

Marathwada Mitra Mandal's
COLLEGE OF ENGINEERING, PUNE
Accredited with 'A' Grade by NAAC, Recipient of "Best College Award 2019" by SPPU

Department of Computer Engineering
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Working Manual of

Virtual try-on system for watches using augmented reality.

Project Members:

- 1) Ankita Prakash Bhikule : B150454210
- 2) Pooja Pandurang Ganeshkar: B150454236
- 3) Kajol Pandurang Kumbhar: B150454272
- 4) Prasad Madhav Nimse: B150454289

Domain Name: Augmented Reality.

Internal Guide name: Prof. Swati Shekapure

External Guide Name: Raviraj Bagale

Parameters of the Project:(Environment/Ethics/Cost/Safety):

Unity:-

Unity is excellent for cross-platform development. The assets store is also reportedly great when compared to other platforms

Vuforia Engine :-

Vuforia Engine makes placing AR content in an environment easy and versatile with its wide range of target options – with their newest release enhancing the popular Model Target feature

Justification for deciding parameters:

Classification of Project:(Product based/ Industry Based/ Research Based/ Application Based/Survey based):Application

Justification for classification: Gives real time experience and less time consuming

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1.Idea of the project :-

In this, we present a system that enhances the visualization of customized watches using augmented reality techniques. Instead of viewing yourself in a real mirror, sophisticated 3D image processing techniques are used to verify the appearance of new watches. A single camera captures the person and outputs the mirrored images onto a large display which replaces the real mirror. Computer graphics models of the watches are augmented into the video such that the person seems to wear the virtual watches. Virtual try-on applications make it possible for buyers to watch themselves wearing different watches without physically trying on them. Within couple of seconds a virtual Watch appears above the place holder on user phone screen. Now user can examine the watch from a variety of angles, and tapping the one icon on the screen lets you know more about the watch. This feature puts list of AR watches at user's finger tips for purchase. The rapid and ever-increasing growth of online shopping is leaving traditional pattern. AR watch showed a potential where customer interact with or see how it might fit them

2.Tools and Technologies Used:-

1.Game Engine :

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as a Mac OS X-exclusive game engine. As of 2018, the engine had been extended to support more than 25 platforms.

Texture

3D-Modeling

Scripting

Animation

2. Blender:

Blender is a free and open-source 3D computer graphics software toolset used for creating animated films, visual effects, art, 3D printed models, motion graphics, interactive 3D applications, virtual reality and computer games.

Texture

3D-Modeing

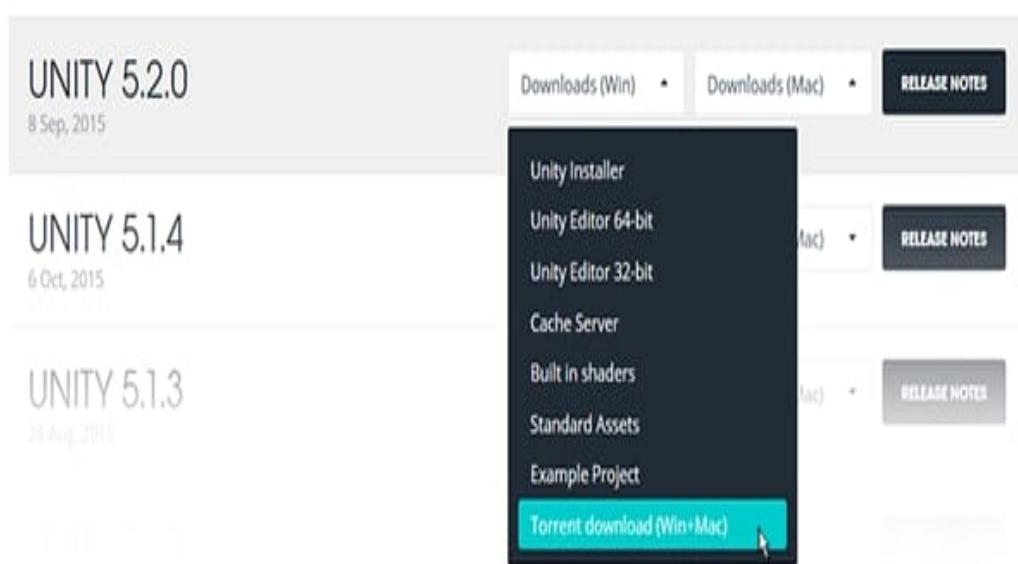
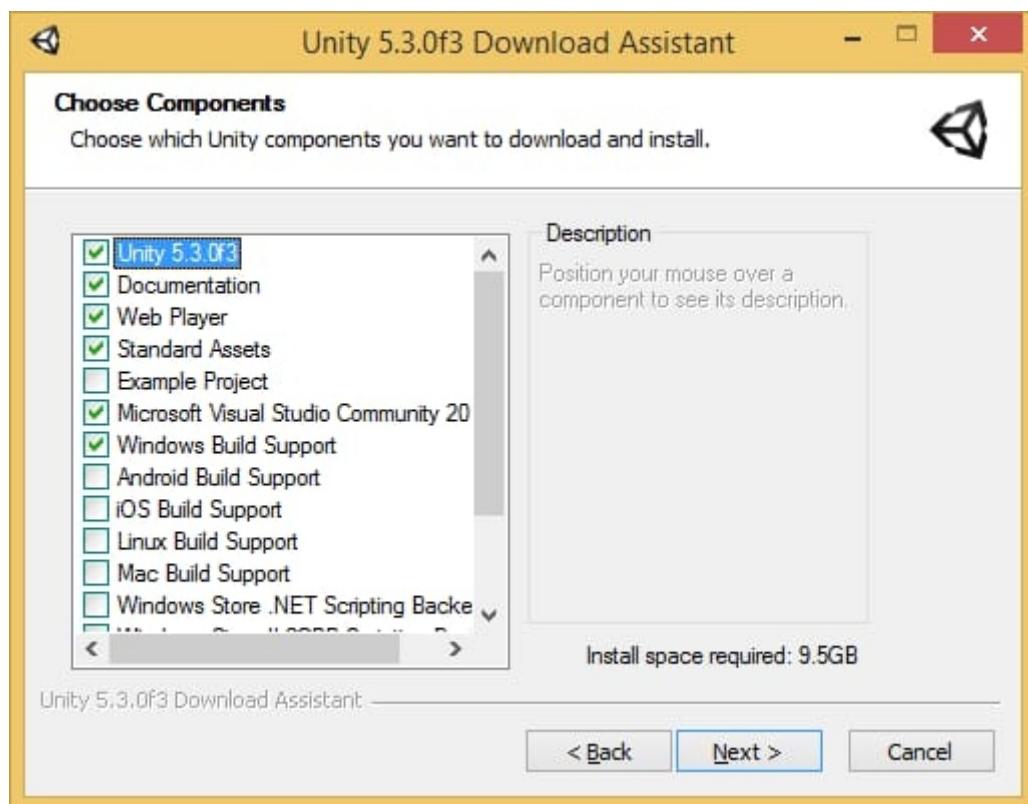
Animation

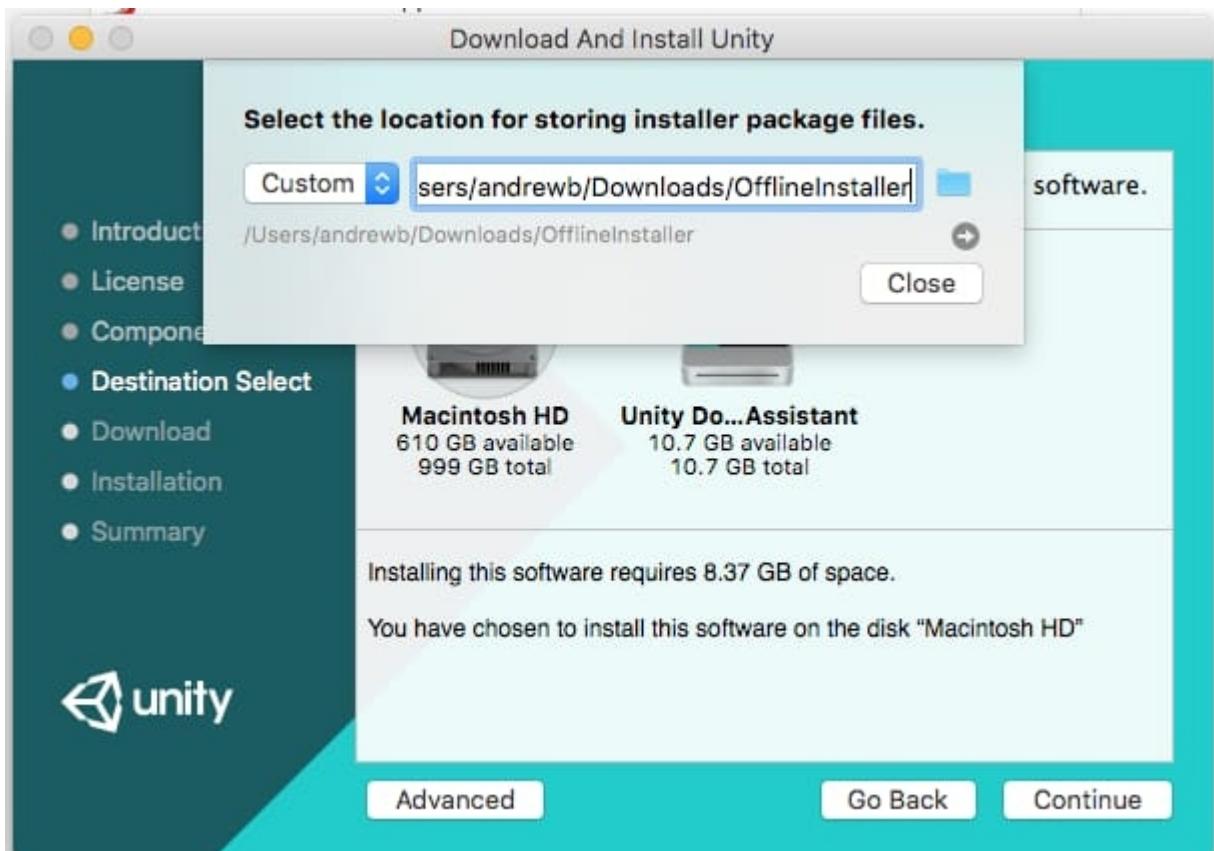
3. Microsoft Visual Studio:

C# (pronounced "see sharp") is a computer programming language. It is developed by Microsoft. It was created to use all capacities of .NET platform.

3. Installation steps with screenshots:-

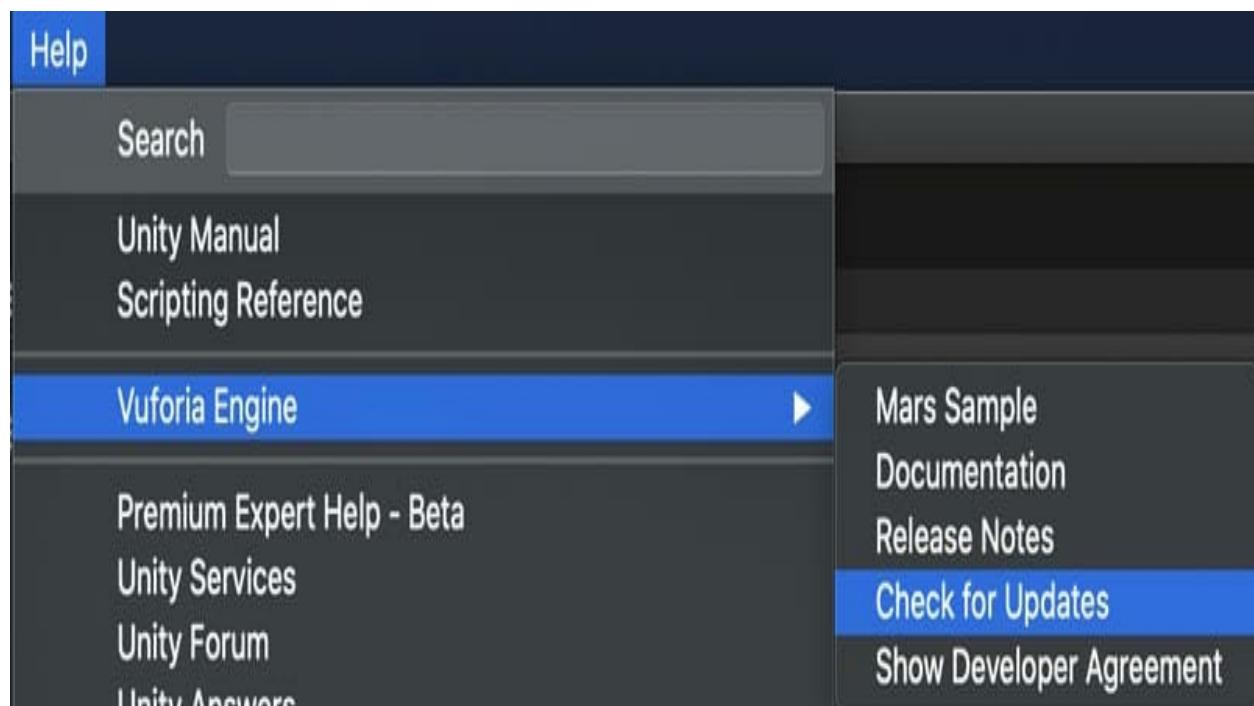
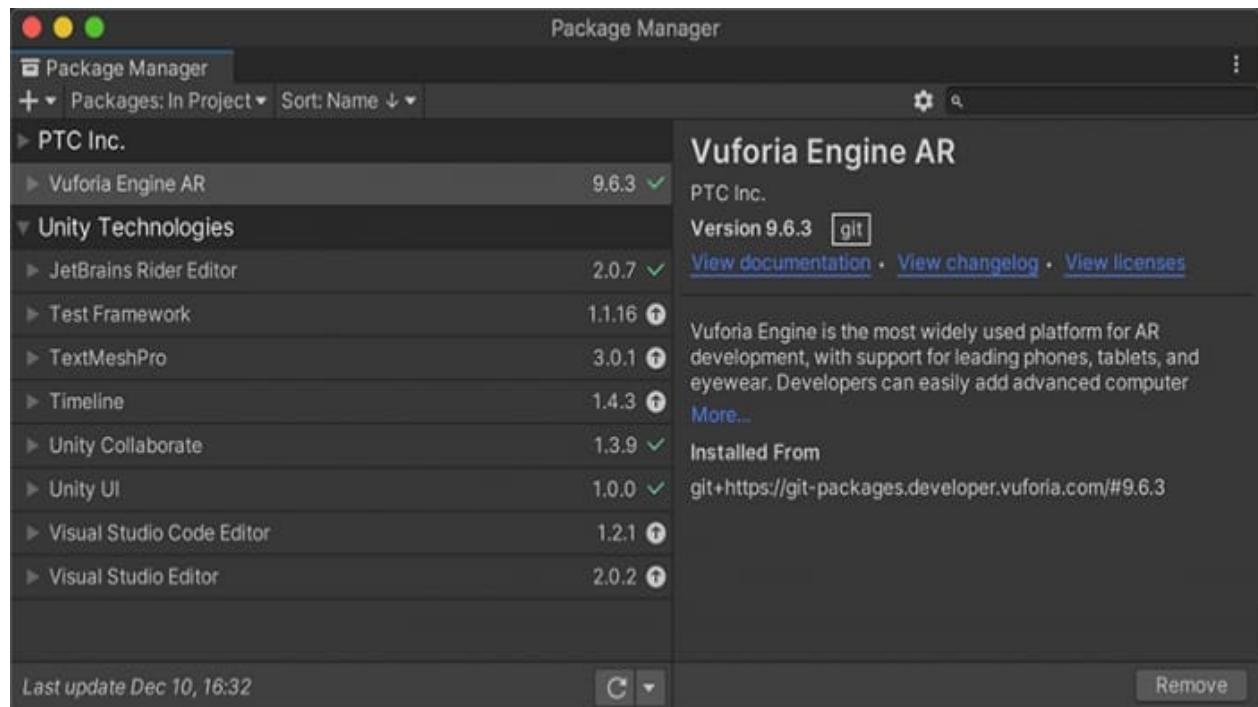
3.1 Unity Installation:-





```
install.sh *  
1#!/bin/sh  
2  
3# Run this script to automatically install or reinstall all packages,  
4# as it's performed by the Unity Download Assistant.  
5# Needs to be run with superuser permissions.  
6  
7/usr/sbin/installer -pkg "Unity.pkg" -target "/" -verbose || exit 1  
8/usr/sbin/installer -pkg "Documentation.pkg" -target "/" -verbose || exit 1  
9/usr/sbin/installer -pkg "StandardAssets.pkg" -target "/" -verbose || exit 1  
10/usr/sbin/installer -pkg "Examples.pkg" -target "/" -verbose || exit 1  
11/usr/sbin/installer -pkg "UnitySetup-Android-Support-for-Editor-5.4.0b8.pkg" -target "/" -verbose || exit 1  
12/usr/sbin/installer -pkg "UnitySetup-iOS-Support-for-Editor-5.4.0b8.pkg" -target "/" -verbose || exit 1  
13/usr/sbin/installer -pkg "UnitySetup-WebGL-Support-for-Editor-5.4.0b8.pkg" -target "/" -verbose || exit 1  
14
```

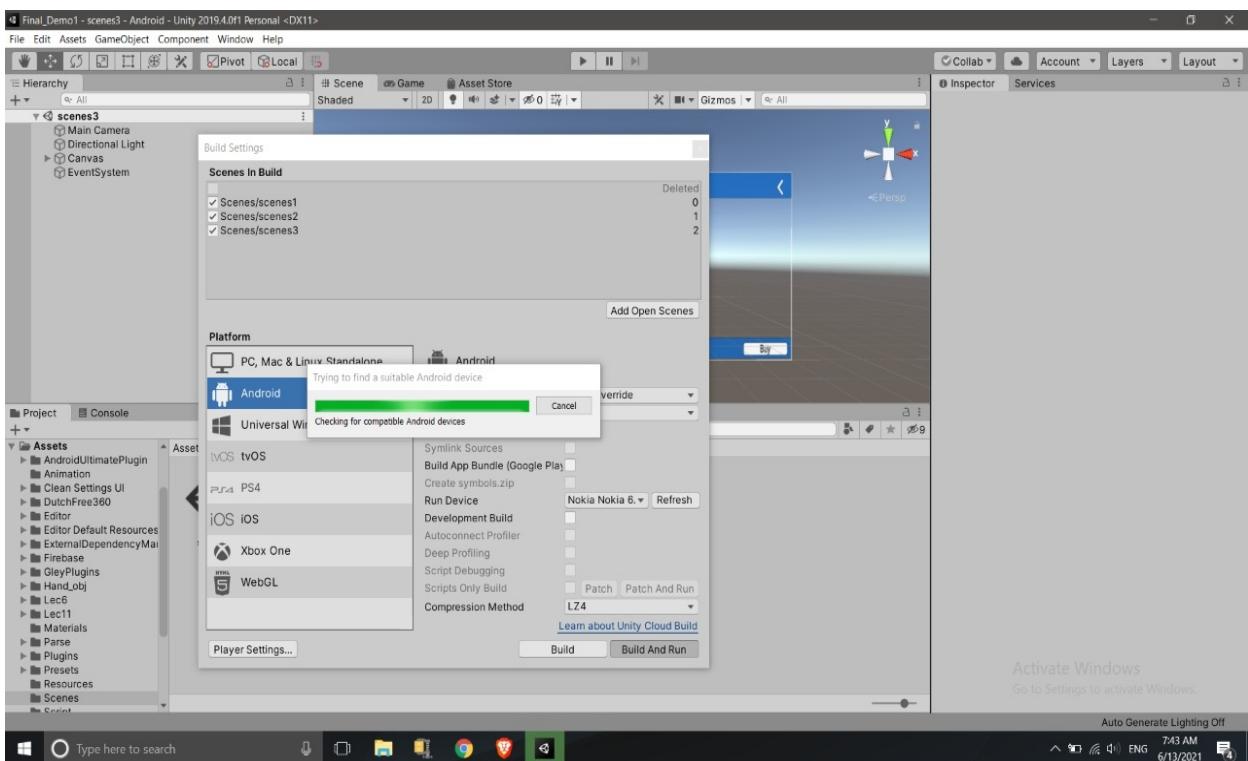
3.2 Vuforia Engine :-

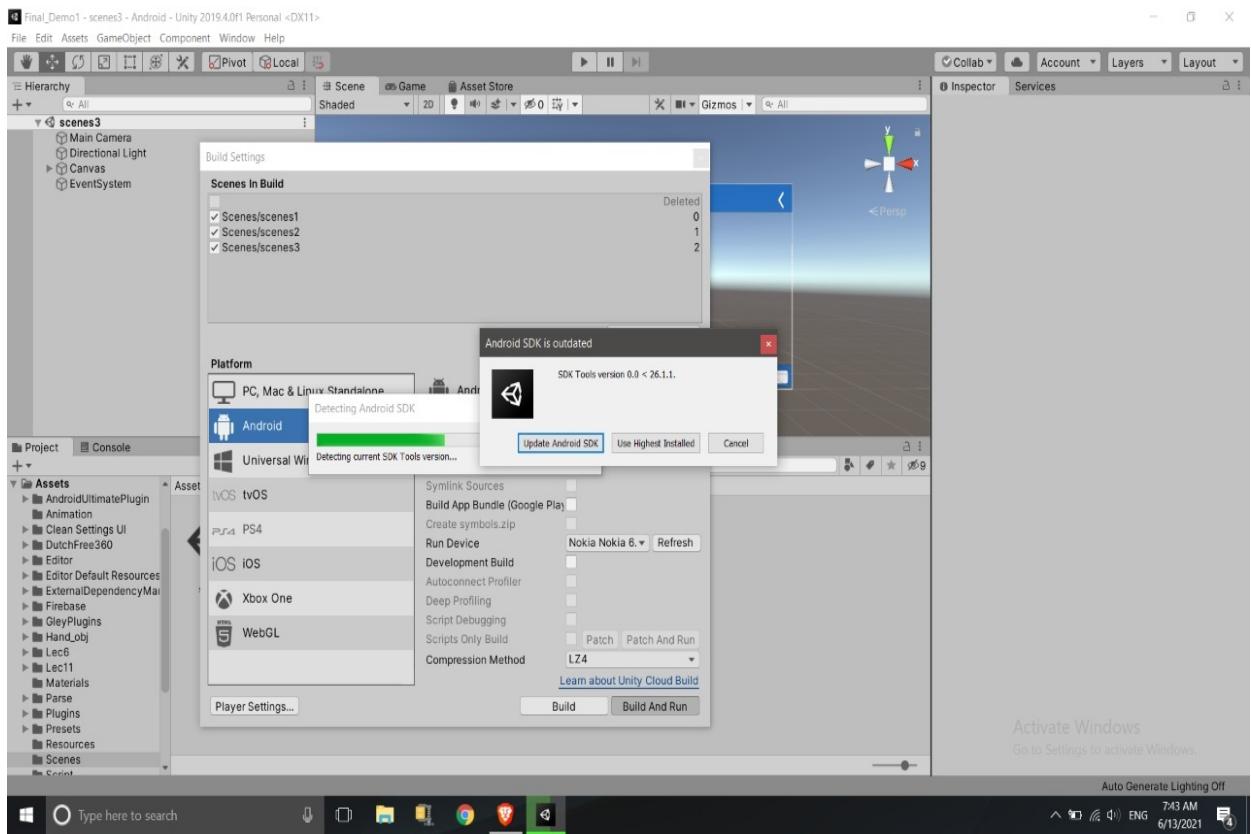






3.3 Android Build:-





4. Document related to project purchase including expenditure of project:-

Design –The Design category refers to the way in which the watches are presented to the user which provides look and feel .

- Ease of use - The perception of ease of use can positively affect the perception of enjoyment, the perceived usefulness and the attitude towards the use of learning objects in AR.

- Usefulness - Without actually going outside the user can try watches at home also so it will not be time consuming and will be useful.AR increases engagement and interaction and provides a richer user experience

- Attitude - Attitude towards the use of system is user like the way in which watches are presented to them

5.List of project modules and brief description of each:-

5.1 Registration Process:-

By taking necessary fields such as email id , username and password one can get register into the system.

5.2 Login :-

If the username and password are valid the user can login into the system.

5.3 Try On Window:-

Instead of viewing yourself in a real mirror, sophisticated 3D image processing techniques are used to verify the appearance of new watches. A single camera captures the person and outputs the mirrored images onto a large display which replaces the real mirror. Computer graphics models of the watches are augmented into the video such that the person seems to wear the virtual watches. Virtual try-on applications make it possible for buyers to watch themselves wearing different watches without physically trying on them. Within couple of seconds a virtual Watch appears above the place holder on user phone screen. Now user can examine the watch from a variety of angles, and tapping the one icon on the screen lets you know more about the watch.

5.4 Filtering Watches:-

Filter function is used to choose the watch depending on parameters such as price, company of the watch etc.

5.5 Add To Cart:-

Add to Cart is a way to create a temporary list of items by adding them to your cart, which will keep track of the items until you leave our website. You can export items in your cart by saving the list to a file

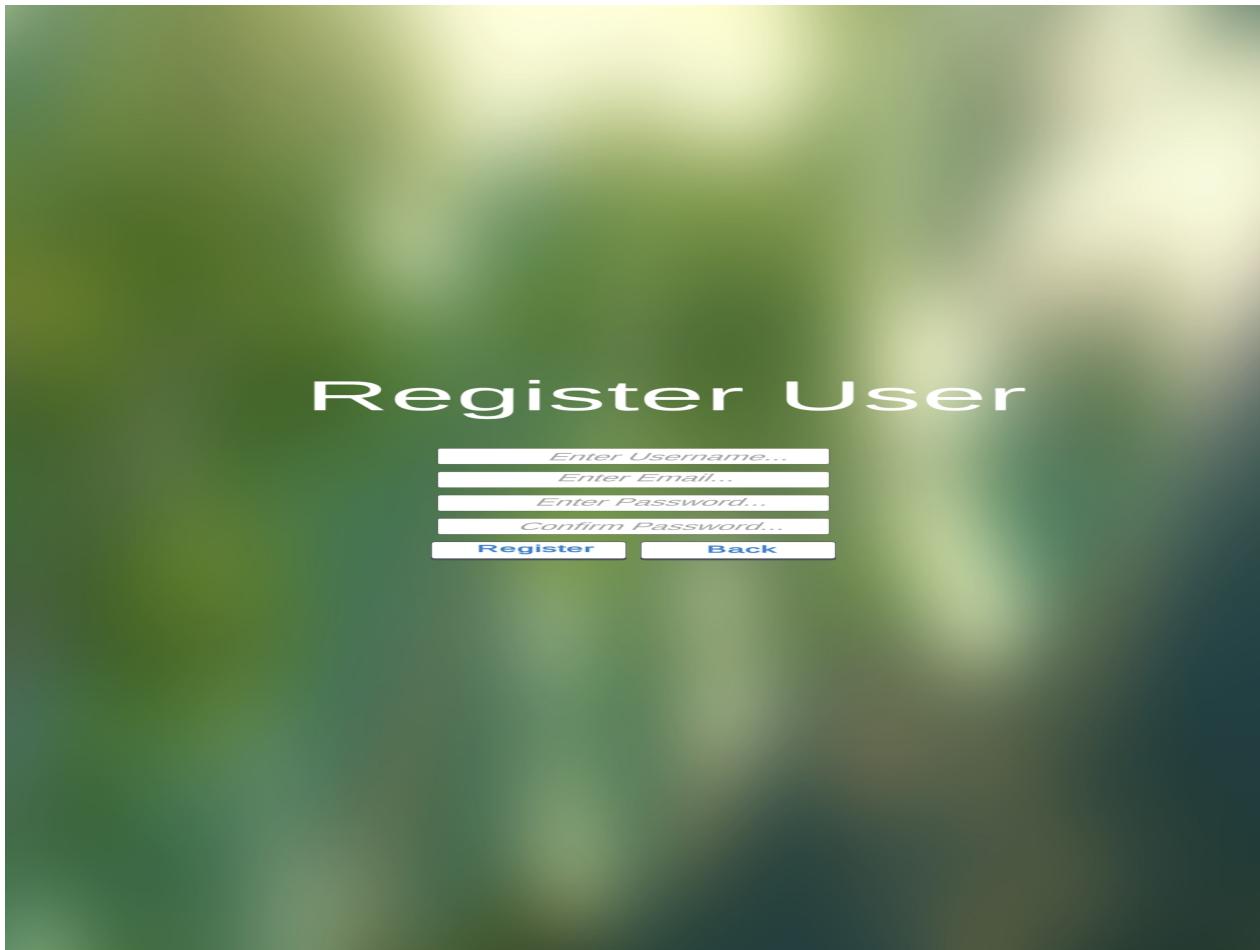
5.6 Buy Watch:-

A payment is the voluntary tender of money or its equivalent or of things of value by one party (such as a person or company) to another in exchange for goods, or services provided by them, or to fulfill a legal obligation the use of money, cheque, or debit, credit or bank transfers.

5.7 Logout:-After completion of whole process by clicking on logout button user can logout from the system.

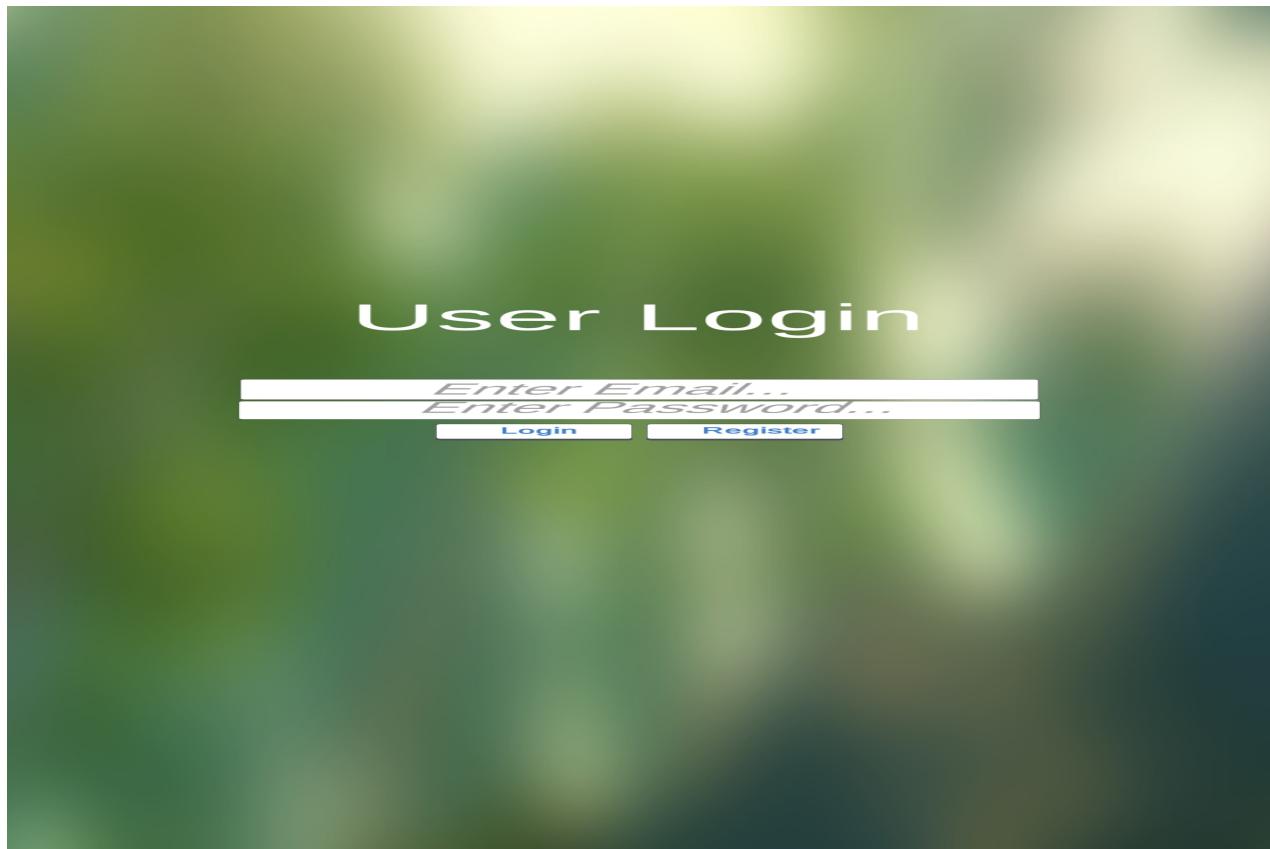
6.Working of every module with output and screenshots:-

Registration Process:-

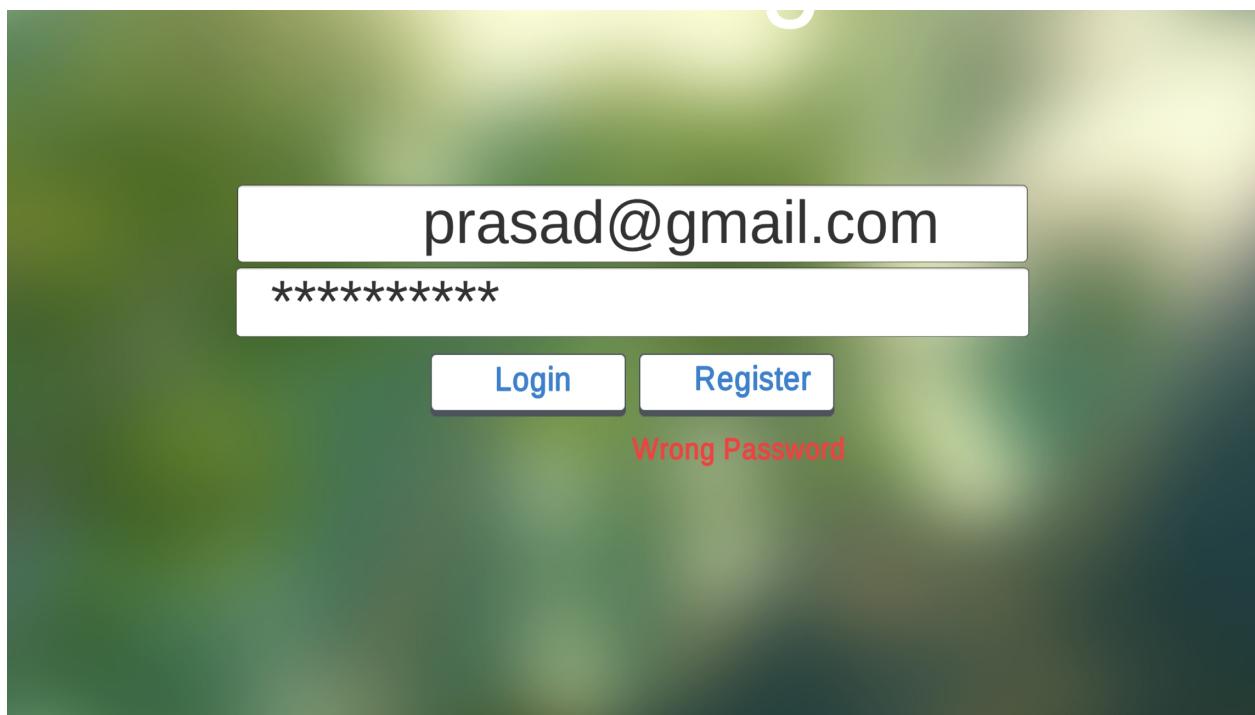


By taking necessary fields such as email id , username and password one can get register into the system.

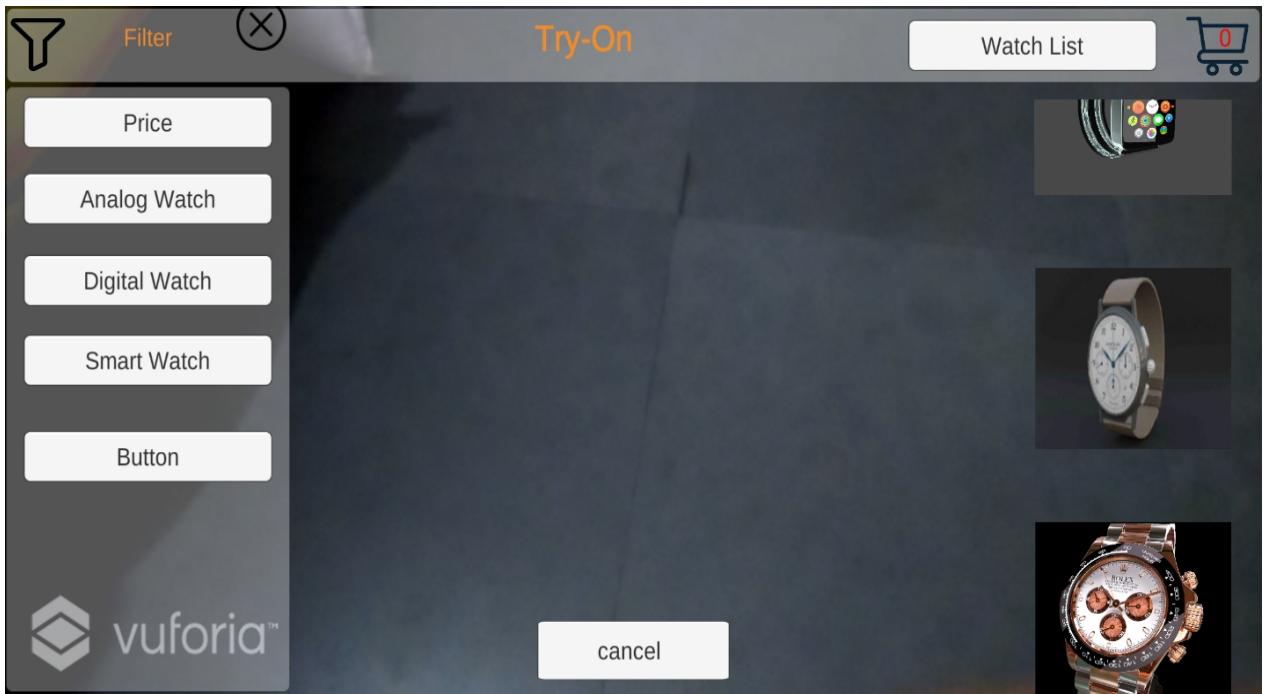
Login :-



If the username and password are valid the user can login into the system.



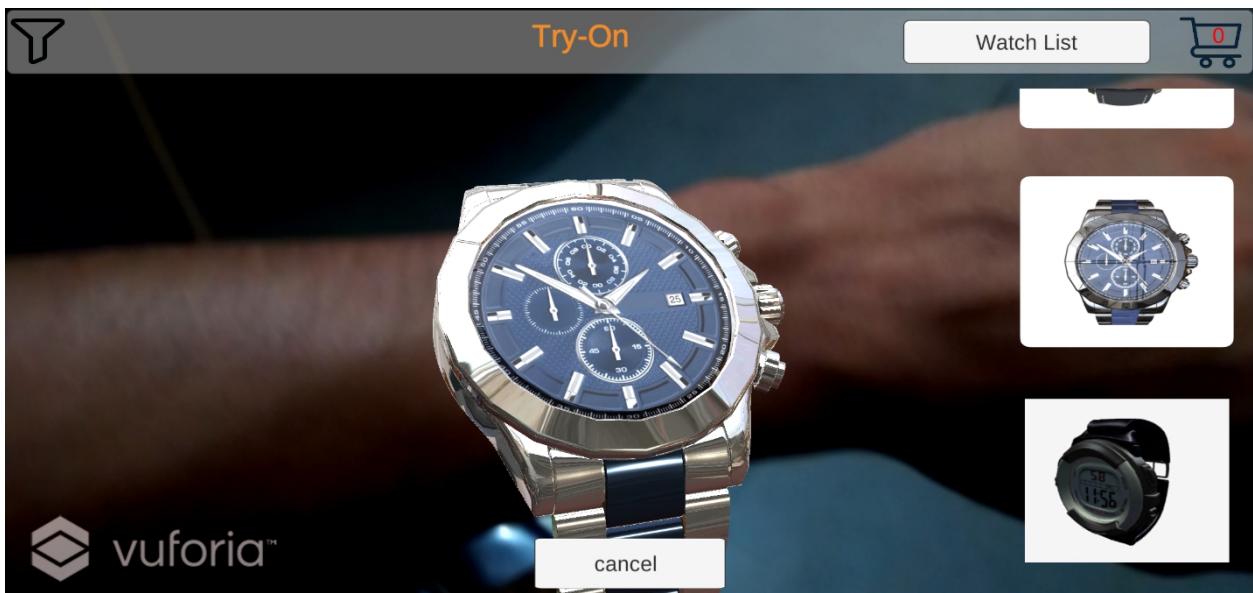
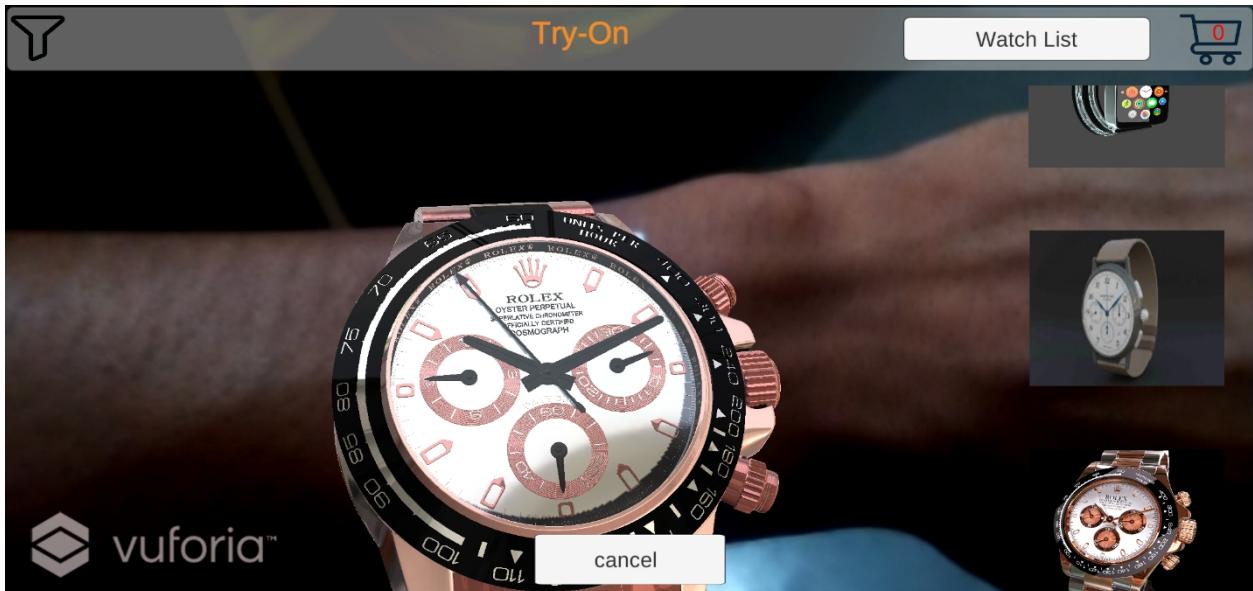
Try On Window:-



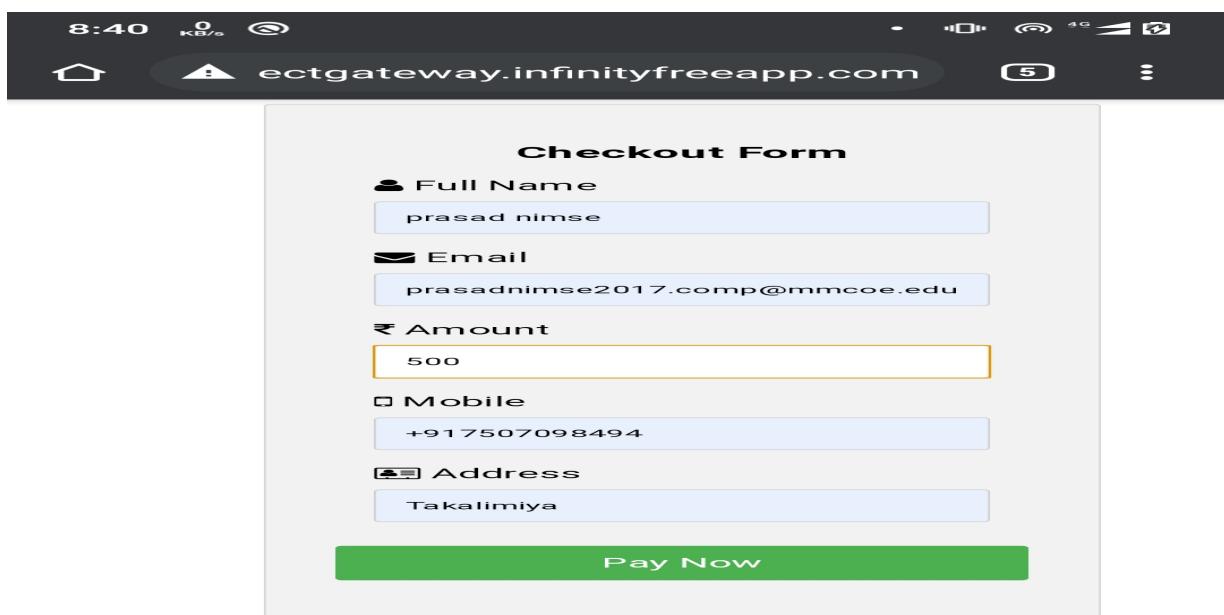
Instead of viewing yourself in a real mirror, sophisticated 3D image processing techniques are used to verify the appearance of new watches. A single camera captures the person and outputs the mirrored images onto a large display which replaces the real mirror. Computer graphics models of the watches are augmented into the video such that the person seems to wear the virtual watches. Virtual try-on applications make it possible for buyers to watch themselves wearing different watches without physically trying on them. Within couple of seconds a virtual Watch appears above the place holder on user phone screen. Now user can examine the watch from a variety of angles, and tapping the one icon on the screen lets you know more about the watch.

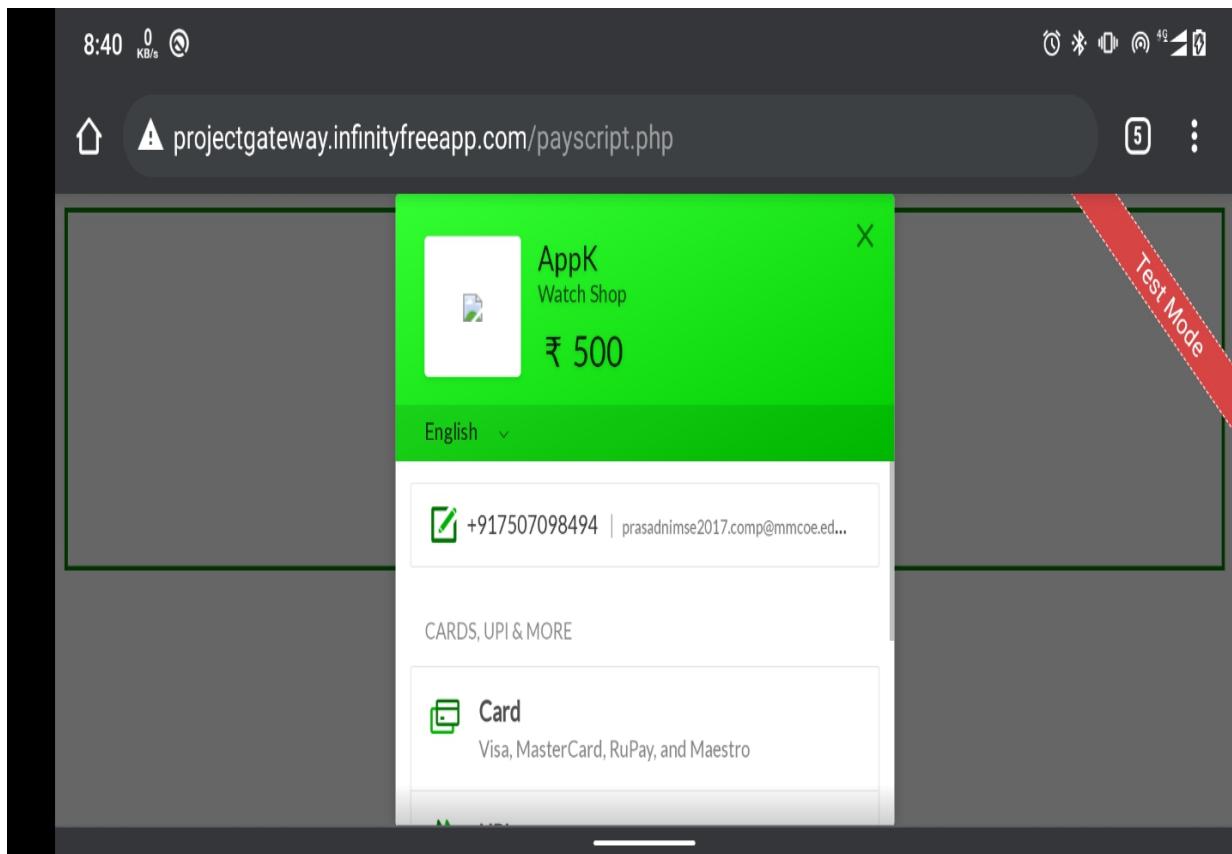
Filtering Watches:-

Filter function is used to choose the watch depending on parameters such as price, company of the watch etc.



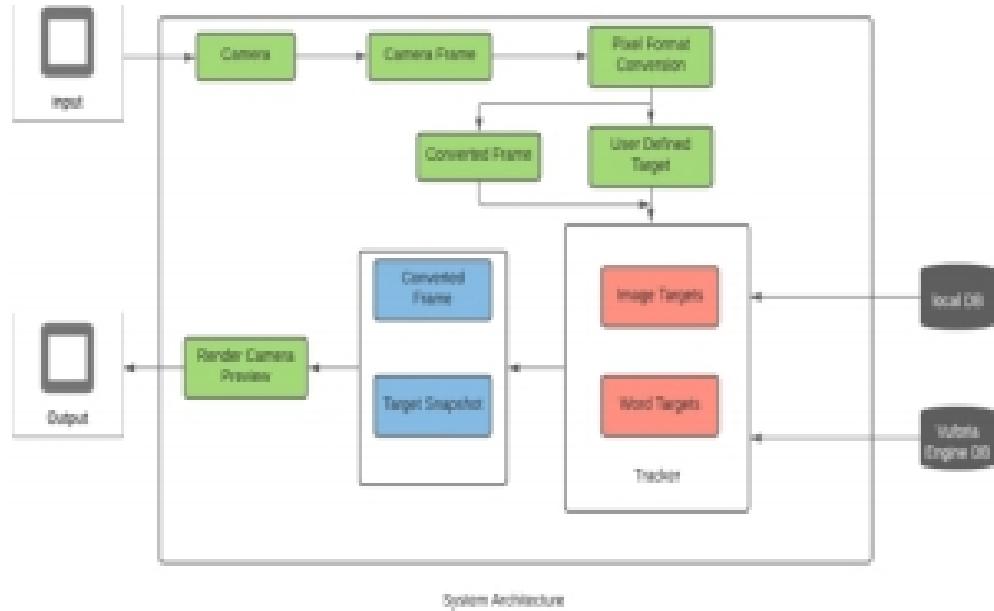
Buy Watch:-





7.Connections and Workflow:-

A project workflow, thus, defines the sequence of activities, responsibilities, and data that must be exchanged or completed to move forward a project.



8.Debugging Tools Used:-

visual studio 2019: Visual Studio Professional 2019 provides powerful features to quickly understand your code. Fixing bugs and errors in your code can be a time-consuming--and sometimes frustrating--task. It takes time to learn how to debug effectively, but a powerful IDE like Visual Studio can make your job a lot easier. An IDE can help you fix errors and debug your code more quickly, and not just that, but it can also help you write better code with fewer bugs. To run or debug a simple app in VS Code, select Run and Debug on the Debug start view or press F5 and VS Code will try to run your currently active file. However, for most debugging scenarios, creating a launch configuration file is beneficial because it allows you to configure and save debugging setup details.

9. Specific steps for executing your project:-

1. Open the application.
2. User will register.
3. After registration user will login in to the system.
4. Then user will select try on option for that user will scan their hand and watch will get place on user's hand .
5. Then if user want to see more watches then he can add previous watch to add to cart .
6. If user want to buy the watch then he can buy watch by clicking on buy button.
7. After completion of whole process user will get log out from the system.

10.Expected results:-

The developed application is easier to understand, more interesting and easier to use as the concept of learning the watches in 3D form. Application provides solutions for student who has difficulty in visualizing the anatomy of a two-dimensional watches into a three-dimensional practice form.

11. Analysis of result:-

- Design –The Design category refers to the way in which the contents are presented.
- Ease of use - For the Ease of Use category, we worked with 3 reagents, which made it possible to demonstrate the comfortability in the management of resources such as mobile, cellular and iPod.
- Usefulness - For the usefulness category, It is appreciated that the students agree that the benefits of the tools are directly correlated with the work done in classes.
- Attitude - Attitude towards the use of content is students like the way the class is taught, because the material provided is very easy to use.

12. Feasibility Study(Technical, Time and Cost):-

Estimation -

- Estimate the effort in person-month or person-hours.
- Estimate the duration in calendar month.
- Estimate the cost in currency.

Estimation Technique Used COCOMO (Constructive Cost Estimation Model) was proposed by Boehm [1981]. COCOMO predicts the efforts and schedule of a software product based on size of the software. COCOMO stands for “Constructive Cost Model”. According to Boehm, software cost estimation should be done through three stages: Basic COCOMO, Intermediate COCOMO and Complete COCOMO.

We are going to used Basic COCOMO that categorized projects into three types:

- i. Organic: Suitable for organization that has considerable experience and requirements.
- ii. Semidetached: Examples of this type are developing new database management system.
- iii. Embedded: Organization has little experience and stringent requirements.

The Basic COCOMO formula takes the form:

$$E=ab(KLOC)(bb) \text{ [person-months]}$$

$$D=cb(E)(db) \text{ [months]}$$

$$P= E / D \text{ [persons]}$$

Where E is the effort applied in person-months, KLOC is the estimated number of thousands of delivered lines of code for the project, D is total time duration to develop the system in months, Coefficient values for Basic COCOMO and P is number of persons required to develop that system.

Effort Estimation

The value ab and bb according to the system is ab=2.8 and bb=1.20 .

The system falls in the system category.

Total LOC (approx) of project is:20000LOC=2.00KLOC

$$\text{Effort (E)} = ab(KLOC)(bb) \text{ [Person -Month]}$$

$$E=3.6*(2.00)1.20$$

$$E = 10PM$$

$$\text{Person - Month} = 10PM(\text{approx})$$

Duration Estimation

$$\begin{aligned}\text{Duration (D)} &= cb(E)(db)[\text{months}] \\ &= 2.5 * (10)0.32 \\ &= 2.5 * 2.34 \\ &= 5.6\end{aligned}$$

Duration 12 [months]

Person Required

$$\begin{aligned}\text{Person Required} &= \text{Effort Applied (E)} / \text{Development Time (D)} [\text{count}] \\ &= 10/6 = 1.66[\text{count}]\end{aligned}$$

Person Required = 1 [Persons]

Cost Estimation :-

We take the assumption 4 person charges 2500 rupees per month.

Total Estimation = 2500 * 6 = Rs.15000/-

Total Estimation = Rs.15000/-

13. Any supporting external applications/ Interfaces which are used:-

User Interfaces

User interface will be provided with the required information.

User interface will have good look and feel etc. so that it will be user friendly

Users can operate the system very efficiently.

Hardware Interfaces

Processor: 1 gigahertz (GHz) or faster processor or SoC.

RAM: 1 gigabyte (GB) for 32-bit or 2 GB for 64-bit.

Hard disk space: 16 GB for 32-bit OS 20 GB for 64-bit OS

Software Interfaces

Unity 2019.4 and later is supported

Vuforia Engine 9.5 and later.

14. Extensibility of the Project:-

Extensibility is a measure of the ability to extend a system and the level of effort required to implement the extension. Extensions can be through the addition of new functionality or through modification of existing functionality. The principle provides for enhancements without impairing existing system functions. So the extensibility of our project is to modify the system like amazon, flipkart and apart from watches you can add various types of accessories.

15.Future scope:-

- Apart from watch we can build that application for multiple accessories which will get displayed into the 3d form.
- Scope of this project can be extended further Like Amazon or another web application .
- The rapid and ever-increasing growth of online shopping is leaving traditional pattern. AR watch showed a potential where customer interact with or see how it might fit them.

16. Project Code(soft Copy):-

The screenshot shows the Visual Studio Code interface with the file `AuthManager.cs` open. The code implements a coroutine for user registration, checking for empty fields and password mismatch, then calling `CreateUserWithEmailAndPassword`. It handles errors by logging them and returning a message. The code is annotated with comments explaining its logic.

```
E:\Final_Demo1\Assets\Scripts> AuthManager.cs
118     }
119
120     private IEnumerator Register(string _email, string _password, string _username)
121     {
122         if (_username == "")
123         {
124             //If the username field is blank show a warning
125             warningRegisterText.text = "Missing Username";
126         }
127         else if(passwordRegisterField.text != passwordRegisterVerifyField.text)
128         {
129             //If the password does not match show a warning
130             warningRegisterText.text = "Password Does Not Match!";
131         }
132         else
133         {
134             //Call the Firebase auth signin function passing the email and password
135             var RegisterTask = auth.CreateUserWithEmailAndPasswordAsync(_email, _password);
136             //Wait until the task completes
137             yield return new WaitUntil(predicate: () => RegisterTask.IsCompleted);
138
139             if (RegisterTask.Exception != null)
140             {
141                 //If there are errors handle them
142                 Debug.LogError(message: $"Failed to register task with {RegisterTask.Exception}");
143                 FirebaseException firebaseEx = RegisterTask.Exception.GetBaseException() as FirebaseException;
144                 AuthError errorCode = (AuthError)firebaseEx.ErrorCode;
145
146                 string message = "Register Failed!";
147                 switch (errorCode)
148                 {
149                     case AuthError.MissingEmail:
150                         message = "Missing Email";
151                         break;
152                     case AuthError.MissingPassword:
153                         message = "Missing Password";
154                         break;
155                 }
156             }
157         }
158     }
159
160     private void InitializeFirebase()
161     {
162         Debug.Log("Setting up Firebase Auth");
163         //set the authentication instance object
164         auth = FirebaseAuth.DefaultInstance;
165     }
166
167     //Function for the login button
168     public void LoginButton()
169     {
170         //Call the login coroutine passing the email and password
171         StartCoroutine(Login(emailLoginField.text, passwordLoginField.text));
172     }
173
174     //Function for the register button
175     public void RegisterButton()
176     {
177         //Call the register coroutine passing the email, password, and username
178         StartCoroutine(Register(emailRegisterField.text, passwordRegisterField.text, usernameRegisterField.text));
179     }
180
181     private IEnumerator Login(string _email, string _password)
182     {
183         //Call the Firebase auth signin function passing the email and password
184         var LoginTask = auth.SignInWithEmailAndPasswordAsync(_email, _password);
185         //Wait until the task completes
186         yield return new WaitUntil(predicate: () => LoginTask.IsCompleted);
187
188         if (LoginTask.Exception != null)
189         {
190             //If there are errors handle them
191             Debug.LogError(message: $"Failed to register task with {LoginTask.Exception}");
192             FirebaseException firebaseEx = LoginTask.Exception.GetBaseException() as FirebaseException;
193             AuthError errorCode = (AuthError)firebaseEx.ErrorCode;
```

The screenshot shows the Visual Studio Code interface with the file `AuthManager.cs` open. The code defines methods for initializing Firebase, logging in, and registering users. It uses `StartCoroutine` to perform these operations. The code includes comments explaining the purpose of each method and how it interacts with the Firebase API.

```
E:\Final_Demo1\Assets\Scripts> AuthManager.cs
50     }
51
52     private void InitializeFirebase()
53     {
54         Debug.Log("Setting up Firebase Auth");
55         //set the authentication instance object
56         auth = FirebaseAuth.DefaultInstance;
57     }
58
59     //Function for the login button
60     public void LoginButton()
61     {
62         //Call the login coroutine passing the email and password
63         StartCoroutine(Login(emailLoginField.text, passwordLoginField.text));
64     }
65
66     //Function for the register button
67     public void RegisterButton()
68     {
69         //Call the register coroutine passing the email, password, and username
70         StartCoroutine(Register(emailRegisterField.text, passwordRegisterField.text, usernameRegisterField.text));
71     }
72
73     private IEnumerator Login(string _email, string _password)
74     {
75         //Call the Firebase auth signin function passing the email and password
76         var LoginTask = auth.SignInWithEmailAndPasswordAsync(_email, _password);
77         //Wait until the task completes
78         yield return new WaitUntil(predicate: () => LoginTask.IsCompleted);
79
80         if (LoginTask.Exception != null)
81         {
82             //If there are errors handle them
83             Debug.LogError(message: $"Failed to register task with {LoginTask.Exception}");
84             FirebaseException firebaseEx = LoginTask.Exception.GetBaseException() as FirebaseException;
85             AuthError errorCode = (AuthError)firebaseEx.ErrorCode;
```

The screenshot shows the Visual Studio Code interface with the 'watchlist.cs' file open. The code defines a MonoBehavior class named 'watchlist' that manages multiple game objects. It includes methods for opening different panels and setting their active status. The interface includes a sidebar with icons for file operations, a search bar, and a status bar at the bottom.

```
4 public class watchlist : MonoBehaviour
5 {
6     // Start is called before the first frame update
7     public GameObject Panel;
8     public GameObject Panel2;
9     public GameObject Panel3;
10    public GameObject Panel4;
11    public GameObject Panel5;
12
13    public void OpenPanel()
14    {
15        if (Panel != null)
16        {
17            Panel.SetActive(false);
18            Panel3.SetActive(false);
19            Panel4.SetActive(false);
20            Panel5.SetActive(false);
21            bool isActive=Panel.activeSelf;
22            Panel.SetActive(true);
23        }
24    }
25
26    public void OpenPanel2()
27    {
28        if (Panel2 != null)
29        {
30            Panel.SetActive(false);
31            Panel3.SetActive(false);
32            Panel4.SetActive(false);
33            Panel5.SetActive(false);
34            bool isActive=Panel2.activeSelf;
35            Panel2.SetActive(!isActive);
36        }
37    }
38
39
40 }
```

Activate Windows
Go to Settings to activate Windows.

Ln 1, Col 1 Spaces: 4 UTF-8 with BOM CRLF C# R

The screenshot shows the Visual Studio Code interface with the 'filterpanel.cs' file open. The code defines a MonoBehavior class named 'filterpanel' that interacts with a game object named 'filter'. It includes methods for starting the filter animation and handling button events to close it. The interface includes a sidebar with icons for file operations, a search bar, and a status bar at the bottom.

```
1 using System.Collections;
2 using System.Collections.Generic;
3 using UnityEngine;
4 using UnityEngine.Events;
5
6 public class filterpanel : MonoBehaviour
7 {
8     // Start is called before the first frame update
9     public GameObject filter;
10    Animation filteranimation;
11
12    void Start()
13    {
14        filteranimation = filter.GetComponent<Animation>();
15    }
16
17    public void filterdisplay()
18    {
19        filteranimation["filter"].speed = 1;
20        filteranimation.Play();
21    }
22
23    public void closemethode()
24    {
25        string buttonName = EventSystem.current.currentSelectedGameObject.name;
26
27        if(buttonName=="close")
28        {
29            filteranimation["filter"].speed = -1;
30            filteranimation["filter"].time = filteranimation["filter"].length;
31            filteranimation.Play();
32        }
33    }
34
35
36 }
```

Activate Windows
Go to Settings to activate Windows.

Ln 1, Col 1 Spaces: 4 UTF-8 with BOM CRLF C# R

```
// Start is called before the first frame update
void Start()
{
    w1windowAnimation = w1window.GetComponent<Animation>();
    w2windowAnimation = w2window.GetComponent<Animation>();
    w3windowAnimation = w3window.GetComponent<Animation>();
    w4windowAnimation = w4window.GetComponent<Animation>();
    w5windowAnimation = w5window.GetComponent<Animation>();
    w6windowAnimation = w6window.GetComponent<Animation>();
    w7windowAnimation = w7window.GetComponent<Animation>();
}

public void watchmodel1buttonclick()
{
    watchModel1.SetActive(true);
    watchModel2.SetActive(false);
    watchModel3.SetActive(false);
    watchModel4.SetActive(false);
    watchModel5.SetActive(false);
    watchModel6.SetActive(false);
    watchModel7.SetActive(false);

    w1windowAnimation["Animation1"].speed = 1;
    w1windowAnimation.Play();
}

public void watchmodel2buttonclick()
{
    watchModel1.SetActive(false);
    watchModel2.SetActive(true);
}

Activate Windows
Go to Settings to activate Windows.
```

```
public void closeAnimation()
{
    string buttonName = EventSystem.current.currentSelectedGameObject.name;

    if(buttonName=="close1")
    {
        w1windowAnimation["Animation1"].speed = -1;
        w1windowAnimation["Animation1"].time = w1windowAnimation["Animation1"].length;
        w1windowAnimation.Play();
    }
    else if(buttonName=="close2")
    {
        w2windowAnimation["Animationx"].speed = -1;
        w2windowAnimation["Animationx"].time = w2windowAnimation["Animationx"].length;
        w2windowAnimation.Play();
    }
    else if (buttonName=="close3")
    {
        w3windowAnimation["Animationy"].speed = -1;
        w3windowAnimation["Animationy"].time = w3windowAnimation["Animationy"].length;
        w3windowAnimation.Play();
    }
    else if (buttonName=="close4")
    {
        w4windowAnimation["Animation4"].speed = -1;
        w4windowAnimation["Animation4"].time = w4windowAnimation["Animation4"].length;
        w4windowAnimation.Play();
    }
    else if (buttonName=="close5")
    {
        w5windowAnimation["anim5"].speed = -1;
        w5windowAnimation["anim5"].time = w5windowAnimation["anim5"].length;
        w5windowAnimation.Play();
    }
    else if (buttonName=="close6")
    {
        w6windowAnimation["anim6"].speed = -1;
        w6windowAnimation["anim6"].time = w6windowAnimation["anim6"].length;
        w6windowAnimation.Play();
    }
}
```

17. All reference papers:-

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