Vellore Institute of Technology
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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

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PROJECT REPORT

On

WristScape AR

"AN IMMERSIVE AR EXPERIENCE OF BUYING WRIST WATCHES"

Submitted For The Course

CSI4005 – Augmented Reality and Virtual Reality

SLOT: B2+TB2

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ABSTRACT

"WristScape AR" is an innovative project that explores the transformative potential of Augmented Reality (AR) in revolutionizing the process of buying wristwatches. In a rapidly evolving technological landscape, this endeavor aims to seamlessly blend the physical and digital worlds to provide users with an immersive and engaging shopping experience. By harnessing AR technology, the project allows customers to virtually explore and try on a diverse range of wristwatches in a three-dimensional space. This groundbreaking approach transcends traditional online shopping, enabling users to make informed decisions by visualizing how different timepieces complement their style and preferences. The project also integrates real-time product information, interactive customization options, and a comprehensive collection of virtual watches, enriching the user's journey and setting new standards for consumer interaction in the retail space. "WristScape AR" signifies a leap forward in the convergence of technology and retail, offering a glimpse into the future of a more immersive, personalized, and informed wristwatch-buying experience.

INTRODUTION

In the ever-evolving landscape of technology, the convergence of the digital and physical worlds has given rise to transformative experiences. Augmented Reality (AR) stands at the forefront of this revolution, promising to reshape how we perceive, interact with, and make decisions about the objects around us. The project "WristScape AR" ventures into the realm of wristwatches, infusing the act of purchasing timepieces with an immersive AR experience. By blending real-world shopping with virtual exploration, "WristScape AR" sets out to redefine the process of buying wristwatches, offering customers an unprecedented level of engagement and insight.

The Evolution of Shopping and AR

Traditional retail has undergone significant changes with the advent of online shopping, but even this online landscape is rapidly evolving. AR is emerging as a powerful tool that bridges the gap between e-commerce and brick-and-mortar stores. It superimposes digital elements onto the real world, allowing consumers to visualize products within their own

environment before making a purchase. This technology has been particularly successful in industries like furniture, where customers can see how a couch fits in their living room or how a dining table complements their space.

The WristScape AR Approach

"WristScape AR" takes this concept to the world of wristwatches, where aesthetics, size, and fit are crucial considerations. The project aims to revolutionize the way customers explore and select wristwatches, transcending the limitations of traditional online shopping. By leveraging AR technology, customers can try on virtual wristwatches through their smartphone or AR glasses, enabling them to see how a watch complements their personal style, size preferences, and overall appearance.

Immersive Exploration

Imagine being able to try on a wide range of wristwatches from the comfort of your home. "WristScape AR" lets you do just that. With the simple tap of a finger or a voice command, users can browse through a curated collection of wristwatches from various brands. The watches are virtually projected onto the user's wrist through the AR device, allowing them to see how each watch looks and feels as if they were wearing it in real life.

The "WristScape AR" experience is designed to mimic the ambiance of a luxury watch boutique. Users can virtually walk through the digital store, examining watches displayed on elegant stands. Each watch can be interacted with – rotated, resized, and observed from different angles. Users can even change the watch face, strap, and other customizable elements, gaining a comprehensive understanding of the watch's design.

Personalization and Empowerment

"WristScape AR" doesn't just offer a visual experience; it provides information and insights. Users can access detailed specifications, materials, and features of each watch, allowing for informed decision-making. This level of transparency and empowerment in the shopping process is a hallmark of AR's potential in retail.

LITERATURE REVIEW

Various Researches have been done on Augmented Reality and various application has been created in the field of IT sector. Therefore, in this literature survey, we will talk about some of the researches which has already tried AR on objects like Watches, Shoes, Furniture and many more.

1. **PAPER TITLE:** Virtual Try of Watch using Augmented Reality and Image Processing

AUTHORS: Manishankar prasad jaiswal, Sanjay kumar, Arib Rabbani, Manish kumar goit, Arbind kumar Gauro Tula's Institute, Dehradun, Uttarakhand, India

DATE OF PUBLICATION: 05 April 2012

LINK: https://ijisrt.com/assets/upload/files/IJISRT22MAY496_(1).pdf

Findings: In this paper They have explained how to try on 2D watch using AR and image processing. We have explained the technologies and the methodology behind it. The upside of this system is the seamless experiences throughout the cycle of trying out various item in AR environment.Currently, the designed system is confined to a simple application but this system can be used as the basic for a more complex AR system. This type of system can also be integerated into various online shopping stores and users can get a 'Try in AR' whenever they are using a mobile or any devices. So, it is a safe to assume that the market share of AR is going to increase and in such times where a threatful virus has spread across the world.

2. **PAPER TITLE**: AR Watch Try – On Application for Android Devices

AUTHORS: Madan Mohan.M,D. Santhosh Kumar,Ajay.K Assistant Professor,Department of Computer Science Engineering,Nehru Institute of Engineering and Technology Coimbatore.

DATE OF PUBLICATION: Issue No.1 (2021)

LINK: https://philarchive.org/archive/MADAWT

FINDINGS: The main objective of this "Augmented Reality Watch Try-on Application" is to analyze the use of augmented reality to render the watch model in real world. Augmented reality technology that allows the customers to decide and interact the watches with the real world, offering new possibilities for online shopping.

It helps the customer to view and understand the watches for their requirements. Due to this customer will come to know that they can buy watches from whenever and wherever they want. Augmented reality support for watches help in creating many new opportunities for future research to anticipate new ideas in the field of online shopping as customer will get benefit with these types of applications and gives a better understanding and decision making for purchasing a watch in an efficient way. Augmented reality is new evolving technology in the field of computer science and will make us much more helpful than the traditional technologies.

3. **PAPER TITLE:** A comparison study of AR applications versus pseudo-holographic

systems as virtual exhibitors for luxury watch retail stores

AUTHORS: Pedro Morillo , Juan M , Orduña , Sergio Casas , Marcos Fernández1

DATE OF PUBLICATION: 19 February 2019

LINK: https://informatica.uv.es/~pmorillo/papers/pmorillo_ms19.pdf

FINDINGS: In this work, they have developed two multimedia solutions for the creation of virtual exhibitors, and we have carried out a comparative study (based on real users) to measure which system would produce the best impact on users when used as virtual exhibitors in traditional luxury watch retail stores.The results do not show statistically significant differences between the two systems when tests were applied, both obtaining high scores, in particular in both fun experience and difficulty. The order in which the systems were tested did not show any statistically significant difference in any of the groups. The reason for such behavior is that the color and depth perception experienced by users was significantly different between both systems, making the users study again all the options when using the second system.

4. **PAPER TITLE:** Augmented Reality Try-On Watch Application

AUTHORS: Saiprasad Patil, Tushar Minche, Tejas Otari, Satyajeet Gaikwad, Aboli Kerle

DATE OF PUBLICATION: 2, April 2022

LINK: https://ijarsct.co.in/Paper3164.pdf

FINDINGS: The main purpose of this "Augmented Reality Watch Try-On Application" is to analyse the use of augmented reality to render watch models in the real world. Augmented reality technology, which allows customers to set watches and interact with the real world, offers new opportunities for online shopping. It helps the customer to visualize and understand the

watches for their needs. This lets customers know that they can buy watches anytime, anywhere. Augmented reality support for watches will help in creating many new opportunities for future research to evaluate new ideas in the field of online shopping as the customer will be able to benefit from these types of applications and purchase watches in an efficient

manner. Helps in better understanding and decision making. , Augmented reality is a newly emerging technology in the field of computer science and it is much more helpful to us than traditional technologies.

In this paper they have explained how to try the 3D watch model using AR. We explained the technology and method behind it. The advantage of this system is a smooth experience. Throughout the cycle of trying different objects in the AR environment. Unlike traditional systems, AR offers additional benefits.

5. **PAPER TITLE:** SHECS: A Local Smart Hands-free Elderly Care Support System on Smart AR Glasses with AI Technology

AUTHOR: Donghuo Zeng; Jianming Wu; Bo Yang; Tomohiro Obara; Akeri Okawa; Nobuko Iino; Gen Hattori; Ryoichi Kawada; Yasuhiro Takishima

DATE OF PUBLICATION:2021

LINK: https://ieeexplore.ieee.org/document/9666085

FINDINGS:

"SHECS" is an acronym for "Smart Hands-free Elderly Care Support System." It refers to a local assistance system designed for elderly individuals, integrated into Smart Augmented Reality (AR) Glasses. These glasses are equipped with advanced AI (Artificial Intelligence) technology. The primary purpose of SHECS is to provide hands-free support to the elderly in various aspects of their daily lives. The system utilizes AI to offer real-time assistance, enhancing the quality of care and support

received by elderly individuals. By leveraging the capabilities of Smart AR Glasses and AI, SHECS aims to improve the elderly's independence, safety, and overall well-being.

6. **PAPER TITLE:** An AR Inspection Framework: Feasibility Study with Multiple AR Devices

AUTHOR: Perla Ramakrishna; Ehtesham Hassan; Ramya Hebbalaguppe; Monika Sharma; Gaurav Gupta; Lovekesh Vig; Geetika Sharma

DATE OF PUBLICATION:2016

LINK: https://ieeexplore.ieee.org/document/7836501

FINDINGS:

The research paper titled "An AR Inspection Framework: Feasibility Study with Multiple AR Devices" investigates the viability of an Augmented Reality (AR) Inspection Framework across various AR devices. The study assesses the effectiveness of this framework in enhancing inspection processes. By evaluating its performance on multiple AR devices, the research gauges the framework's adaptability and potential real-world applications. The findings contribute valuable insights into the feasibility and practicality of employing AR for inspection purposes, offering a foundation for further development and implementation in various industries.

7. **PAPER TITLE:** Wearable smart multimeter equipped with AR glasses based on IoT platform

AUTHOR: Kun Xia; Tianci Tang; Zheng Mao; Zihan Zhang; Hanfei Qu

DATE OF PUBLICATION:2020

LINK: https://ieeexplore.ieee.org/document/9234764

FINDINGS:

This research paper introduces a novel concept of a wearable smart multimeter integrated with augmented reality (AR) glasses, leveraging the capabilities of the Internet of Things (IoT) platform. The system aims to enhance the efficiency and convenience of electrical measurements and troubleshooting tasks. The wearable smart multimeter is designed to be comfortably worn by technicians or engineers and is wirelessly connected to an IoT platform. The AR glasses provide real-time visual

guidance by overlaying measurement data and instructions onto the technician's field of view. This integration of AR technology with a multimeter allows for hands-free operation and instant access to relevant information. The IoT platform enables remote monitoring, data storage, and collaboration, making it possible to troubleshoot and analyze electrical issues more effectively. Overall, this research explores the fusion of wearables, AR, and IoT in the field of electrical measurements, offering potential improvements in productivity and accuracy for professionals in various industries.

8. PAPER TITLE: A STUDY ON CUSTOMER PERCEPTION AND PURCHASE INTENTION TOWARDS SMARTWATCH

AUTHORS: Ms. S. Magdalene, Dr. P. Jona Jenifer

LINK: https://ijcrt.org/papers/IJCRT2304251.pdf

FINDINGS:

An innovative device that was introduced recently is the smart watch. A smart watch is a wearable device that provides functionality beyond basic time keeping which is similar to a wristwatch. Many sensors, including accelerometers, gyroscopes, and optical heart rate sensors, are frequently included in smart watches, which can wirelessly connect to smartphones. There are several manufacturers producing a selection of smart watch models to fit different uses and pricing points. The study's goal is to examine consumer perspective towards smart watches and their intent to purchase them. A questionnaire was used to collect information for

this primary research study from a sample of 100 respondents. The research design used for this study was descriptive research and simple Random sampling method is adopted for the sample collection. The tools used for the study was Chi-square test and Spearman’s rank correlation coefficient. The study concludes that customer perspective and purchase intent towards smart watch is highly positive.

There is a significant relationship between Age and Level of Agreement for Smart Watch.

There is a significant relationship between Income level and Price preference for Smart Watch.

Spearman's Rank Correlation Coefficient, rs is 0.225 and 0.244. It indicates a positive association between the variables at 5% level of significance. It concluded that, the factors such as design and comfort are influencing to purchase smart watch

9. **PAPER TITLE:** Watch Try on using Augmented Reality

AUTHORS: Prateek Singh, Prof. Ajay Kaushik

LINK: http://www.ijmtst.com/volume6/issue12/80.IJMTST0612267.pdf

FINDINGS: In this paper we have explained how to try on 3D watch models using AR. We have explained the technologies and the methodology behind it. The upside of this system is the seamless experience throughout the cycle of trying out various items in AR environment. Unlike the traditional systems AR provides added advantages. Currently, the designed system is confined to a simple application but this system can be used as the basis for a more complex AR system. We are currently using 3 models, these can also be replaced by an inventory. This type of system can also be integerated into various online shopping stores and users can get a "Try in AR" whenever they are using a mobile or any other such computable device.

So, it is safe to assume that the market share of AR is going to increase and in such times where a threatful virus has spread across the world, we realize the importance of online shopping and user experience on the platform.

10. **PAPER TITLE:** WatchAR: 6-DoF Tracked Watch for AR Interaction

AUTHORS: Zhixiong Lu, Yongtao Hu, Jingwen Dai

LINK: Link

FINDINGS: AR is about to change how people observe and interact with the world. Smart wearable devices are widely used, their input interfaces, like button, rotating bezel, and inertial sensors are good supplementary for interaction. Further 6-DoF information of these wearables will provide richer interaction modalities. We present WatchAR, an interaction system of 6-DoF trackable smartwatch for mobile AR. Three demos demonstrate different interactions: Air Hit shows a way to acquire 2D target

with single hand; Picker Input shows how to select an item from a list efficiently; Space Fighter demonstrates the potential of WatchAR for interacting with a game.

An efficient and intuitive interaction system of 6-DoF trackable smartwatch for mobile AR. We explored different interaction possibilities by presenting three unique demos. In future work, we will explore other interaction modalities, look for ways to reduce fatigue, explore single handed input as well as further miniaturize the prototype.

ADVANTAGES OF "WristScape AR"

1. Personalized Exploration: Users can discover watches that resonate with their personal style and preferences.

2. Accurate Sizing: Visualizing watches on their wrist helps users determine the ideal size and fit, eliminating the uncertainty of online purchases.

3. Enhanced Engagement: The immersive AR experience elevates customer engagement, making the shopping process more enjoyable.

4. Informed Choices: Detailed information empowers customers to make well-informed decisions.

5. Global Access: "WristScape AR" transcends geographical barriers, allowing customers worldwide to access the same experience

What Problem it solves?

1. It gives the user an immersive experience of 'seeing-before-buying' through the Augmented Reality technology embedded into the app. This app is an idea which the 'Wrist watch' companies or other industries might use in the future to market their products to the public by giving them a life-like experience of the product before they actually buy it.
2. It also solves one more problem which is following the COVID protocols, this app would help avoid the unnecessary over touching and trying of wrist watches at markets and shops. You can first see it visually on your wrist and if you like it then try it and wear it.

NOVELTY OF THE APP

1. It consumes less space compared to other AR apps. This is because of the cloud platform echoAR which helps us by rendering and augmenting the 3D models directly into the app rather than locally storing them.
2. Helping through COVID situations by making people avoid unnecessary touching and trialing of wrist watches on their hands.
3. Providing a newer marketing experience to the companies for the users.

Technologies Used

1. Unity Engine
2. EchoAR
3. Vuforia
4. ARCore
5. ARkit
6. C#

Algorithm

The choice of algorithms for an Augmented Reality (AR) project on a smartwatch depends on the specific requirements and functionalities you aim to implement. Here are some key algorithms commonly used in AR development, and they can be adapted for use in a smartwatch AR project:

1. Camera Calibration:

Algorithms like Zhang's camera calibration algorithm are often used to calibrate the smartwatch camera. This is crucial for accurate tracking and registration of virtual objects.

2. Feature Detection and Tracking:

Feature detection algorithms, such as the Scale-Invariant Feature Transform (SIFT) or Speeded Up Robust Features (SURF), are employed for identifying and tracking key

points in the real-world environment. This is essential for maintaining the alignment between the virtual and real worlds.

3. **Pose Estimation:**

Pose estimation algorithms, like PnP (Perspective-n-Point) algorithms or iterative closest point (ICP) algorithms, help determine the position and orientation of the smartwatch camera in relation to the real-world scene.

4. **Object Recognition:**

For object recognition in AR, algorithms like Haar cascades or deep learning-based approaches using Convolutional Neural Networks (CNNs) can be applied. These algorithms help in identifying and tracking specific objects or markers in the environment.

5. **Spatial Mapping:**

Algorithms for spatial mapping, such as Simultaneous Localization and Mapping (SLAM), are crucial for mapping the physical environment and placing virtual objects within it. SLAM algorithms help the AR system understand the space around the smartwatch.

6. **Rendering and Graphics:**

Graphics algorithms, including rendering techniques like OpenGL ES or Vulkan, are used for displaying virtual objects on the smartwatch screen. Efficient rendering is crucial for maintaining a smooth and responsive AR experience.

7. **Gesture Recognition:**

Gesture recognition algorithms, such as Hidden Markov Models (HMMs) or machine learning-based approaches, are applied to interpret user gestures and interactions with the smartwatch for controlling the AR experience.

8. **Collision Detection:**

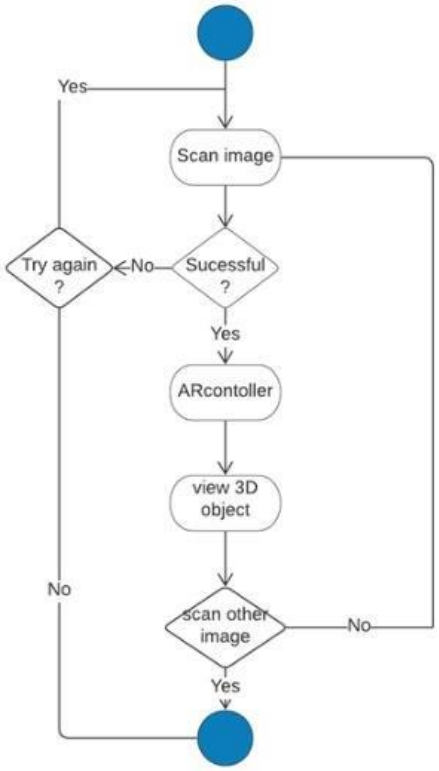
Algorithms for collision detection, such as bounding volume hierarchies (BVH) or spatial partitioning, are essential for ensuring that virtual objects interact correctly with the physical environment.

Future Enhancements

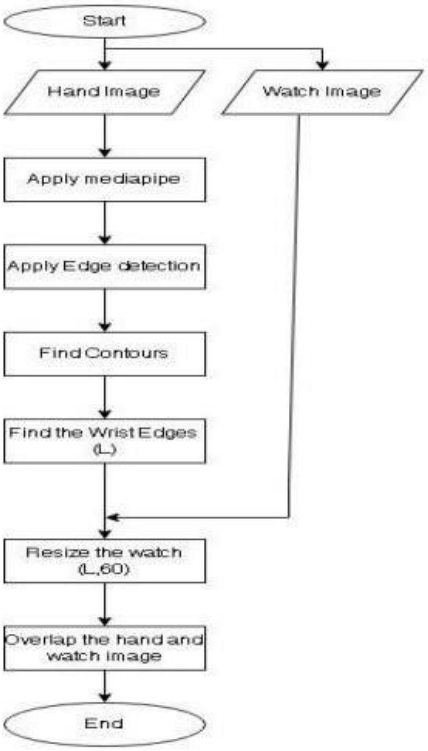
- Use Unity's manmotion and hand wrist tracking to overlay the augmented model on the wrist perfectly.
- Build a complete shopping app where users can select more watches and try them out virtually.
- Make a Web based platform of the same idea using the WebXR of echoAR Make the app more user-friendly and appealing.
- Add the functionality of changing the colors, size and shape of the bands of the wrist watches.

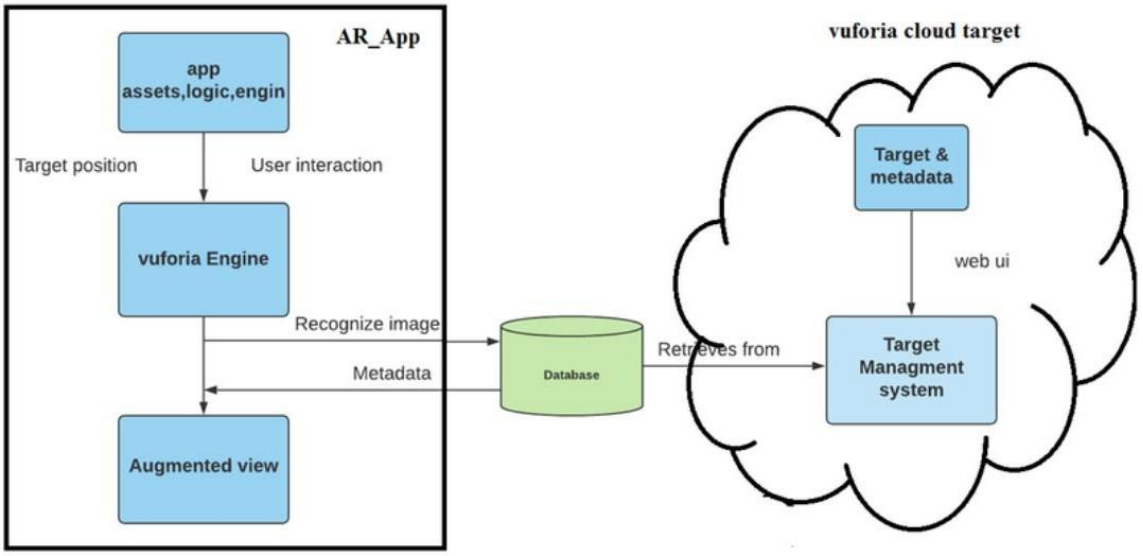
DESIGN DIAGRAMS

ACTIVITY DIAGRAM



FLOW CHART

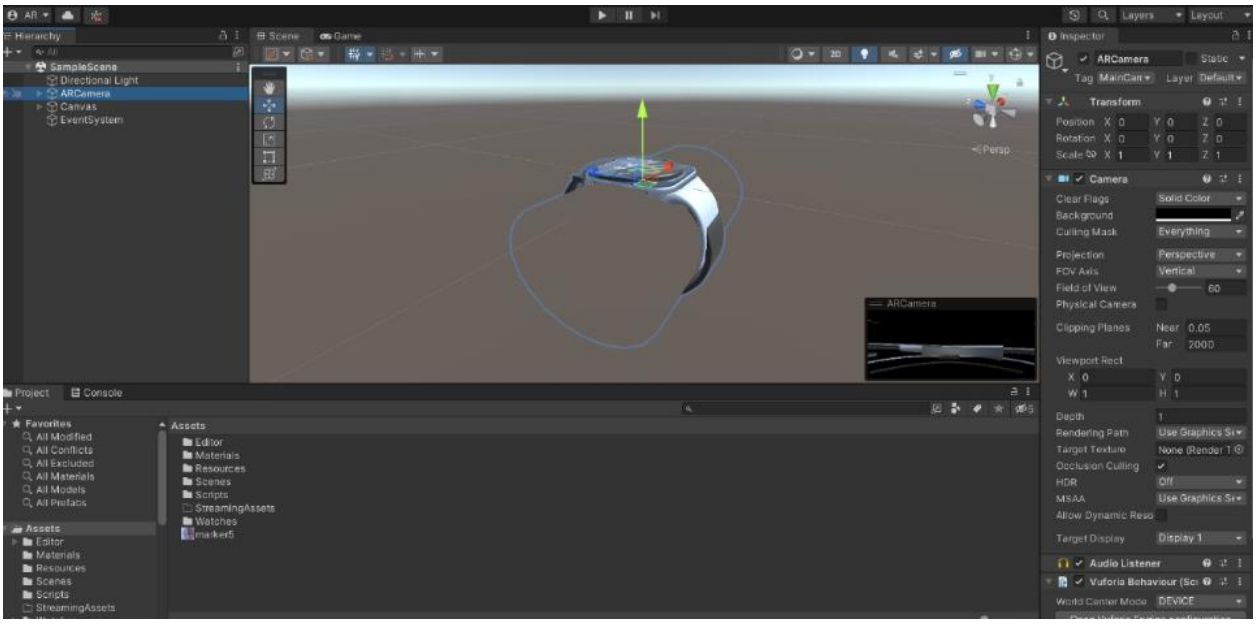


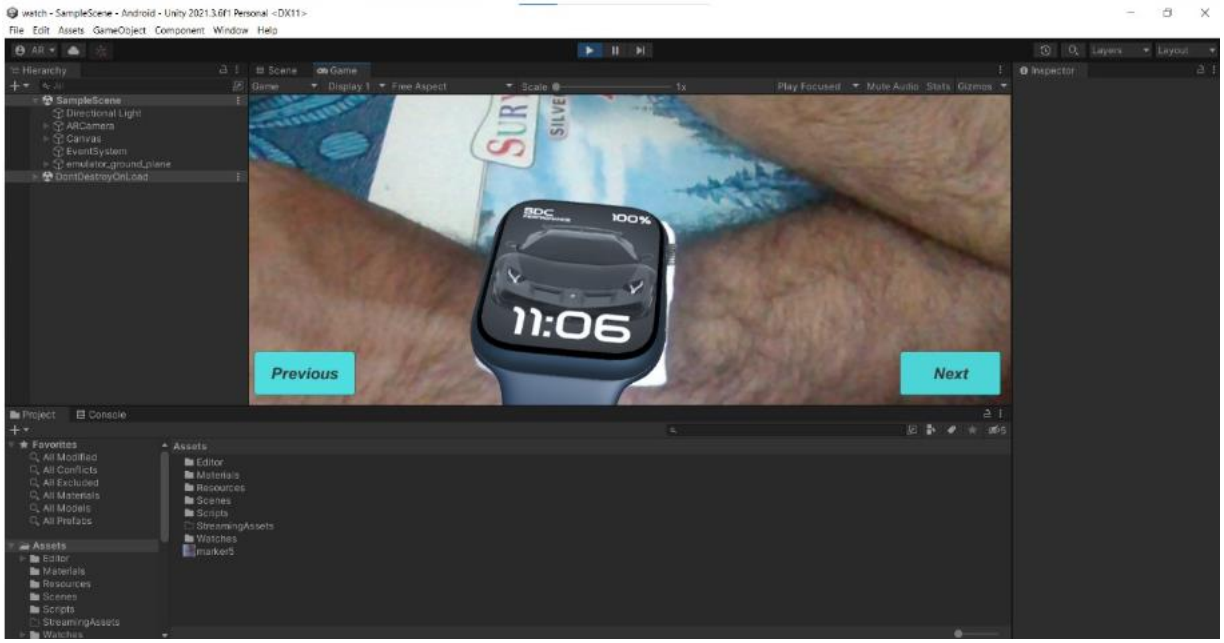


FIDUCIAL MARKERS(INPUT):

OUTPUT:

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class Menu : MonoBehaviour
{
	public GameObject[] watches;
	private int currentWatch = 0;

	public void nextWatch()
	{
		for(int i =0; i<watches.Length; i++)
		{
			watches[i].gameObject.SetActive(false);
		}


		currentWatch++;
		if(currentWatch == watches.Length)
		{
			currentWatch = 0;
		}
		watches[currentWatch].gameObject.SetActive(true);
	}

	public void backWatch()
	{
		for(int i =0; i<watches.Length; i++)
		{
			watches[i].gameObject.SetActive(false);
		}
		currentWatch--;
		if(currentWatch == -1)
		{
			currentWatch = watches.Length-1;
		}
		watches[currentWatch].gameObject.SetActive(true);
	}
}
```

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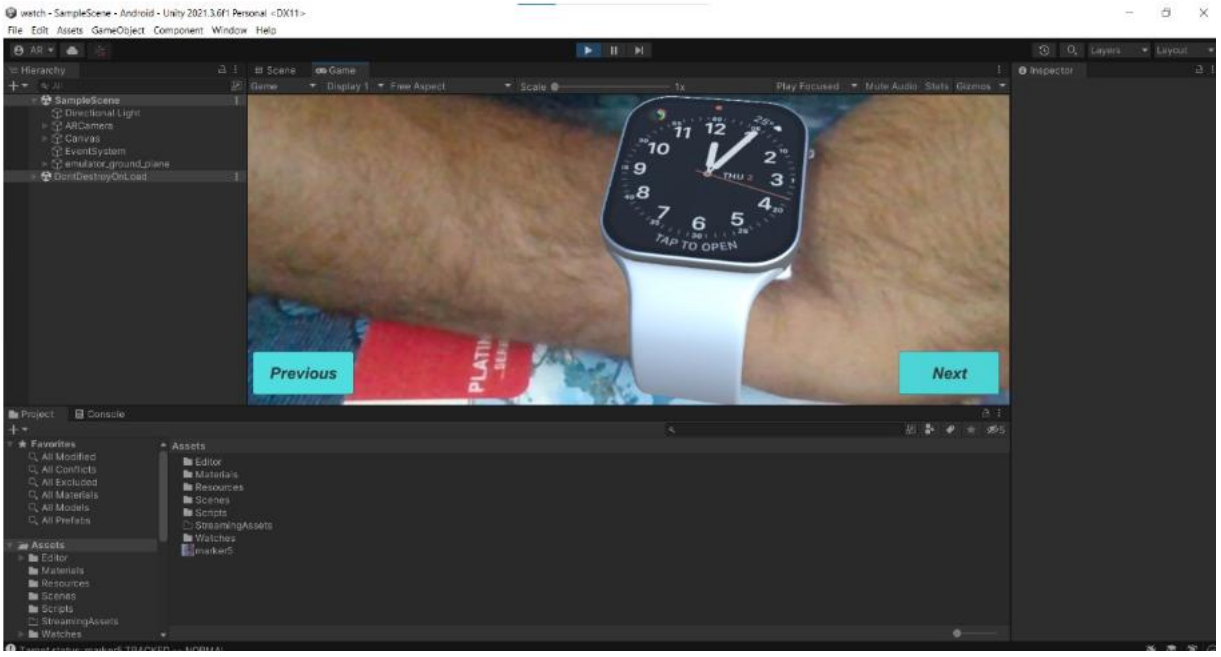
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