to transform online shopping by enabling users to virtually try on fashion accessories, including clothes, shoes, and watches. By leveraging AR technology, the app overlays digital images of selected items onto the user's physical environment, providing a realistic and interactive preview in real-time. Users can browse a catalog, select an accessory, and use their smartphone camera to visualize how the item looks on their body or in their surroundings. This functionality helps users make informed purchasing decisions, saving time and reducing the need for physical store visits. Additionally, the app enhances the shopping experience by allowing users to experiment with different styles, colors, and textures, and share their virtual try-on results on social media. Developed using Unity, AR Foundation, and Vuforia for robust AR capabilities and QR code recognition, the app showcases the potential of AR technology in revolutionizing the fashion industry. As AR continues to advance, this AR Accessories app or other AR application sets the stage for more immersive and engaging shopping experiences in the future.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Augmented reality is an interactive experience of a real-world environment where the objects that reside in the real world and are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, and olfactory. It is a good way to render real world information and present it in an interactive way so that virtual elements become part of the real world. A simple augmented reality use case is a user captures the image of a real-world object, and the underlying platform detects a marker, which triggers it to add a virtual object on top of the real-world image and displays it on your camera screen. Augmented reality derives its meaning from the word “augment” which means to add, thus adding or superimposing object onto the real world is augmented reality.

AR can be delivered across multiple sensory modalities, including visual, auditory, and olfactory. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural 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, whereas virtual reality completely replaces the user's real-world environment with a simulated one. This means that users can interact with AR experiences using various senses, creating a truly immersive experience that engages multiple aspects of the user's perception. For example, a user might see a virtual object superimposed on their physical environment, hear audio cues that enhance the experience, and even smell virtual scents that add another layer of immersion.

Augmented reality is largely synonymous with mixed reality. There is also an overlap in terminology with extended reality and computer-mediated reality.

The primary value of augmented reality is the manner in which components of the digital world blend into a person's perception of the real world, not as a simple display of data, but through the integration of immersive sensations, which are perceived as natural parts of an environment. The earliest functional AR systems that provided immersive mixed reality experiences for users were invented in the early 1990s, starting with the Virtual Fixtures system developed at the U.S. Air Force's Armstrong Laboratory in 1992. Commercial augmented reality experiences were first introduced in entertainment and gaming businesses. Subsequently, augmented reality applications have spanned commercial industries such as education, communications, medicine, and entertainment. In education, content may be accessed by scanning or viewing an image with a mobile device or by using marker less AR techniques.

Software for Augmented reality:

A key measure of AR systems is how realistically they integrate augmentations with the real world. The software must derive real world coordinates, independent of camera, and camera images. That process is called image registration, and uses different methods of computer vision, mostly related to video tracking. Many computer vision methods of augmented reality are inherited from visual odometry. An augogram is a computer-generated image that is used to create AR. Augography is the science and software practice of making augograms for AR.

Usually, those methods consist of two parts. The first stage is to detect interest points, fiducial markers or optical flow in the camera images. This step can use feature detection methods like corner detection, blob detection, edge detection or thresholding, and other image processing methods. The second stage restores a real-world coordinate system from the data obtained in the first stage. Some methods assume objects with known geometry (or fiducial markers) are present in the scene. In some of those cases the scene 3D structure should be calculated beforehand. If part of the scene is unknown simultaneous localization and mapping (SLAM) can map relative positions. If no information about scene geometry is available, structure from motion methods like bundle adjustment are used. Mathematical methods used in the second stage include: projective (epipolar) geometry, geometric algebra, rotation representation with exponential map, Kalman and particle filters, nonlinear optimization, robust statistics.

In augmented reality, the distinction is made between two distinct modes of tracking, known as marker and marker less. Markers are visual cues which trigger the display of the virtual information. A piece of paper with some distinct geometries can be used. The camera recognizes the geometries by identifying specific points in the drawing. Marker less tracking, also called instant tracking, does not use markers. Instead, the user positions the object in the camera view preferably in a horizontal plane. It uses sensors in mobile devices to accurately detect the real-world environment, such as the locations of walls and points of intersection.

Augmented Reality Markup Language (ARML) is a data standard developed within the Open Geospatial Consortium (OGC), which consists of Extensible Markup Language (XML) grammar to describe the location and appearance of virtual objects in the scene, as well as ECMAScript bindings to allow dynamic access to properties of virtual objects.

To enable rapid development of augmented reality applications, some software development applications such as Lens Studio from Snapchat and Spark AR from Facebook were launched including Software Development kits (SDKs) from Apple and Google have emerged.

Augmented reality is used to enhance natural environments or situations and offers perceptually enriched experiences. With the help of advanced AR technologies (e.g. adding computer vision, incorporating AR cameras into smartphone applications, and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated. Information about the environment and its objects is overlaid on the real world. Augmented Reality is any experience which is artificial and which adds to the already existing reality or real, e.g. seeing other real sensed or measured information such as electromagnetic radio waves overlaid in exact alignment with where they actually are in space. Augmented reality also has a lot of potential in the gathering and sharing of tacit knowledge. Augmentation techniques are typically performed in real-time and in semantic contexts with environmental elements. Immersive perceptual information is sometimes combined with supplemental information like scores over a live video feed of a sporting event. This combines the benefits of both augmented reality technology and heads up display technology (HUD).The potential applications of AR are vast and varied. From gaming and entertainment to education and training, AR has the potential to revolutionize the way we interact with technology and the world around us. One of the most significant advantages of AR is its ability to render real-world information and present it in an interactive way. This means that users can learn and interact with real-world objects and environments in a more engaging and immersive way.

One of the simplest use cases of AR is marker-based AR, where a user captures the image of a real-world object, and the underlying platform detects a marker, which triggers it to add a virtual object on top of the real-world image and displays it on the user's camera screen. This can be used for a wide range of applications, such as product demonstrations, virtual tours, and interactive museum exhibits.

Nonetheless, there are still some challenges that need to be fixed in order to make augmented and virtual reality an ideal tool for work. “The computational demand of inside-out computer vision tracking currently places limits on the rendering capability of the HoloLens, which potentially results in image latency and additionally poses a limitation in model detail (resolution) which can be detrimental for medical applications.” This means that the latency and the resolution of the Microsoft’s HoloLens still needs to be fixed to fully trust it as a tool for medicine. Taking into account that the HoloLens are possibly the most popular AR headset, more improvements need to be made. Furthermore, in a study made by Alaric Hamacher, Jahanzeb Hafee, and Roland Csizmazia, it was found that, when compared to a traditional mouse, the HoloLens goes below average in efficiency, and it was also evaluated to be less precise than the mouse. This means that there are still some challenges for engineers and developers before current augmented and virtual reality become an optimal tool. However, considering the rapid pace at which these technologies are being developed, it is most likely that these limitations will be fixed sooner rather than later.

The expansion of online marketplaces has dramatically changed shopping patterns in the worldwide retailing environment. It is reported that US customers made 51 per cent of their purchases online in 2016 (Farber, 2016). Clothing and accessories have been the leading online merchandise category in the past decade (Huang and Shia, 2017). For example, US online retail sales in apparel, footwear and accessories generated $81bnin 2017 and is expected to increase to $123bn by 2022 (Statista, 2018). Despite the steady rise in online apparel sales over the years, the inability to try-on clothing is a major obstacle to online purchases, which is usually termed as the suit, fit and match dilemma (Patchoulis and Kapetanovic, 2012).

Using ecommerce AR, online shoppers can virtually try before they buy, making it especially useful in industries like fashion and home décor, where shoppers often like to interact with products in person before purchasing. Customers can get a better sense of how a product looks without needing to see it in a physical store. They can virtually try on a shirt or place a couch in their living room to see if it fits—no heavy lifting required.

Here are five different types of AR, how they work.

1. **Marker-based AR**

Marker-based AR—also referred to as image recognition AR—relies on a QR code or visual marker, also known as a fiducial marker, to trigger the interactive experience. A shopper scans the marker with their smartphone camera, activating the visual effects. They can then move their mobile device around the static marker to see the digital image in 3D on their screen

The critical limitation of marker-based AR is it can only be used with mobile devices (i.e., smartphones or tablets), and users may need to download a dedicated app (like

Google Play Services for AR for Android devices; Apple iPhone users with iOS 13 or higher have access to built-in AR support).

2. **Marker less AR**

Marker less AR doesn't rely on physical markers like a QR code or image. Instead, it uses location-based data like GPS or accelerometers in mobile devices to detect and track the user's environment and determine the location of the virtual content. This allows the software to understand the spatial relationships and orientation of objects and surfaces in the user's view and superimpose the virtual content accordingly.

Shoppers open the mobile app or webpage and scan their physical environment with their device to make the digital item appear on material surfaces, like the floor or a wall. Marker less AR can work on irregular surfaces if there are recognizable features like corners, textures, and objects to track. Note that the complexity and variability of the environment impact the accuracy of marker less AR.

3. **Projection-based AR**

Projection-based AR relies on projectors to display 3D imagery or digital content onto a flat two-dimensional surface, like a wall, floor, or object. It doesn't create fully immersive environments, mainly holograms for events and movies.

You can use projection-based AR for in-person events like store openings or pop-up shops, where you might want to show holograms.

4. **Superimposition-based AR**

With superimposition-based AR, an existing physical item is fully or partially replaced with a digital augmentation. In other words, it identifies specific objects or features in the user's view—perhaps a book cover, a product label, or a landmark—then overlays relevant digital content onto the object or feature.

In physical stores, superimposition AR can give customers directions and guidance. By overlaying virtual arrows onto the environment, shoppers can find their way to the products they're looking for. Superimposition AR can also provide customers with product details. By pointing their smartphone camera at a product, shoppers can see virtual overlays with details like price, features, and reviews.

5. Location-based AR

Location-based AR is a type of marker less AR that relies on geographic data to deliver digital images at specific locations. It's a popular type of AR for gaming—Pokémon Go, for example, relies on location-based AR.

Brands that want to gamify the shopping experience could use location-based AR to encourage shoppers to interact with their products. For instance, you could create a virtual scavenger hunt encouraging shoppers to explore your store and collect rewards.

1.1 Problem Statement

In this generation most people prefer online shopping through e-commerce sites such as Amazon, Flipkart etc. But the foremost problem faced with all of us is the hesitance. Dress is a powerful tool of influence since most of us accept the fact that in most cases, the way we dress reflects our first impression, a reflection of our character, and an insight into our likes and dislikes. The fashion industry is a vast area that involves the production of raw materials, the production of fashion goods by designers, and retail sales. Therefore, the fashion industry contributes a lot to the global economy. However, several considerations in the traditional fashion industry such as customers may have to spend a lot of time for fit-on, skin diseases, and privacy concerns inside trial rooms have led the industry toward digitalization. On the other hand, online shopping becomes massively accelerating with the closure of online retail shops during the Covid-19 pandemic, due to the restricted social life during the pandemic, and people tend to satisfy their needs and wants through online platforms. However, with online shopping customers are unable to verify whether the item does fit or suit them, which raise the need for AR and ML.

1.1.1 Time taking

As rapidly with changing times, the coming era has become more succulent to impatience and less time. Thus, to find the right dress skimming through all the multiple stores and then trying is toll on time and effort.

1.1.2 Money and Privacy concern

All the stores have to invest a huge amount of sum to ensure the safety of their customers while making it comfortable with installing changing rooms. The stores also must pay huge amounts for maintenance of their stocks, hiring the right people, providing security etc.

1.2 Proposed System

1. Our proposed application helps the user to virtually try watches, T-shirts, and shoes through the ease of their devices.

2. This application helps the user to solve the dilemma, of a user faced while shopping by letting them try it on virtually before buying it.

3. This application helps in saving time of users, money spent by the stores to provide for the maintenance.

1.3 Objective

In In today's digital age, e-commerce has become a popular way of shopping for many people. Platforms like Amazon, Flipkart, and others have made it easy for customers to shop online from the comfort of their homes. However, despite the convenience of online shopping, some people are still hesitant to buy products online, especially when it comes to items like watches. This is because customers cannot physically feel the product on themselves before purchasing it.

To address this issue, companies are turning to augmented reality (AR) to provide customers with a more realistic shopping experience. AR is an interactive technology that overlays digital information onto the real world, allowing users to see and interact with virtual objects in their physical environment. One application of AR in e-commerce is the creation of try-on apps.

A few years ago, the only way to see a product yourself was to go to a store. As AR becomes more common, we're no longer bound by these limitations—a boon for shoppers and sellers alike.

It's no wonder, then, that customers want to use AR. In 2023, around 97 million Americans expect to use AR at least once a month, and nearly half say they're interested in using AR and VR technology to shop in the next five years.

Different types of AR can help you bridge the gap between online shopping and in-store experiences. They can also help you:

1. **Reduce return rates.** Using AR, customers can get a more accurate representation of a product before buying it, making it less likely they'll order the wrong size or color, for instance.

2. **Increase conversion rates.** By letting customers view products in a virtual environment, try them on virtually, or see how they would look in their space, shoppers are more likely to purchase.

3. **Differentiate your brand.** AR lets brands create unique and memorable shopping experiences, helping them stand out in a crowded retail landscape.

AR try-on apps allow customers to visualize how a product, like a watch, would look on their wrist without physically trying it on. This is done by using the customer's phone camera and superimposing a digital image of the watch onto the customer's wrist in real-time. This technology helps customers make more informed purchasing decisions by giving them a better understanding of the product's size, color, and style. Additionally, it eliminates the need for customers to physically visit a store to try on a product, saving them time and effort.

AR technology also has applications beyond e-commerce. In industries like manufacturing and healthcare, AR can be used to enhance work processes and improve training for employees. For example, AR can be used to overlay digital information onto equipment, allowing employees to quickly identify parts and troubleshoot issues. AR can also be used to provide virtual training for employees, allowing them to practice procedures and protocols in a safe and controlled environment.

1.4 Scope

The augmented reality (AR) market is expected to reach over $97bn by 2028, bringing with it a dizzying change in the way we interact with the world and tech.

Unlike virtual reality, which creates a completely artificial environment, augmented reality refers to an interactive experience that combines the real world and computer-generated content. There will be an estimated 1.73bn active devices (smartphone apps and other devices) using AR by 2024.

While phones are the key to augmented reality in the immediate future, creating headsets which are light, cost-effective and unobtrusive is essential for widespread consumer adoption. By next year, Statista anticipates that global AR headset shipments will reach over 30m units — over twelve times the number shipped in 2020.

Augmented reality in retail is forecasted to be worth $6.7bn by 2028, with innovations ranging from virtual fitting rooms to customers using 3D representations of products to see how they would fit in their homes.

But only 1% of retailers say they are using augmented reality right now in their buying experience — and 52% are not prepared to start using the new technology.

The key could be companies that bridge the gap. Beam, a technology incubated inside Rocket makers which will soon spin off into its own company, creates user-friendly augmented reality experiences.

Experts suggest Virtual and augmented reality technology will get be consolidated. It will be available in two forms namely, tethered systems and standalone units in the future. Tethered systems are units or wearables on the head, with a wire attached to a processing unit.

Standalone units will have various types of systems such as display to processing and it will be within the unit and will be available in the form of wearables. Since manufacturers choose a mix of standalone and tethered, we are already able to see the early signs of these trends. Although some standalone units are available in the market, these devices are rather complex and difficult to implement.

Today, we tend to compromise with augmented and virtual reality devices. Because none of the existing systems are giving users a complete, seamless, and immersive experience. Most of the systems lack natural & wider 'Field of View (FOV), have restricted display resolution, lower brightness, shorter battery life, and lack 3D sensing capabilities. It will take another couple of years before we experience true and seaming integrated AR/VR applications.

Covid-19 pandemic has significantly contributed towards the augmented reality and virtual reality technology market growth since more & more businesses have turned completely into the remote. Another reason for Augmented reality and virtual reality markets to grow fast will be factors like higher demand for smartphone-based augmented reality, growing takeovers and company mergers, advanced augmented and virtual reality technology, high demand for advanced tools in the entertainment sector, and more adoption of AR VR technology in education, health care, and retail industries. The augmented reality and virtual reality market size stood at approx. $15 billion in 2020 is projected to grow at a staggering rate of a CAGR 40%. It will touch around $450 billion by 2030.

Many large enterprises show the highest growth in the augmented and virtual reality markets and are expected to maintain their dominance in the forthcoming years. Augmented and virtual reality has penetrated nearly every sector such as automotive, manufacturing, construction, airlines, healthcare, smartphones, education, real estate, sports, and more. The small and medium enterprises (SMEs) segment is expected to witness higher growth due to the AR VR technology such as lesser field staff, no expenses on training, inventory setups, faster solutions, and better customer satisfaction.

1.5 Challenges

A big problem with implementing AR solutions is the technological gap between AR devices. It is one thing to design an app for a fully-fledged AR gear, and it is a completely different thing to do it for a smartphone. The latter case got many limitations that make the whole experience not really user-friendly and somewhat redundant to the activity it augments.

Considering that most of the target audiences will not likely purchase AR gear due to its impractical and high prices - smartphones remain a preferred function and since they have certain augmented reality app design limitations - it neuters the whole point of implementing AR solution to the mix.

1. **Hardware issues**

   Currently, every available AR headset is a bulky piece of hardware that may be too expensive for the masses. Also, a majority of AR headsets need to be tethered to a computer, making the entire experience limited and inconvenient. Alternatively, consumers can use their smartphones or tablets for AR applications. However, mobile AR faces major issues in displaying visuals accurately. For instance, mobile sensors such as accelerometer can be disturbed by electric interference, which is commonly witnessed in urban areas. Additionally, smartphone cameras are built for 2D image capture and are incapable of rendering 3D images. Hence, the hardware required for AR technology needs to be enhanced before mass adoption.

2. Lack of regulations

Currently, there are no regulations that help businesses and consumers understand which type of AR applications can be used and how data can be processed. Hence, the technology can be used with malicious intent. For instance, a cybercriminal can hijack personal accounts by mining data output and manipulating AR content. In such cases, consumers may have questions like who could be held accountable, which mitigation strategies can be used, and how to avoid such incidents in the future. Hence, one of the significant challenges of augmented reality is creating regulations that can ensure the privacy and security of consumer data as well as simplify mainstream adoption of the technology.

3. Physical safety risks

Augmented reality applications can be immensely distracting and may lead to physical injuries. For instance, many people were injured while playing Pokémon Go. Likewise, augmented reality applications can lead to serious injuries in case they are used in potentially risky environments such as busy roads, construction sites, and medical institutions.

Although augmented reality technology is still in its infancy, its existing applications have shown that further research and development to address the challenges with augmented reality can enable large scale deployment of the technology. And once that happens, the implementation of augmented reality can be witnessed in law enforcement, healthcare, finance, and other critical areas.

4. **Public skepticism**

Although augmented reality is a popular topic of discussion among tech experts, consumers are unaware of the benefits of the technology. Consumers have only used the most popular applications of augmented reality such as trying out glasses, wardrobe, and accessories. Therefore, consumers need to be informed about various applications and benefits of augmented reality. Additionally, a lack of awareness may lead to concerns about privacy and security while using augmented reality technology. Hence, users' concerns need to be addressed to accelerate the mainstream deployment of augmented reality.

1.6 Use of AR in different fields

Augmented Reality (AR) is a technology that superimposes virtual content on the real world. It has gained significant popularity in recent years due to its immersive and interactive nature and has found applications in a wide range of fields. In this essay, I will discuss the use of AR in different fields.

1. **Education:** AR has revolutionized the field of education by making learning more interactive and engaging. AR applications can create 3D models of objects that can be viewed from different angles, which helps students to understand complex concepts better. AR also provides a more immersive and engaging way of learning by bringing textbook concepts to life. AR can also be used to create virtual field trips, which allow students to explore different places and learn about them without leaving the classroom. This technology has the potential to make education more accessible and interactive for students, especially those with different learning styles.

2. **Healthcare:** AR has found significant applications in the healthcare sector. It can be used to create virtual simulations of surgical procedures, which can help surgeons to practice and improve their skills before performing the actual surgery. AR can also be used to provide real-time guidance to surgeons during procedures, which can improve their accuracy and reduce the risk of complications. AR can also be used to create visual aids that help patients to understand their medical conditions and treatment options better.

3. **Gaming:** AR has revolutionized the gaming industry by creating more immersive and interactive gaming experiences. AR games can be played in the real world, which adds a new dimension of interactivity to gaming. AR games can also be used to create social experiences, where players can interact with each other in the real world while playing the game. This technology has the potential to create new gaming experience.

4. **Marketing:** AR has significant applications in the field of marketing. It can be used to create interactive advertisements that engage customers and provide them with a more immersive and personalized experience. AR can also be used to create virtual try-on experiences, where customers can see how a product would look on them before purchasing it.

5. **Retail:** AR has the potential to revolutionize the retail industry by providing customers with a more immersive and personalized shopping experience. AR can be used to create virtual try-on experiences, which allow customers to see how clothes or accessories would look on them before purchasing them. AR can also be used to create virtual showrooms, where customers can explore different products in a more immersive and interactive way. This technology has the potential to improve customer engagement.

6. **Architecture and Design:** AR has significant applications in the field of architecture and design. It can be used to create virtual models of buildings and structures, which can help architects and designers to visualize and modify their designs before constructing them. AR can also be used to provide virtual tours of buildings and structures, which can help clients to understand and visualize the final product better.

This technology has the potential to improve the efficiency and accuracy of the design process.

7. **Tourism:** AR has the potential to revolutionize the tourism industry by providing tourists with a more immersive and interactive travel experience. AR can be used to create virtual tours of different tourist destinations, which can provide tourists with a more immersive and engaging experience. AR can also be used to create virtual guides, which can provide tourists with information about different tourist attractions and help them navigate their way around the destination. This technology has the potential to improve the tourist experience and increase tourism revenue.

1.7 Technology used.

Unity 3D: 3D/2D game engine and powerful cross-platform IDE.

Vuforia: Software development kit for creating AR apps.

IDE: Visual Studio 2019.

Programming language: C#

CHAPTER 2

LITERATURE REVIEW

2.1 AR ACCESSORIES TRY-ON

An augmented reality (AR) accessories try-on app is a tool that enables users to virtually try on accessories such as clothes, shoes, watches, and other fashion items. This app uses AR technology to overlay digital images of the selected accessories onto the user's physical environment, allowing them to visualize how the accessories would look on them before making a purchase.

When using an AR accessories try-on app, the user typically starts by selecting the product they want to try on from a catalogue or database of items available in the app. Once they have selected the product, they use their smartphone camera to scan their body or the area where they want to try on the accessory.

The app then uses AR technology to superimpose a digital image of the selected accessory onto the user's physical environment. The digital image appears on the user's smartphone screen, and they can see how the accessory looks on them in real-time. They can move their body or change the angle of the camera to get a better view of how the accessory looks from different angles.

The AR accessories try-on app allows users to try on a wide range of accessories virtually, from shoes and t-shirt to watches. This tool is particularly helpful for online shoppers who want to get a better sense of how an item will look on them before purchasing it. It saves time and money by eliminating the need for users to physically visit a store to try on items.

In addition to helping users make more informed purchasing decisions, AR accessories try-on apps also provide a more engaging and interactive shopping experience. Users can explore different styles and combinations of accessories, experiment with different colours and textures, and even share their virtual try-on experience with friends and family on social media.

Overall, AR accessories try-on app is a valuable tool for the fashion industry and a convenient way for consumers to try on accessories virtually. As AR technology continues to advance, we can expect to see more innovative and exciting applications of this technology in the world of fashion and beyond.

2.2 Apparel self-Customization

The concept of mass customization, defined as producing goods and services to meet individual customer needs. Most of the industries have tended to practice mass customization as it is a very populated one. In the field of the fashion industry, most of the time customers struggle in finding suitable clothes that cater to their needs. Sometimes it may be colours, styles, patterns, or any other factors that result in them feeling uncomfortable wearing dresses. Therefore, many researchers suggested a customization system for the users themselves in which the customer himself can customize the dress. In 2009, Bradley et al. had researched cloth with realistic illumination using augmented reality. For that, they wear a T-shirt or some clothes and from the AR application that they developed, they have selected the images and finally aimed the output to the shirt they were trying to see the final product output.

From the research, they were trying to build a real-time flexible augmentation on cloth. For that, they used spare cloth tracking in video images using a new version-based marker system with the temporal conference. From the research, they prove that real-time 2D augmented reality on a non-grid object such as clothes can track a new circular system and apply the correct illuminations and shadows on the product. From that, they can customize a product to the customer by identifying the correct illuminations and shadows. They have researched only light clothes with limited motions allowed. In Mass customization, they produced a completely new product mode with a combination of customization and mass production. As the customers have various choices of brands, drapes, fabrics, and colours. Here the research is only implemented for certain garment types. Rather than customization of the t-shirt, the researchers are trying to customize footwear with motion detectors.

In 2013, Luh et al. presented a systematic framework for design customization of footwear for children. This system consists of novel functionalities which support customization and pattern development of shoes. Customization design module behaviours controlled by JavaScript. Functions of the design module are colour, texture, embroidery, carving style, and shape.

Unity3D is used for the rendering of colours and texture, and the UVW mapping technique is used for mapping. It is important for users to quickly evaluate their design and give feedback in any customization design system. This paper proposed a further solution to a virtual try-on module. The ideation was implemented by AR Toolkits and resides as an add-on in Unity3D. Kinect used for the object (foot) detection. And then this research applies the ICP algorithm to superimpose the trimmed model on the depth data captured by Kinect from the scene. The proposed solution encourages mass customization product development. Having the ability for consumers to personally design a product and interact instantly with it creates a highly desirable advantage for product customization. The research for footwear was limited to children and on the other hand.

Previously mentioned works have used Augmented Reality, specifically for T-shirts and footwear customization. In recent research carried out in 2021, Feng et al. proposed a full featured clothing customization system using Augmented Reality where it involves the implementation of the material library for the selection of styles, patterns, colours, and fabrics for the users to choose. The system is proposed not only in the custom designing phase, but users can also further fit on the virtual clothes. The system uses Azure Kinect somatosensory technology, OpenGL 3D rendering, and a somatosensory virtual fitting room. The user is allowed to apply various designs to the cloth, once satisfied he can try virtual fitting. The system consists of functional modules. The design sub-module includes the selection of patterns, colours, fabrics, and styles. In the virtual fitting sub-module, it captures the depth data stream of human bones through Azure Kinect Somatosensory camera and realizes bone-tracking processing process and 3D clothing virtual try-on the proper position on the human body. Then as the effect of rendering, it chooses appropriate rendering tools to render clothing textures, lighting, etc., so that people can see virtual clothing with more realistic effects through the display. The hand-made module is implemented and requires hand-made by skilled professionals.

2.3 Enhancing Customer shopping experience.

Use of AR in the retail industry has various touchpoints of the consumer journey, one of them is the consumer shopping experience. However, shopping is a time-consuming activity for some.

Many approaches have been tried to simultaneously answer two fundamental shopper concerns: “does is suit” and “does it fit”, therefore reducing guesswork involved in shopping to enhance consumer experience using AR and ML for the past decades.

AR in fashion retailing includes virtual try-on using personalized or non-personalized virtual models to simulate the appearance of the apparel product combinations on a body form.

Furthermore, the 'Magic Mirror" concept is one of the most popular virtual try-on solutions hence the solution can be used inside physical clothing stores.

Kim and Cheeyong's study in 2015 indicated a "Magic Mirror" using a large screen. The screen displays various outfits for the user with prioritizing make-up and hair simulations also. For the interaction, this solution uses a touch system. A more recent study (2019) proposed a more advanced virtual trial room using IOT mirrors to offer consumers a more realistic try-before-you-buy shopping experience for apparel. AR has been used for skin colour recognition and apparel recommendation according to skin colour for this study.

Studies show the impact of AR on consumers' fashion experience, satisfaction, enhancement of the perception of reality, and overall, a fun, pleasant, and personalized experience to be relevant for users. This was further supported by Liu et al. (2020) findings, where it emerged that AR used for virtual fitting of online stores through using AR-HMD and Microsoft HoloLens (allowing users to virtually see how the dress would fit on their life-sized personalized 3D human avatars), while doing the daily activities and interacting the avatar with the real physical world was regarded as contributing to the 'fun factor of shopping experience'.

An explosive growth occurred, using ML for the fashion industry during the past few years. Regarding ML, more recent research states that the availability of large-scale datasets such as Deep Fashion has fuelled recent progress in applying deep learning to fashion tasks. Amongst the latest applications, Yu et al. proposed a fashion design framework using generative adversarial training which helps in achieving great success in synthesizing realistic images. The specialty of the proposed system is instead of suggesting existing items from the dataset, the system synthesizes images of new items that are compatible with a given query item. The framework automatically models the user's fashion taste then designs an item to a given query.

Overall, Scholz and Smith (2016) stress the importance for both online and offline retailers of adopting immersive AR, crafting experiences that generate value for consumers, and thus the importance of focusing on consumer experience.

2.4 Augmented Reality

Augmented reality (AR) is a technology that superimposes digital information onto the real world, creating an interactive and immersive experience for users. It works by using a camera or other input device to capture the real-world environment, and then overlaying digital information, such as images, videos, or 3D models, onto that environment in real-time.

AR has many applications across a variety of industries, including gaming, entertainment, education, healthcare, and retail. In gaming and entertainment, AR is used to create immersive experiences, allowing users to interact with virtual objects and characters in the real world. In education, AR is used to enhance learning by providing interactive and engaging content, such as virtual field trips and simulations. In healthcare, AR is used to aid in medical procedures and training, providing doctors and nurses with a more realistic and accurate view of the patient's anatomy.

AR also has applications in retail, allowing customers to try on products virtually before making a purchase, such as the AR watch try-on mentioned in a previous question. This technology provides customers with a more realistic and engaging shopping experience and can help reduce returns due to sizing or style issues.

As AR technology continues to advance, we can expect to see more innovative and exciting applications of this technology in various industries. AR has the potential to transform the way we interact with the world around us, making our experiences more immersive and interactive than ever before.

2.5 Factors causing Augmented Reality Scanning Difficulties

While augmented reality (AR) has the potential to transform the way we interact with the world, it is not without its challenges. Some of the factors that can cause difficulties in AR implementation include:

Hardware limitations: AR technology requires powerful hardware, including cameras, sensors, and processing power, to function properly. If the hardware is not up to par, the AR experience may be glitchy or slow, leading to a less than optimal user experience.

Environmental factors: AR requires a stable and well-lit environment for optimal performance. If the lighting is poor or the environment is too cluttered, the AR system may have difficulty tracking the user's movements and accurately placing digital objects in the real world.

Lack of standardization: There are currently no widely accepted standards for AR development, making it difficult for developers to create AR applications that work across different platforms and devices. This lack of standardization can lead to compatibility issues and make it more challenging to create seamless AR experiences.

Cost: The development and implementation of AR technology can be costly, particularly for small businesses or startups. The high cost of hardware and software, as well as the need for specialized expertise, can make it challenging for smaller companies to adopt AR technology.

User adoption: Finally, one of the biggest challenges facing AR technology is user adoption. While the technology has great potential, it can take time for users to become comfortable with using AR in their daily lives, and some may not see the value in adopting AR technology.

Overall, while there are several factors that can cause difficulties in AR implementation, with continued advancements in technology and increased user adoption, we can expect to see AR become a more integral part of our lives in the coming years.

2.6 Target Image

A target image, also known as a marker or a fiducial marker, is an image or pattern used as a reference point for augmented reality (AR) applications. The target image is recognized by an AR system, which uses it to determine the position and orientation of virtual objects in the real world.

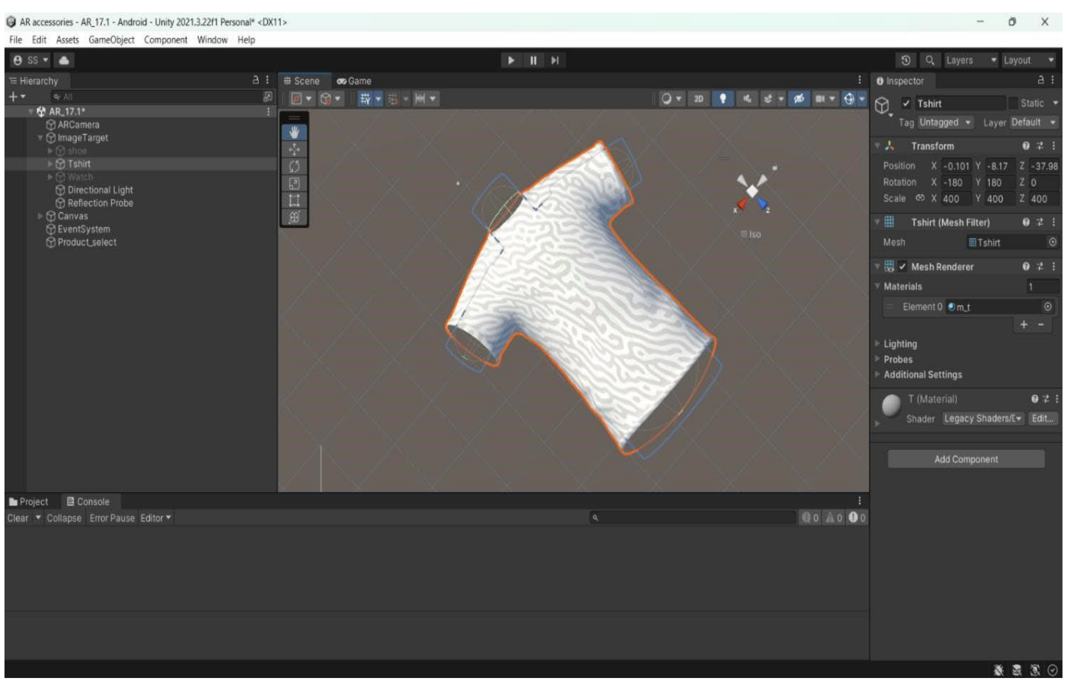
Typically, a target image is a black and white pattern, although it can also be a photograph, logo, or any other image that can be easily recognized by the AR system. The image is usually printed on a piece of paper or displayed on a screen.

When a user points a camera at the target image, the AR system detects the marker and tracks its position and orientation in real-time. This information is used to overlay virtual objects onto the real-world scene, creating an augmented reality experience.

In summary, a target image is a reference point used by AR systems to track the position and orientation of virtual objects in the real world. It is an essential component of many AR applications, providing developers with a reliable and accurate way to create compelling augmented reality experiences.

<u>Fig 2.1 Target image</u>

2.7. 3D MODELS OF ACCESSORIES



<u>Fig 2.2 T-shirt 3D model</u>

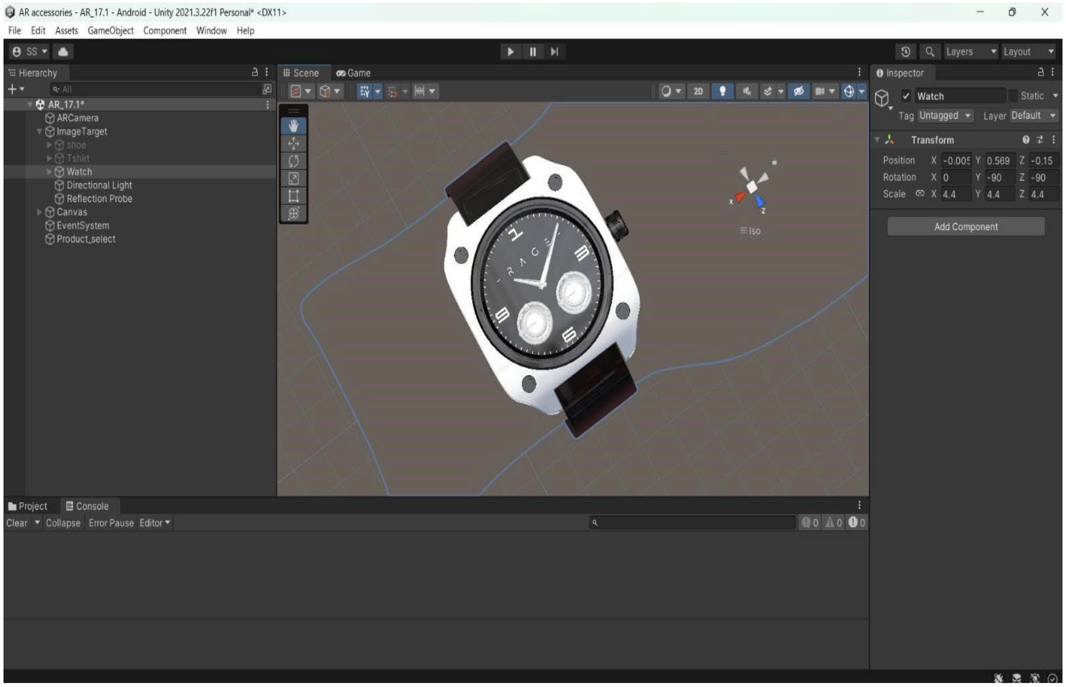


Fig 2.3 Watch 3D model.

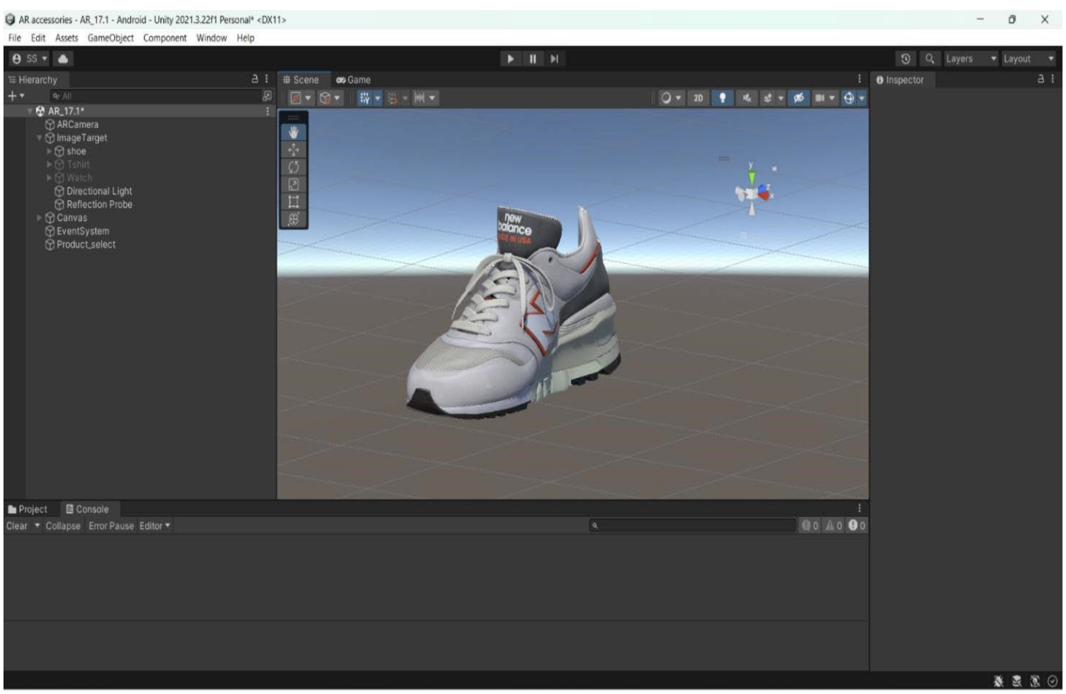
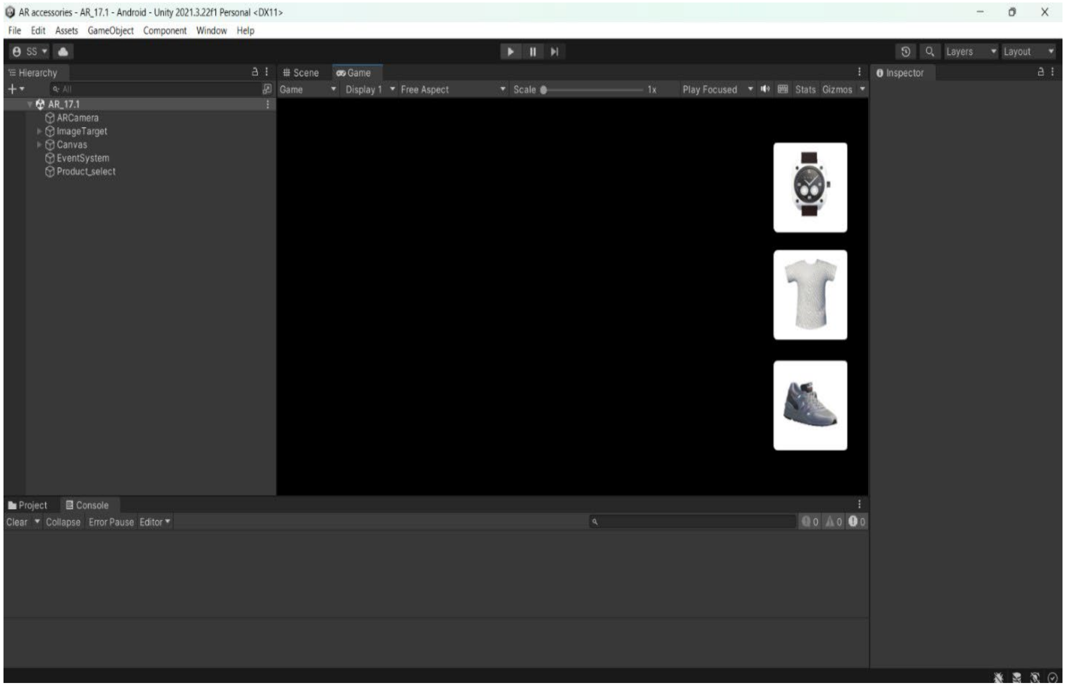
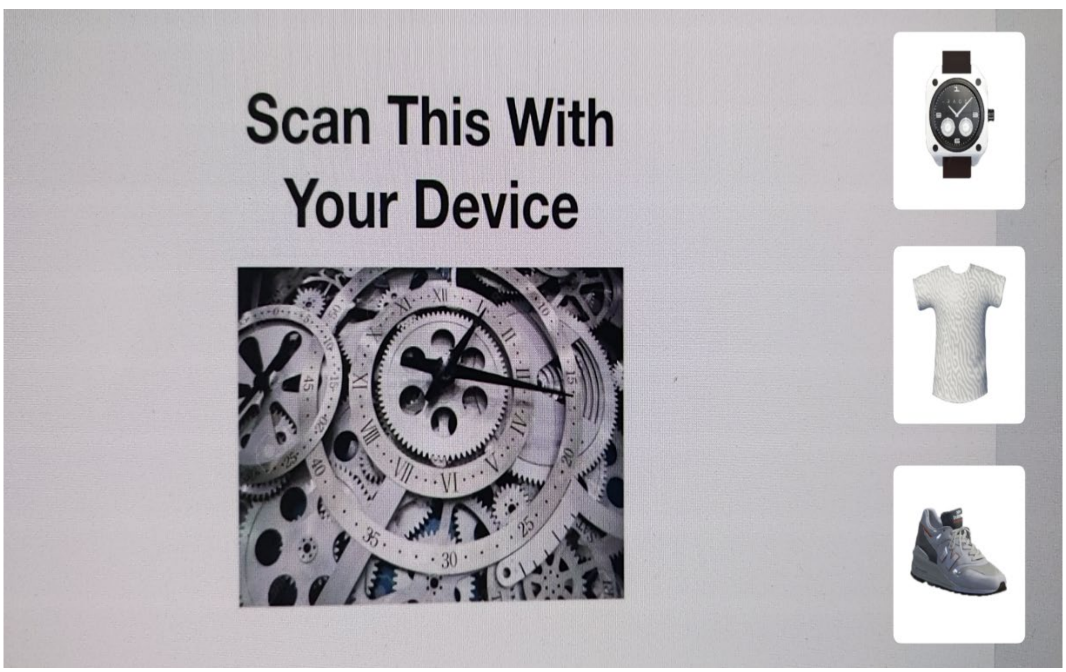


Fig 2.4 Shoe 3D model



<u>Fig 2.5</u> <u>AR app interface</u>



<u>Fig 2.6</u> <u>Android Application Look</u>

<u>Fig 2.7</u> <u>AR Accessories App Watch Implementation</u>

<u>Fig 2.8</u> <u>AR Accessories App Shoes Implementation</u>

2.8 Working procedure.

This app is designed to perform image recognition, using a target image as a reference point. For the app to work, the user must first set a target image, which will be used as a reference for the app to detect and recognize objects within the image.

Once the target image has been set, the app will use its algorithms to detect and recognize objects within the image. This is done by comparing the features of the target image to those of the objects within it. When the app has successfully recognized an object, it will then overlay a Unity model on top of it.

A Unity model is a 3D model that has been created using the Unity game engine. The model can be customized to look and behave in a specific way, depending on the needs of the app. Once the Unity model has been placed on top of the object, it can be interacted with in various ways, depending on the design of the app.

Overall, this app is designed to use target image recognition and Unity models to create an interactive experience.

Fig 2.9 Glimpse of AR accessories try-on

2.9 Conclusion

In conclusion, the Augmented Reality (AR) accessories try-on app is a groundbreaking technology that has revolutionized the way people shop for accessories such as clothes, shoes, watches, and other items. By using the power of AR, users can try on accessories virtually and get a real-world feel for how they look and fit before making a purchase.

The app provides an interactive and engaging experience that enhances customer engagement and improves the shopping experience. It also allows users to explore a wider range of products and variations, as well as visualize how they will look with their outfits or in different environments.

Use of AR in the retail industry has various touch points of the consumer journey; one of them is the consumer shopping experience. However, shopping is a time-consuming activity for some people, while for others a much enjoyed one. Many approaches have been tried to simultaneously answer two fundamental shopper concerns: “does is suit” and “does it fit”, therefore reducing guesswork involved in shopping to enhance consumer experience using AR and ML for the past decades. Research during 2018 on marker-based AR used in a physical clothing retail environment through AR mobile applications, which interact with the consumer by triggering information on the product such as size, colours available, stock, etc, and visualizing a 2D pattern of the item.

While there are some challenges associated with implementing AR technology, such as the need for powerful hardware and specialized expertise, the benefits of the AR accessories try-on app outweigh the drawbacks. The app can improve customer satisfaction, reduce returns, and increase sales for retailers, while also providing a more engaging and interactive shopping experience for users.

Overall, the AR accessories try-on app is a prime example of how AR technology can be used to enhance and transform industries, providing new and innovative ways to engage customers and drive business growth.

CHAPTER 3

METHODOLOGY

3.1 Methodology flow

The AR Accessories Try-On App leverages augmented reality to enhance the online shopping experience by enabling users to virtually try on accessories. This chapter details the methodology used to develop and implement the application, focusing on the process flow, image processing, model overlay, customization, and the type of AR technology used.

This app is designed to perform image recognition, using a target image as a reference point. For the app to work, the user must first set a target image, which will be used as a reference for the app to detect and recognize objects within the image.

Once the target image has been set, the app will use its algorithms to detect and recognize objects within the image. This is done by comparing the features of the target image to those of the objects within it. When the app has successfully recognized an object, it will then overlay a Unity model on top of it.

3.1.1 Methodology Flowchart

Below is a high-level flowchart of the methodology:

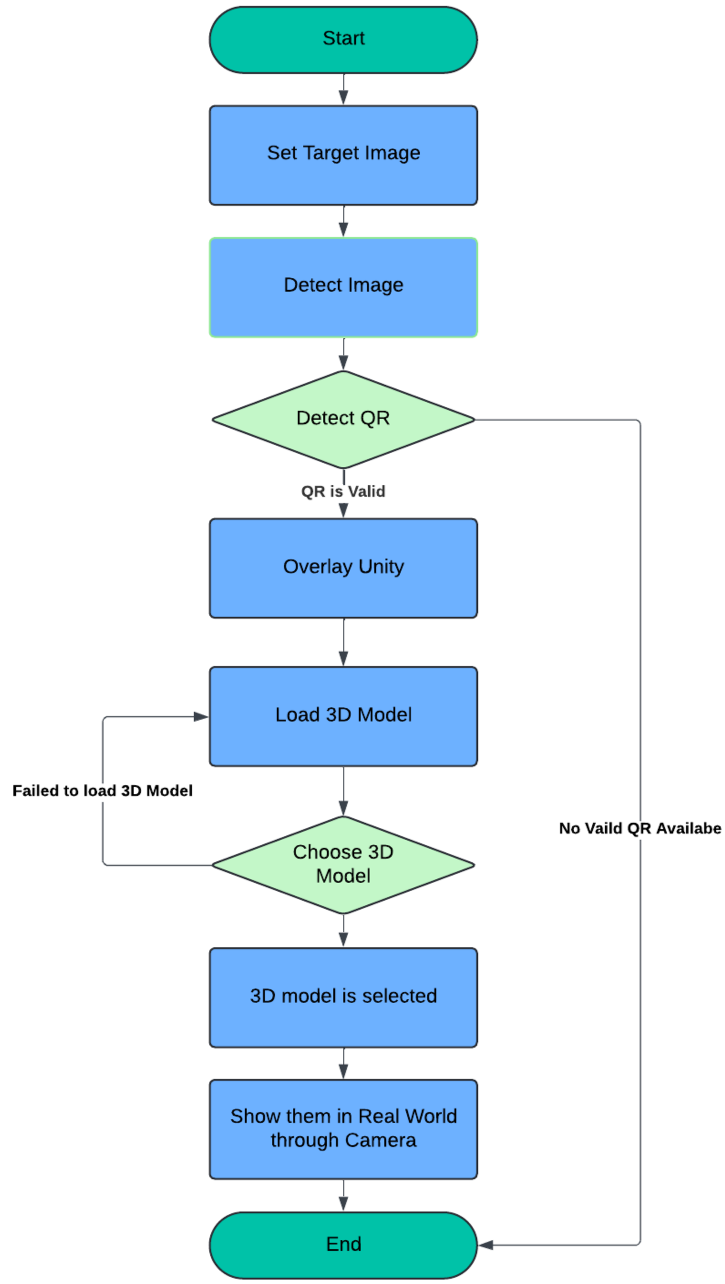


Fig 3.1 Methodology Flowchart

3.1.2 Use Case Diagram

The use case diagram illustrates the primary interactions between the user and the system, AR Accessories Try-On App interactions between the user and the system:

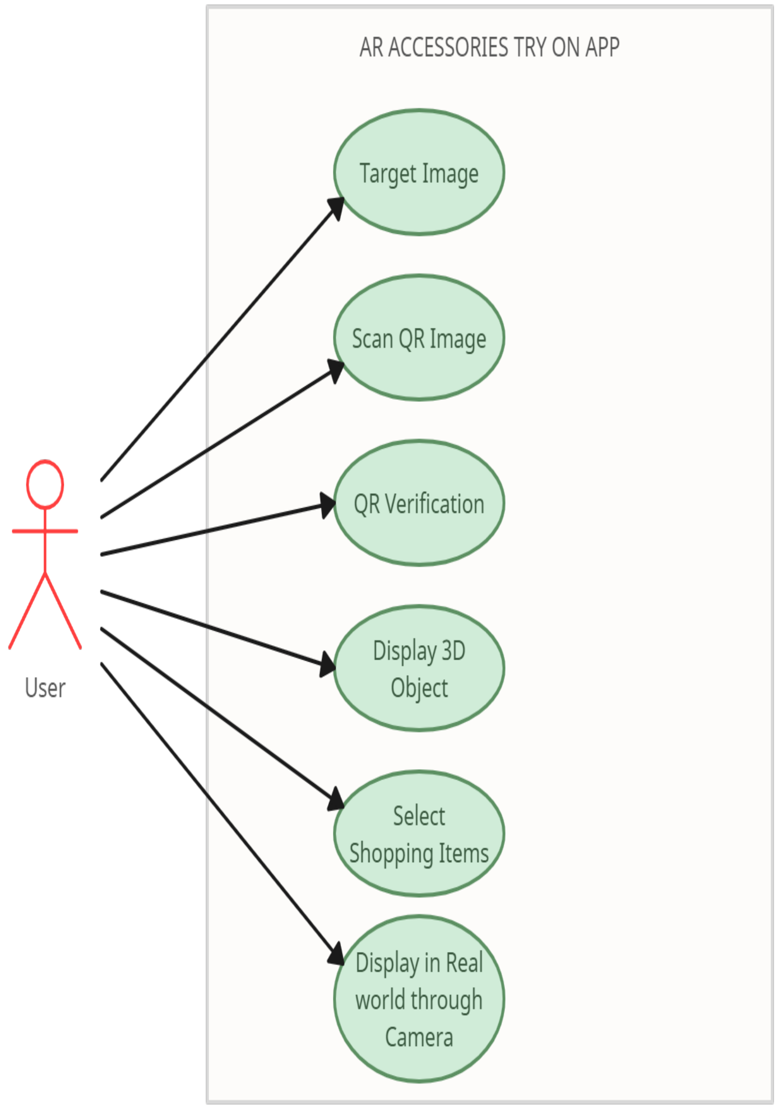


Fig 3.2 Methodology Use Case Diagram

3.2. Image Processing

The first and crucial step in the AR Accessories Try-On App is the detection and recognition of the target image. This process involves several sub-steps:

1. **Set Target Image**: Users select a target image, which serves as a reference for detecting and recognizing objects.

2. **Image Detection**: The app uses Vuforia SDK to detect the target image. Vuforia's algorithms analyze the visual features of the target image to recognize and track it.

3. **Feature Comparison**: The app compares the features of the target image with stored reference data to ensure accurate recognition.

3.3 Overlay of desired product

After recognizing the target image, the app proceeds to overlay the desired product using AR technology:

1. **Load 3D Model**: The selected accessory's 3D model, created and optimized using the Unity game engine, is loaded.

2. **Superimpose Model**: The AR engine superimposes the 3D model onto the recognized target image. This process uses Vuforia's tracking capabilities to maintain the model's position and orientation relative to the target image.

3. **Real-Time Interaction**: The overlay is rendered in real-time, allowing users to interact with it as they move their device around the target image.

3.4 Change of model

Once the desired product is overlayed onto the target image, we can customize the product as per our need.

1. **Customization Options**: The app provides options to change various aspects of the 3D model, such as colour, size, and texture.

2. **Real-Time Update**: Changes made by the user are reflected in real-time, giving immediate visual feedback.

3. **Enhanced Interactivity**: Users can interact with the 3D model by rotating, zooming, and repositioning it to better visualize the accessory.

3.5 Type of AR used.

Marker-based AR—also referred to as image recognition AR—relies on a QR code or visual marker, also known as a fiducial marker, to trigger the interactive experience. A shopper scans the marker with their smartphone camera, activating the visual effects. They can then move their mobile device around the static marker to see the digital image in 3D on their screen

The critical limitation of marker-based AR is it can only be used with mobile devices (i.e., smartphones or tablets), and users may need to download a dedicated app (like Google Play Services for AR for Android devices; Apple iPhone users with iOS 13 or higher have access to built-in AR support).

CHAPTER 4

TESTING

Testing is a vital phase in the development lifecycle of the AR Accessories Try-On App. This phase ensures that the application functions correctly, provides a seamless user experience, and performs efficiently under various conditions. The testing process involved several stages, including unit testing, integration testing, user acceptance testing, and performance testing, each focusing on different aspects of the application to ensure its robustness and reliability.

4.1 Unit Testing

Unit testing is the process of testing individual components or modules of the application in isolation to verify their functionality. For the AR Accessories Try-On App, unit testing focused on key functionalities such as image recognition algorithms, 3D model loading and overlay, user interaction features, and the marker-based AR functionality using the Vuforia SDK.

The image recognition algorithms were tested under various conditions to ensure that the app accurately identifies and processes target images regardless of lighting conditions or backgrounds. The loading mechanism for 3D models was scrutinized to verify that models appear correctly and promptly when triggered. Additionally, the functionality for rotating, scaling, and moving the 3D models was tested to ensure that user inputs are accurately captured and reflected in the application. Finally, the marker-based AR functionality was tested to confirm that the app reliably recognizes and responds to QR codes or other markers, ensuring stability and accuracy.

The results of unit testing were positive, with the app demonstrating high accuracy in image recognition, correct loading and appearance of 3D models, and smooth and responsive user interactions. The marker-based AR functionality also performed reliably across different scenarios. Unit tests were written to validate the behavior of these components under different scenarios, ensuring they perform as expected and handle edge cases gracefully.

4.2 Integration Testing

Integration testing evaluates the interaction and integration between different modules or components of the application. For the AR Accessories Try-On App, this involved ensuring that the Unity game engine correctly interfaces with the Vuforia SDK for AR functionalities, testing the communication between the app's frontend and backend systems, and validating the interaction between user interface elements and backend functionalities.

The integration between Unity and the Vuforia SDK was tested to ensure seamless real-time AR overlay, which worked without any glitches. Data synchronization between the frontend and backend was tested to ensure consistent and reliable data exchange, such as loading models and saving user preferences. Additionally, user interface actions were validated to ensure they correctly trigger the appropriate backend processes, ensuring smooth functionality.

Overall, integration testing confirmed that all components of the application work together harmoniously, delivering the intended functionality without any issues.

4.3 User Acceptance Testing (UAT)

User acceptance testing (UAT) involves evaluating the application's usability, functionality, and user experience from an end-user perspective. A diverse group of users participated in this testing phase to provide comprehensive feedback on the ease of use, functional accuracy, and overall user experience.

During UAT, users were asked to complete various tasks such as selecting a product, scanning a target image, viewing the 3D model, and customizing it. The feedback collected indicated high user satisfaction with the app's ease of use and functionality. Users found the interface intuitive and appreciated the realistic AR overlay provided by the application. Some suggestions for improvement included faster model loading times and additional customization options.

The feedback from UAT was invaluable in identifying areas for improvement and ensuring that the app meets user expectations.

4.4 Performance Testing

Performance testing assesses the app's responsiveness, stability, and resource utilization under various conditions. This phase involved evaluating the app's responsiveness to user interactions, its stability under different network speeds and device specifications, and its usage of CPU, memory, and battery to identify any performance bottlenecks.

The app demonstrated fast response times with minimal latency during performance testing. It remained stable across different devices and network conditions, with no crashes or significant slowdowns. Resource utilization tests showed that the app used system resources efficiently, maintaining low CPU and memory usage and moderate battery consumption.

Performance tests were conducted using profiling tools and real-world usage scenarios to ensure the app delivers a smooth and efficient experience to users.

4.5 Test Results

Overall, the testing process yielded positive results, with the AR Accessories Try-On App demonstrating robust functionality, usability, and performance. Key findings from the testing phase include:

- High accuracy and reliability of image recognition and AR overlay.
- Smooth and responsive user interactions, with minimal latency.
- Positive feedback from user acceptance testing, indicating a satisfying user experience.
- Stable performance across different devices and network conditions.

4.6 Testing Conclusion

The comprehensive testing process for the AR Accessories Try-On App ensured that it meets high standards of functionality, usability, and performance. Unit testing confirmed the reliability of individual components, while integration testing validated the seamless interaction between these components. User acceptance testing provided valuable insights into the user experience, and performance testing ensured the app's efficiency and stability. The positive results from all testing phases indicate that the AR Accessories Try-On App is ready for deployment, offering users an engaging and reliable augmented reality shopping experience.

CHAPTER 5

SOFTWARE USED

5.1 Unity

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Worldwide Developers Conference as a Mac OS X game engine. The engine has since been gradually extended to support a variety of desktop, mobile, console and virtual reality platforms.

5.2 Vuforia

Vuforia is an augmented reality software development kit for mobile devices that enables the creation of augmented reality applications. It uses computer vision technology to recognize and track planar images and 3D objects in real time.

5.3 Visual Studio 2019

Visual Studio 2019 is a software development tool from Microsoft. It's like a workbench for programmers, allowing them to write code in various languages (C#, Unity Apps, Python, etc.) to create websites, mobile apps, and more. It offers features like code completion and debugging to make coding easier. While there's a newer version available (Visual Studio 2022), 2019 is still a good option for many developers.

5.4 VS Code

Visual Studio Code, also commonly referred to as VS Code, is a source-code editor made by Microsoft with the Electron Framework, for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git.

5.5 C#

C# is a general-purpose high-level programming language supporting multiple paradigms. C# encompasses static typing, strong typing, lexically scoped, imperative, declarative, functional, generic, object-oriented, and component-oriented programming disciplines.

CHAPTER 6

FUTURE SCOPE

The AR Accessories Try-On App represents a significant step forward in the realm of augmented reality (AR) shopping applications. As AR technology continues to evolve, there are numerous opportunities to expand and enhance the app's capabilities. This chapter explores potential future developments and improvements that could be implemented to increase the app's functionality, user engagement, and market reach.

One of the primary areas for future development is the incorporation of advanced AR features. Enhancing the realism of 3D models through improved texture mapping techniques can make the virtual try-on experience even more lifelike. Simulating materials such as fabric, leather, and metal with greater accuracy would provide users with a more authentic view of the accessories. Additionally, implementing dynamic lighting and shadows would improve the integration of 3D models into the real-world environment, allowing the models to respond to lighting conditions in real-time, thereby creating a more immersive experience.

Another potential enhancement is the integration of motion tracking capabilities, which would enable users to see how accessories look when they move. This feature is particularly useful for items like watches, bracelets, and shoes, where the appearance and fit during movement are important aspects of the user experience. User interaction can be significantly improved by introducing voice command functionality, which would streamline the user experience and make the app more accessible. Gesture controls could also be incorporated, allowing users to interact with the 3D models through hand movements, providing a more intuitive and engaging way to manipulate virtual accessories. Furthermore, enhancing social media integration would allow users to share their virtual try-on experiences directly from the app, including features like direct posting to social media platforms, live streaming, and the ability to invite friends for virtual shopping sessions.

Expanding the product range to include a wider variety of accessories, such as hats, bags, glasses, and jewellery, could attract a broader user base. Collaborating with fashion brands and retailers to offer exclusive virtual try-ons of their products would increase the app's appeal and market reach. Additionally, offering customizable options for accessories, such as different colour choices, patterns, and sizes, would provide users with a more personalized shopping experience.

To ensure the app's widespread adoption, improving performance and accessibility is crucial. Expanding the app's compatibility to work on various platforms such as iOS, Android, and potentially AR glasses would increase its accessibility. Continuous optimization of the app’s performance to ensure smooth operation on a wide range of devices, including older models, would enhance user satisfaction. Developing features that allow the app to function offline or in low-connectivity environments would make it more reliable and versatile for users in different regions.

Finally, leveraging data analytics and personalization can significantly enhance user engagement. Integrating advanced analytics to track user interactions and preferences would provide valuable insights for improving the app. This data can be used to tailor recommendations and personalize the shopping experience. Implementing artificial intelligence to offer personalized recommendations based on user behaviour, past interactions, and preferences can further enhance user engagement and satisfaction. Creating a feedback loop where users can rate their experiences and provide suggestions for improvement would help in continuously refining the app to better meet user needs.

6.1 Advanced AR Features

1. **Realistic Texture Mapping**: Enhancing the realism of 3D models by incorporating more advanced texture mapping techniques can make the virtual try-on experience even more lifelike. This could involve simulating materials like fabric, leather, and metal with greater accuracy.

2. **Dynamic Lighting and Shadows**: Implementing dynamic lighting and shadows to 3D models will improve their integration into the real-world environment. This will allow the models to respond to lighting conditions in real-time, providing a more immersive experience.

3. **Motion Tracking**: By integrating motion tracking capabilities, the app can allow users to see how accessories look when they move. This would be particularly useful for items like watches, bracelets, and shoes, where the movement is an important aspect of the user experience.

6.2 Enhanced User Protection

1. **Voice Commands**: Introducing voice command functionality could streamline the user experience, allowing users to control the app hands-free. This would make the app more accessible and convenient to use.

2. **Gesture Controls**: Incorporating gesture recognition can enable users to interact with the 3D models through hand movements, providing a more intuitive and engaging way to manipulate virtual accessories.

3. **Social Media Integration**: Enhancing social media integration can allow users to share their virtual try-on experiences directly from the app. This could include features like direct posting to social media platforms, live streaming, and the ability to invite friends for virtual shopping sessions.

6.3 Expanding Product Range

1. **Diverse Accessories**: Expanding the range of accessories available in the app to include a wider variety of items such as hats, bags, glasses, and jewellery can attract a broader user base.

2. **Partnerships with Brands**: Collaborating with fashion brands and retailers to offer exclusive virtual try-ons of their products can increase the app's appeal and market reach.

3. **Customizable Options**: Offering customizable options for accessories, such as different colour choices, patterns, and sizes, can provide users with a more personalized shopping experience.

6.4 Improved Performance and Accessibility

1. **Cross-Platform Compatibility**: Expanding the app’s compatibility to work on various platforms such as iOS, Android, and potentially AR glasses can increase its accessibility.

2. **Performance Optimization**: Continuously optimizing the app’s performance to ensure smooth operation on a wide range of devices, including older models, can enhance user satisfaction.

3. **Offline Functionality**: Developing features that allow the app to function offline or in low-connectivity environments can make it more reliable and versatile for users in different regions.

6.5 Data Analytics and Personalisation

1. **User Behaviour Analytics**: Integrating advanced analytics to track user interactions and preferences can provide valuable insights for improving the app. This data can be used to tailor recommendations and personalize the shopping experience.

2. **AI-Driven Personalization**: Leveraging artificial intelligence to offer personalized recommendations based on user behaviour, past interactions, and preferences can enhance user engagement and satisfaction.

3. **Feedback Loop**: Implementing a feedback loop where users can rate their experiences and provide suggestions for improvement can help in continuously refining the app to better meet user needs.

CHAPTER 7

CONCLUSION

The AR Accessories Try-On App is a pioneering application designed to transform the online shopping experience by utilizing augmented reality (AR) technology. This application enables users to virtually try on a wide range of accessories, such as clothes, shoes, watches, and other fashion items, by overlaying digital images of the selected accessories onto the user's physical environment. The app uses marker-based AR technology, specifically the Vuforia SDK, to detect and recognize target images and overlay 3D models created using the Unity game engine.

The application works by allowing users to select a product from a catalog. Once a product is chosen, users scan a QR code or a visual marker with their smartphone camera. The app then employs Vuforia's image recognition capabilities to detect and recognize the marker. Upon successful recognition, the app superimposes a 3D model of the selected accessory onto the marker. Users can interact with the 3D model in real-time, rotating, scaling, and moving it to get a better view of how the accessory looks from different angles.

The AR Accessories Try-On App includes several key features that contribute to its innovative nature. The app's image recognition algorithms accurately detect and recognize target images, ensuring that the 3D models are correctly overlaid. The 3D model overlay feature provides a realistic and responsive representation of the accessories. Customization options allow users to change colours, sizes, and other attributes of the 3D models in real-time. The user interaction functionalities are smooth and intuitive, making it easy for users to manipulate the virtual accessories. The marker-based AR technology ensures stable and accurate tracking of target images, providing a reliable AR experience.

The application offers numerous benefits to users, enhancing the overall shopping experience. By enabling users to virtually try on accessories, the app provides a more interactive and engaging shopping experience compared to traditional online shopping. This capability allows users to make more informed purchasing decisions by seeing how accessories look on them before making a purchase, reducing the likelihood of returns and increasing customer satisfaction. The convenience of the app eliminates the need to visit physical stores, allowing users to try on accessories from the comfort of their homes. The personalized shopping experience, facilitated by customization options, adds to user satisfaction. Additionally, the app's social sharing features enable users to share their virtual try-on experiences on social media, making shopping a more social activity.

In conclusion, the AR Accessories Try-On App successfully integrates augmented reality technology to offer a revolutionary online shopping experience. By allowing users to virtually try on accessories, customize them in real-time, and interact with realistic 3D models, the app provides an engaging and convenient platform for online shoppers. The positive feedback from testing phases indicates that the app meets high standards of functionality, usability, and performance. As AR technology continues to advance, there is substantial potential for future enhancements, including the incorporation of more sophisticated AR features, expansion of the product range, and improvement of user interaction and personalization. The AR Accessories Try-On App represents a significant innovation in the fashion industry, offering a valuable tool for both consumers and retailers.

CHAPTER 8

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