Department of Information Technology

NBA Accredited

A.P. Shah Institute of Technology

G.B.Road, Kasarvadavli, Thane(W), Mumbai-400615

UNIVERSITY OF MUMBAI

Academic Year 2020-2021

A Project Report on

HomeDecor: AR Enabled Home Styler Application

Submitted in partial fulfillment of the degree of
Bachelor of Engineering(Sem-8)
in
INFORMATION TECHNOLOGY
By

Tejas Khanted(17104015)
Aniket Gaikwad(17104032)
Kavan Naik(17104006)

Under the Guidance of
Prof. Kaushiki Upadhyaya and Prof. Nahid Shaikh

1.Project Conception and Initiation

1.1 Abstract

- Augmented Reality (AR) in Furniture act as an interactive application that is based on Augmented Reality.
- It explains all phases of building the Augmented Reality started with analyzing images from the rear camera of a smartphone or tablet using ground plane detection technique for displaying products detail and displaying 3D model and calculation of position to display a 3d model over real world image.
- This Augmented Reality application can be used by the user to solve the problem of satisfy as they cannot put them into their own place before buying as it will help customers visualize how furniture pieces will look and fit in their homes and can also provide details of the product to support customer.

1.2 Objectives

- To create a mobile based application for furniture placement using augmented reality technology.
- To make user to visualize multiple furniture at they are own spaces.
- To make User Friendly Interface design.
- To produce correct information about selected objects dimensions and texture.
- To produce realistic virtual furniture model in mobile app similar to the real furniture.

1.3 Literature Review

Sr. No.	Title	Author	Learning
1	Augmented Reality and its effect on our life	Riya Aggarwal, Abhishek Singhal	From this paper, we have founded to use Superimposition Based Augmented Reality.
2	Use of Augmented Reality in the furniture Industry	Elizabeth Simao Carvalho, Gustavo Macaes, Isabel Varajao, Nuno Sousa	In this paper, explains how furniture industry can used marker based AR and application in which connect via database for storing models, textures, color.
3	Research on Object Based Augmented Reality Using Unity3din Education System	Dipti Rajan Dhotre	This paper explains how Augmented Reality and Unity 3d can work together in learning and training and how can it as potential impact in education.
4	AR Development for Room Design	Peeranut Reuksupasompon, Maytichai Aruncharathorn, Sirion Vittayakorn	From this research paper, we founded to included feature to user that user will able to customize its own furniture by changing color.

1.4 Problem Definition

- Problem Identified

As more and more purchases move online, new categories of products start gaining e-commerce traction. Using AR people can visualize the required furniture and make a perfect choice in between them so, making it easier rather than actually taking a note of dimensions, look and physically bringing of the furniture for making choice. The biggest problem with buying furniture is that you have almost no idea how it will actually look into your interior. This is why people hire visual designers who can show the whole picture.

1.5 Scope

- Virtual furniture placement with a possibility to change item textures and translate.
- The capability to take a photo of the placement.
- Buy the furniture from the link provided.
- AR allows user to try before buying it.

1.6 Technology stack

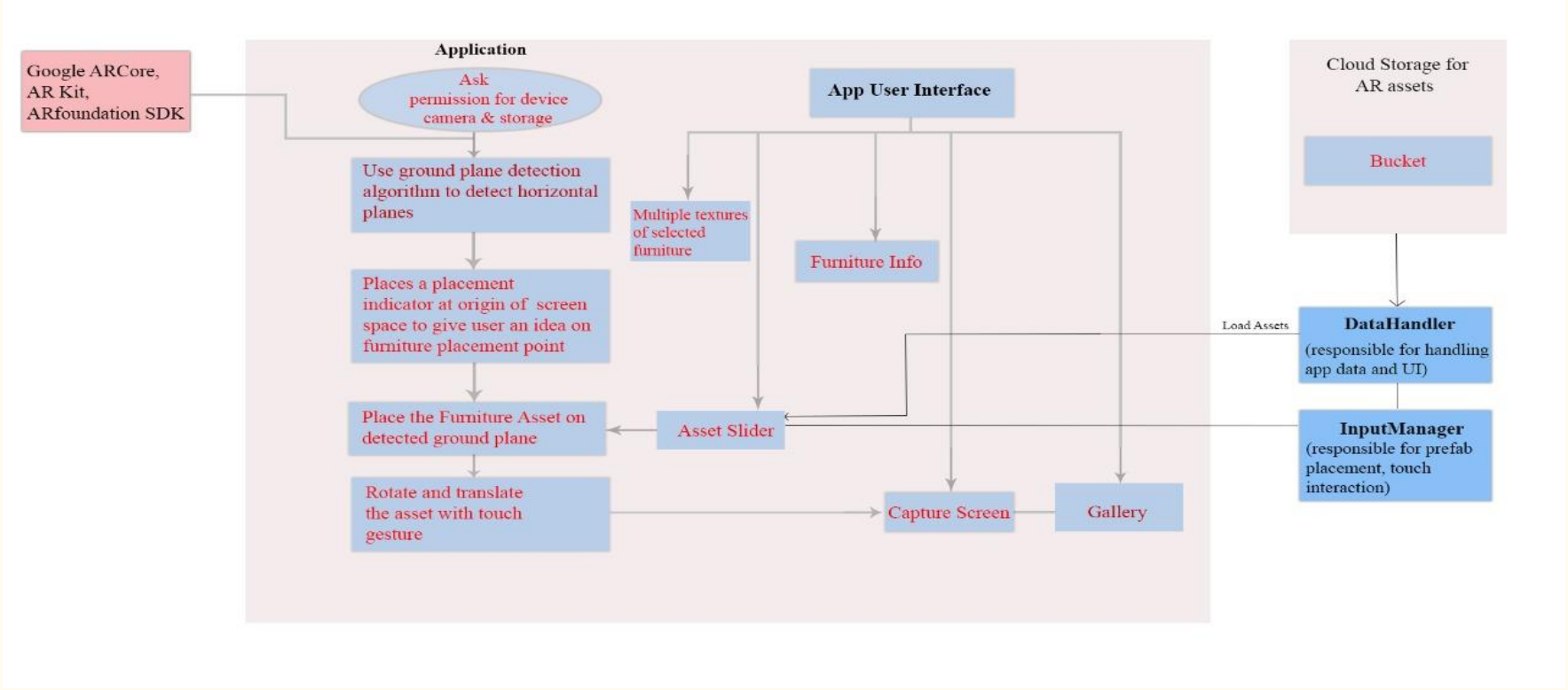
- Unity 3D
- Unity AR Foundation
- AWS Cloud

1.7 Benefits for environment & Society

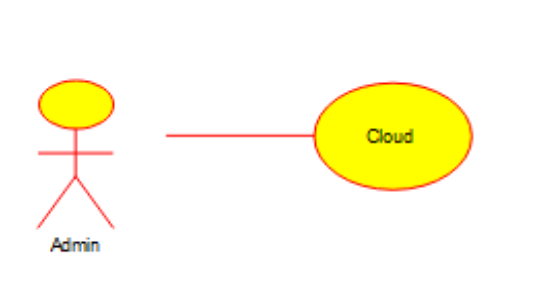
- Augmented Reality Takes the Store to the Customer.
- AR increases interaction and provides a richer user experience.
- AR is mobile and personal and, therefore, hugely accessible to a rapidly growing smartphone market.
- AR allows user to try before buying it and also allows user to customization the furniture.

2. Project Design

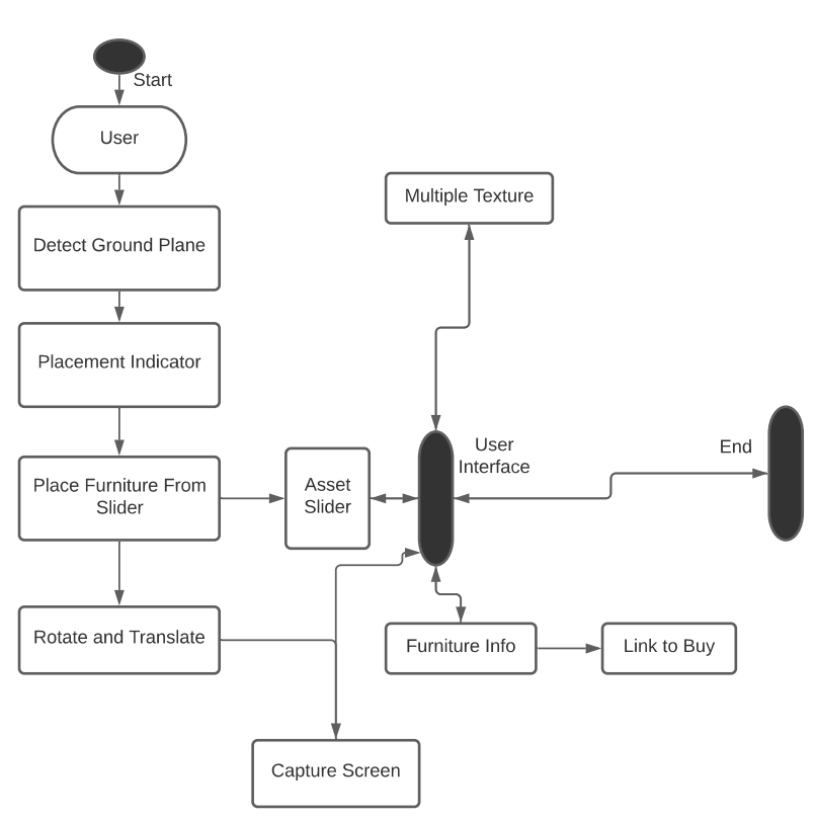
2.1 Proposed System



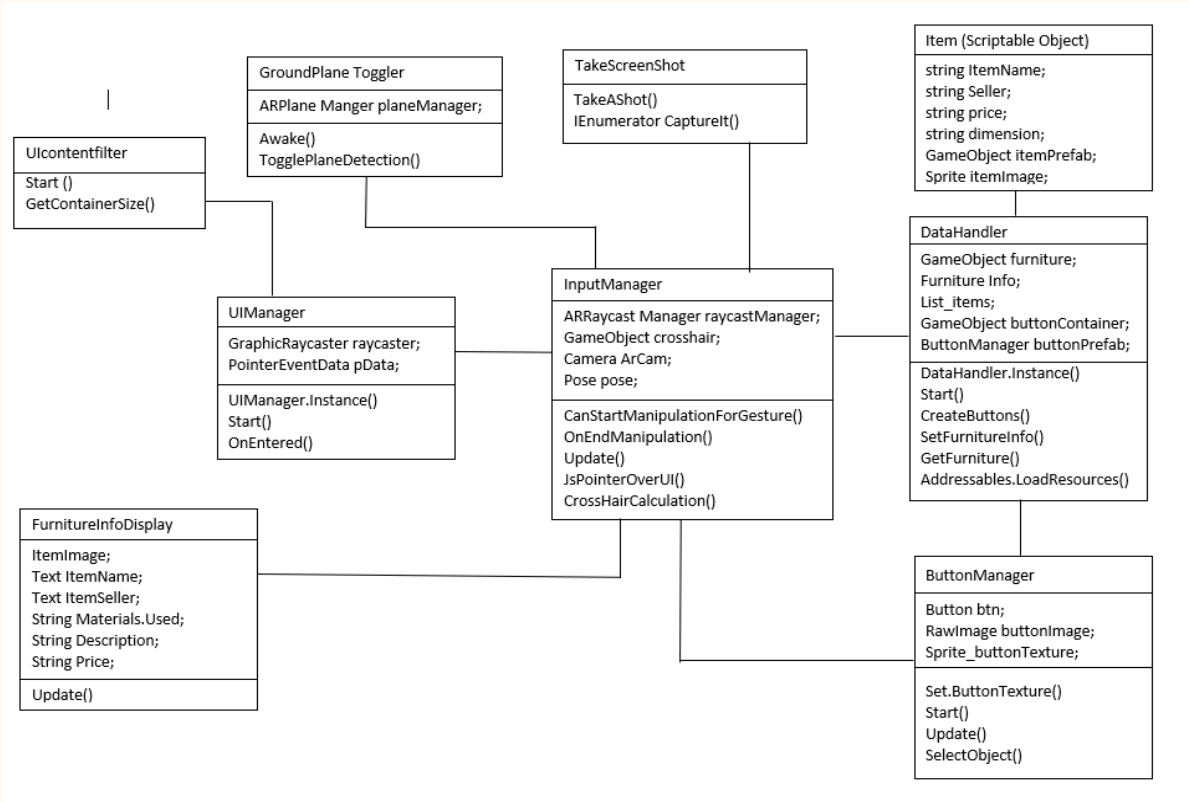
2.3 Use Case Diagram



2.4 Activity diagram

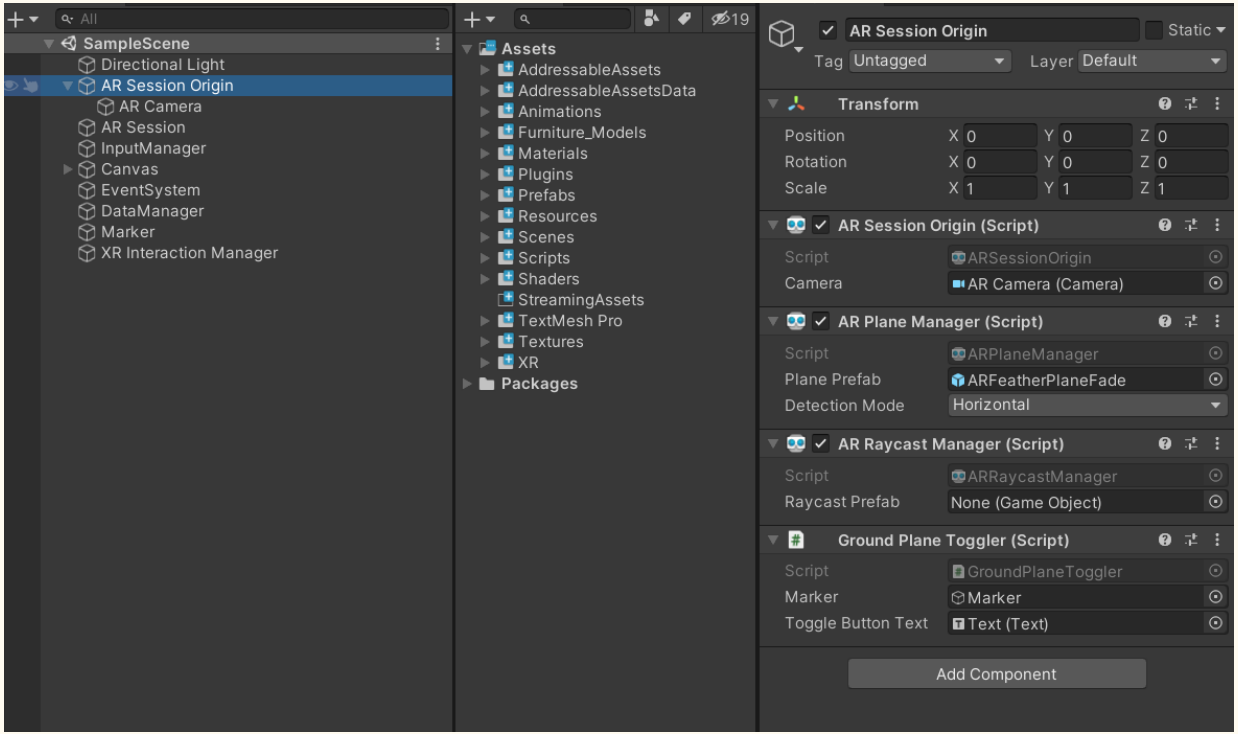


2.5 Class Diagram

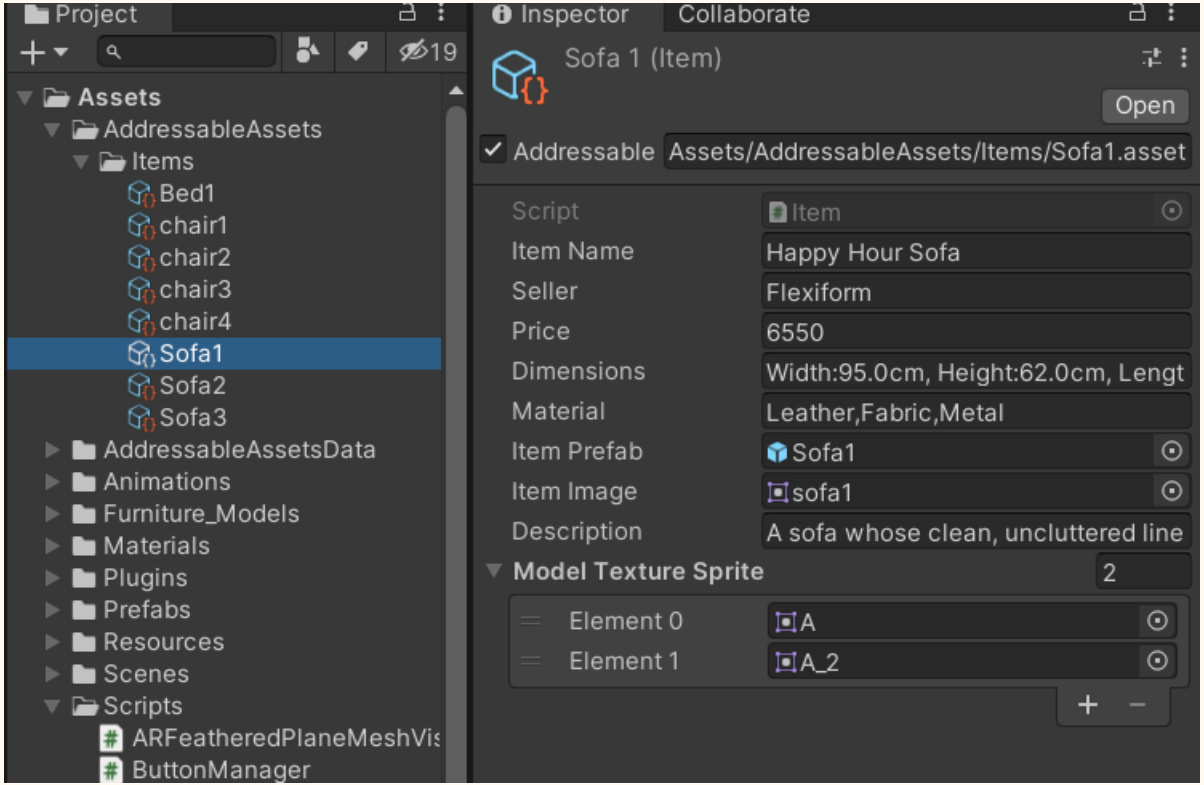


3. Implementation

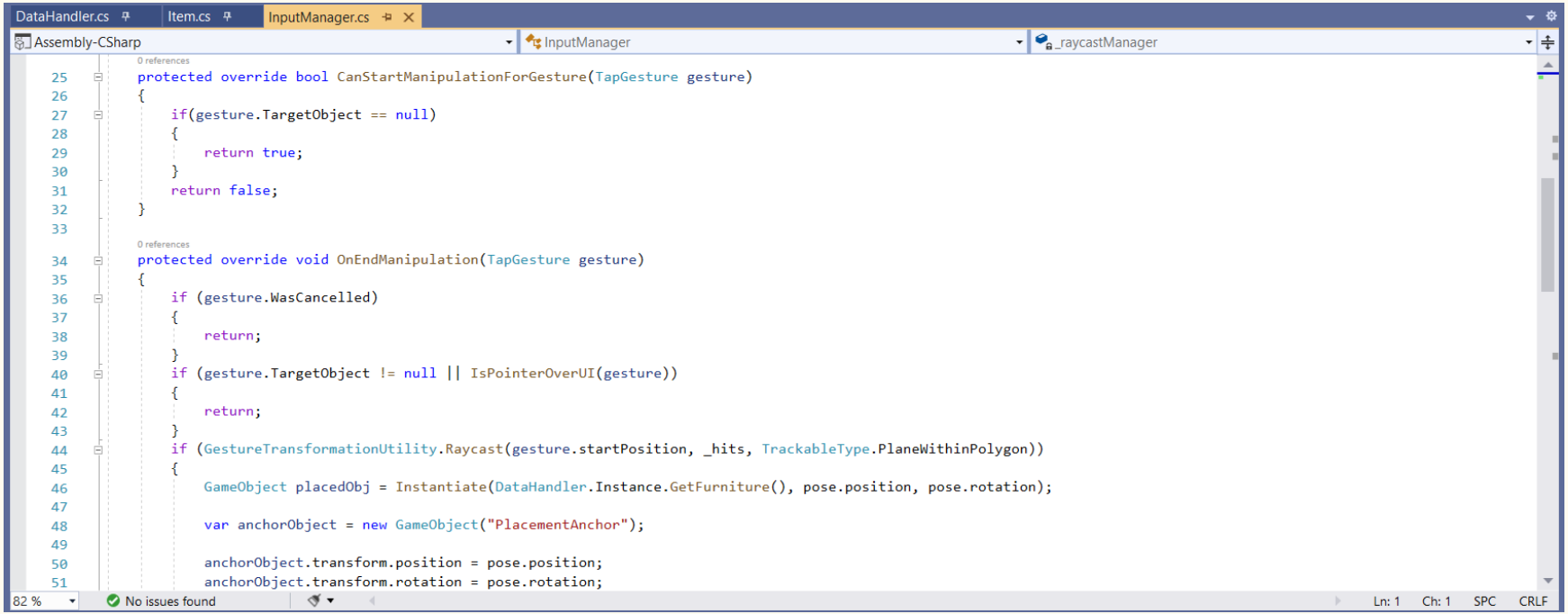
AR Session, AR camera and Plane Detection Mode: AR session is responsible to create a session for AR setup. It also has AR camera component. We can set the plane detection mode in AR Plane manager script as vertical, horizontal or both.



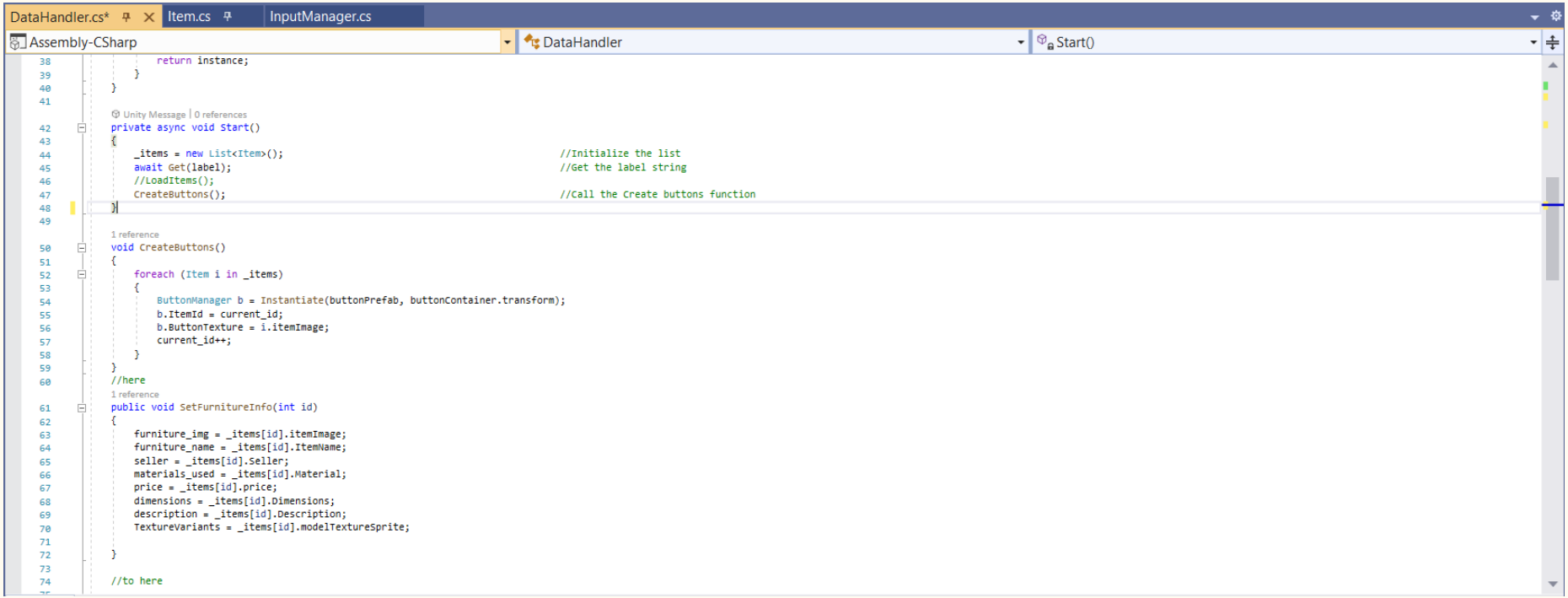
Store information about each furniture in a single container using scriptable object method.



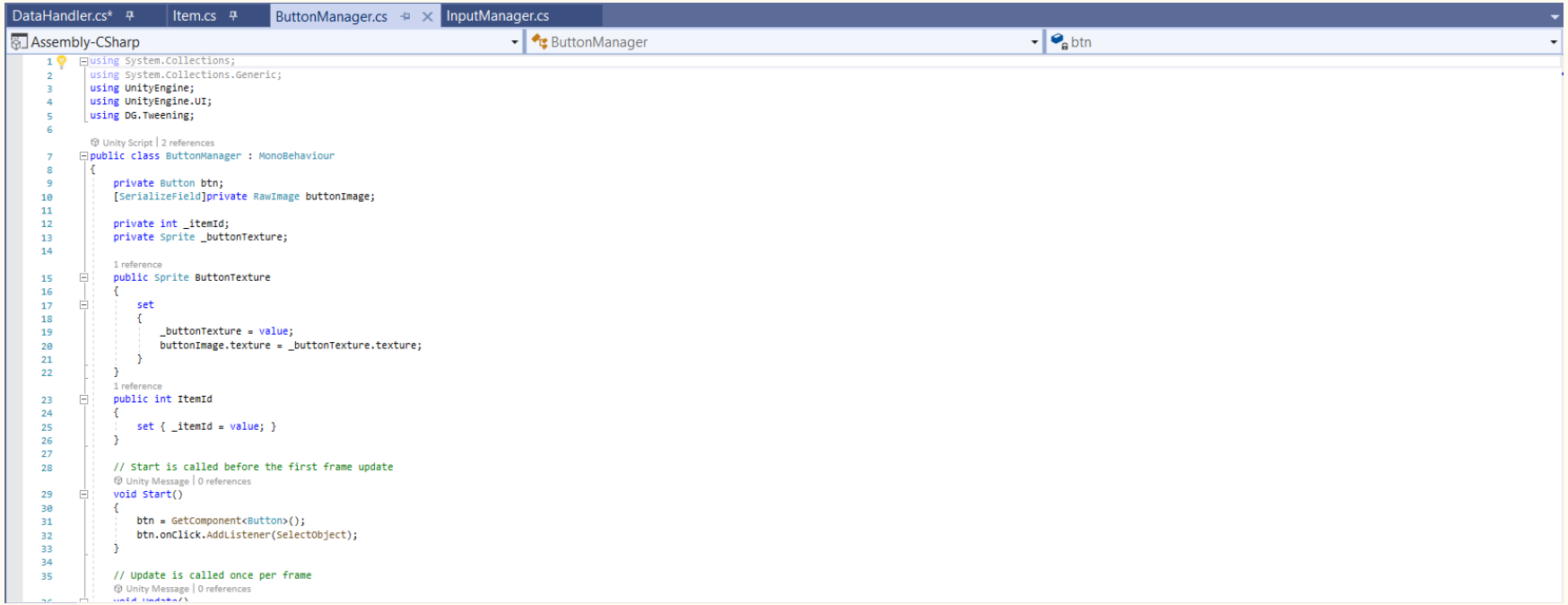
The Input Manager is responsible for placing the selected object on detected surface. Also Input Manager is responsible for touch gestures that is used to transform the furniture model.



Data Handler is responsible for handling furniture data and app data.

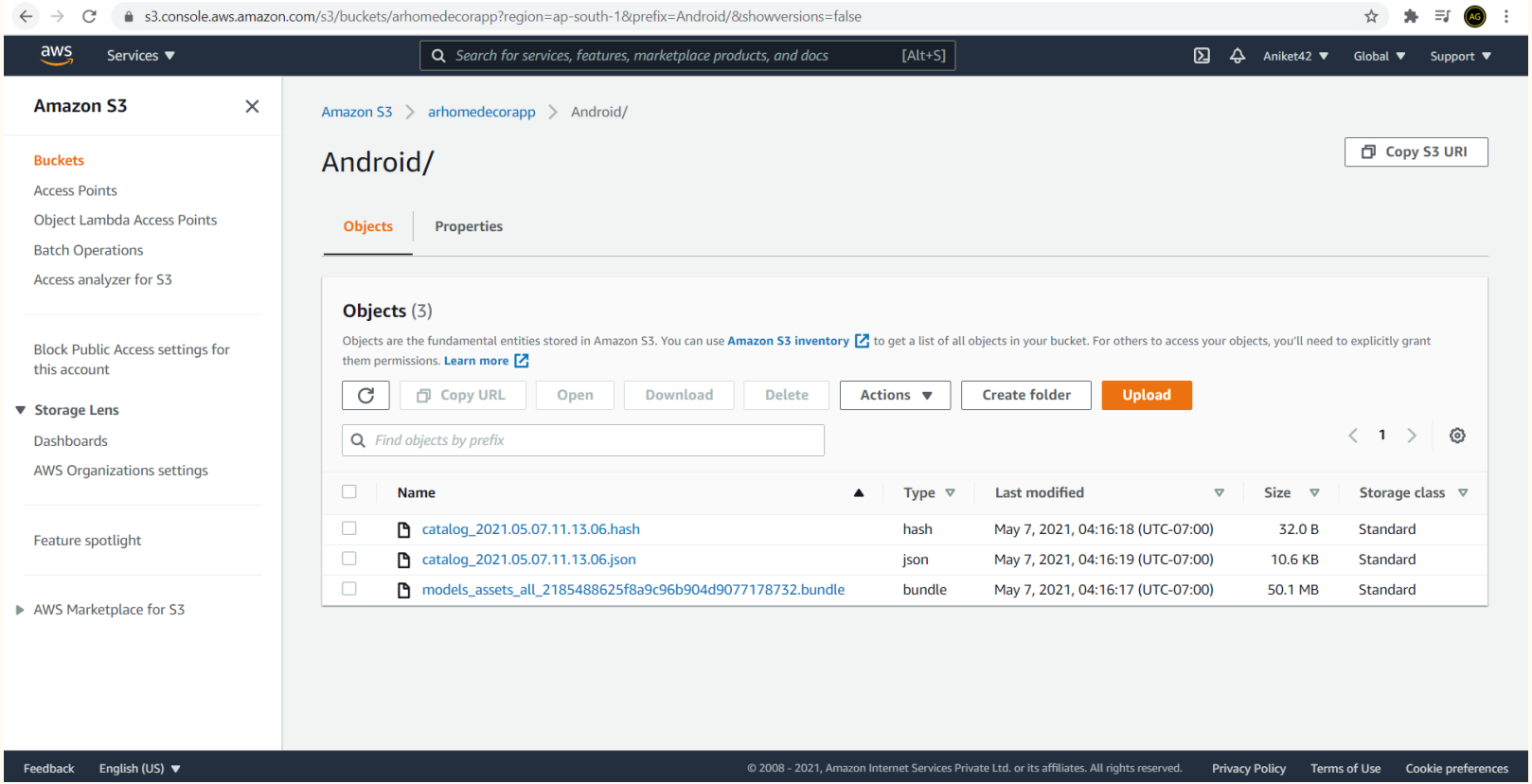


Button Manager is responsible for creating Button in Slider and mapping particular furniture prefab to the relevant button.




```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.UI;
using DG.Tweening;

Unity Script | 2 references
public class ButtonManager : MonoBehaviour
{
    private Button btn;
    [SerializeField]private RawImage buttonImage;

    private int _itemId;
    private Sprite _buttonTexture;

    1 reference
    public Sprite ButtonTexture
    {
        set
        {
            _buttonTexture = value;
            buttonImage.texture = _buttonTexture.texture;
        }
    }
    1 reference
    public int ItemId
    {
        set { _itemId = value; }
    }

    // Start is called before the first frame update
    Unity Message | 0 references
    void Start()
    {
        btn = GetComponent<Button>();
        btn.onClick.AddListener(SelectObject);
    }

    // Update is called once per frame
    Unity Message | 0 references
```

Assets stored on AWS cloud storage.



4. Testing

Test No.	Test Name	Expected Resulted	Actual Result
1	Use Device Camera	Device Camera must be turned on while using the app.	Device’s camera turned on successfully.
2	Ground Plane Detection	Ground Plane must be detected on Horizontal Surfaces	Ground Planes are successfully detected

Test Case 1: Basic App Functionalities.

Test No.	Test Name	Expected Resulted	Actual Result
1	App Scalability	The assets used in app must be stored on cloud.	The assets are stored in S3 storage successfully.
2	Load Assets	The assets must be loaded into application from cloud.	The assets are loaded into application from cloud successfully
3	Asset Prefab Placement	The selected asset should be placed on detected ground plane on touch	The selected asset is placed on detected ground plane successfully
4	Detect touch gestures	The application must be able to detect number of touch inputs	The app is able to detect touch inputs successfully
5	Crosshair(Placement Indicator)	The app must place a crosshair on detected ground plane at origin of screen space	Crosshair is placed successfully.

Test Case 2: Main app functionalities.

Test No.	Test Name	Expected Resulted	Actual Result
1	Asset Selection	Placed asset must be able to select.	Placed asset is selected successfully.
2	Asset Rotation	Placed asset must be rotated on two finger gesture.	Placed asset is successfully rotated.
3	Asset Translation	Placed asset must be able to translate to any position on the detected ground plane.	Asset is translated successfully
4	Texture Change	Assets must be able to change texture if it has.	Textures is successfully changed.
5	Remove Placed Asset	Placed asset must be removed .	Placed asset is removed successfully.

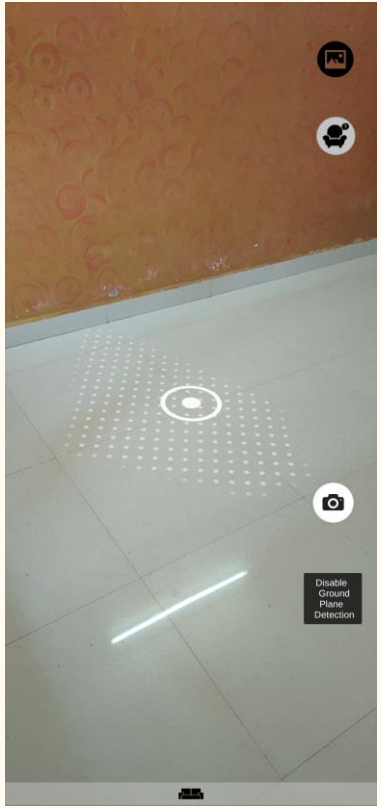
Test Case 3: Asset(Prefab/furniture model) functionalities.

Test No.	Test Name	Expected Resulted	Actual Result
1	Load Buttons dynamically in slider relevant to asset.	Buttons be loaded into slider dynamically w.r.t assets.	Buttons are successfully loaded into slider dynamically w.r.t assets.
2	Screenshot	App must be able to take screenshot of the scene.	ScreenShot is taken successfully.
3	Ground Plane toggling	App must show/hide detected ground plane on button clicks.	Ground plane toggling is done successfully.
4	Funiture information display	App must display a UI regarding the selected asset information , dynamically.	Asset information of selected asset is displayed on UI successfully.
5	Redirect to buying page	Redirect user to the seller’s page on button click, where furniture could be purchased	Redirecting is done successfully.

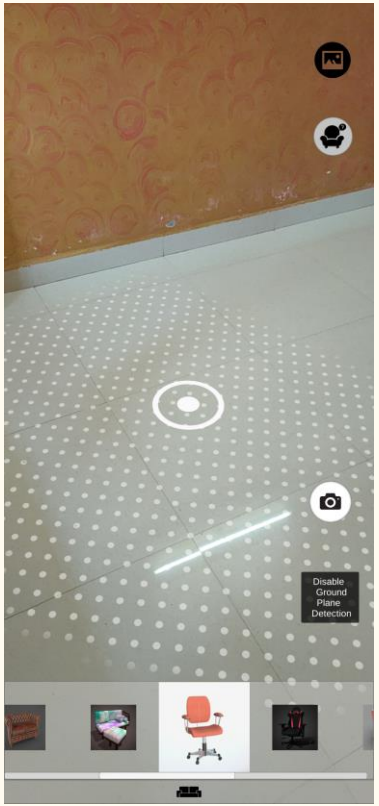
Test Case 4: UI functionality

5. Result

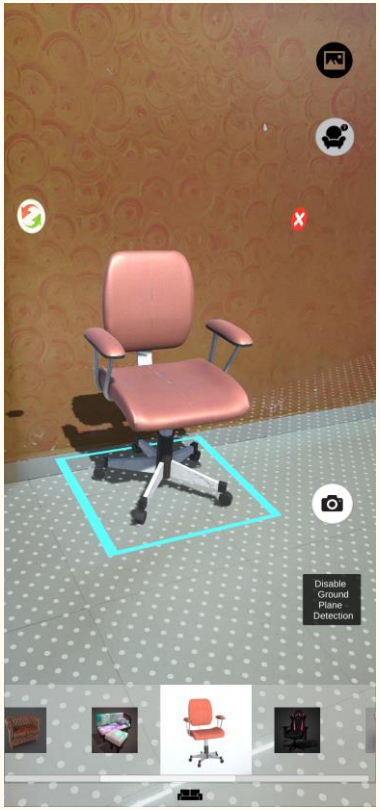
Welcome User Interface



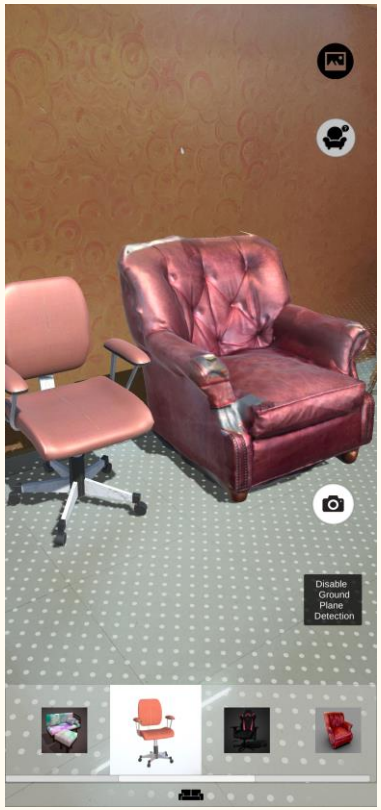
Ground Plane Detection



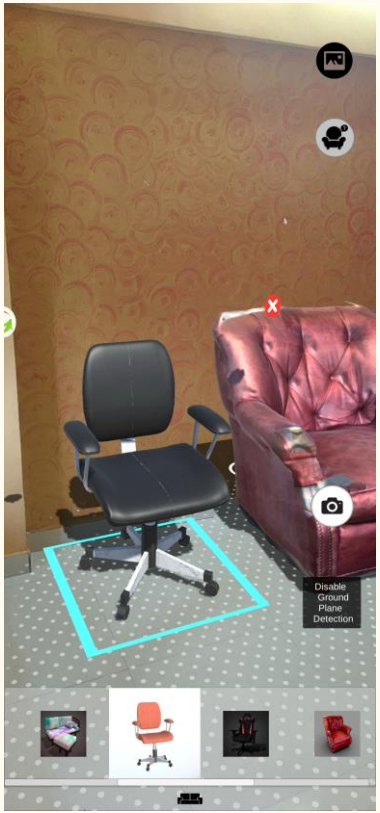
Assets loaded into Slider



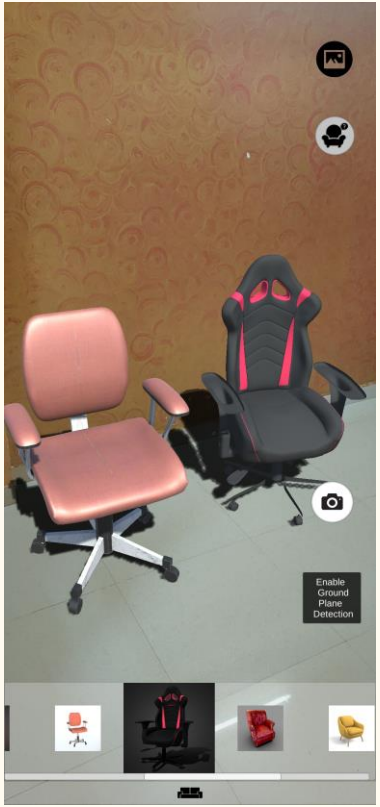
Single Object Placement



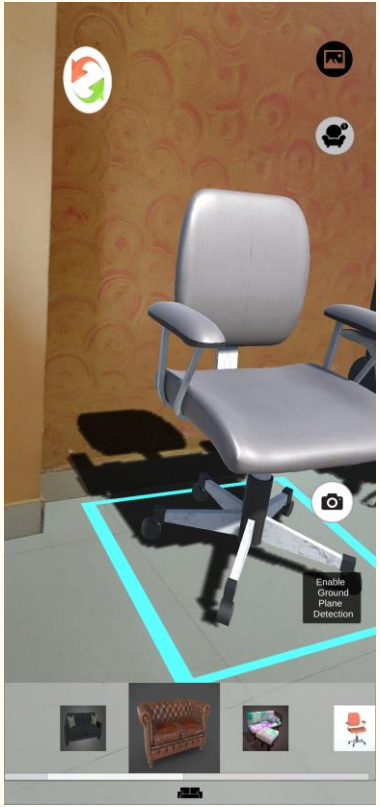
Multiple Object Placement



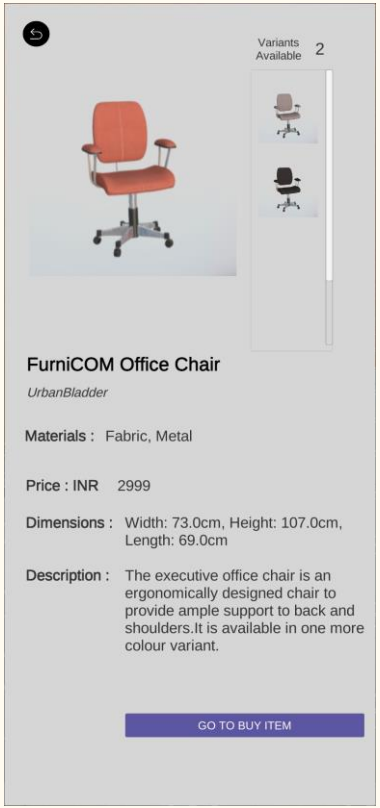
Change Textures Of Selected Object



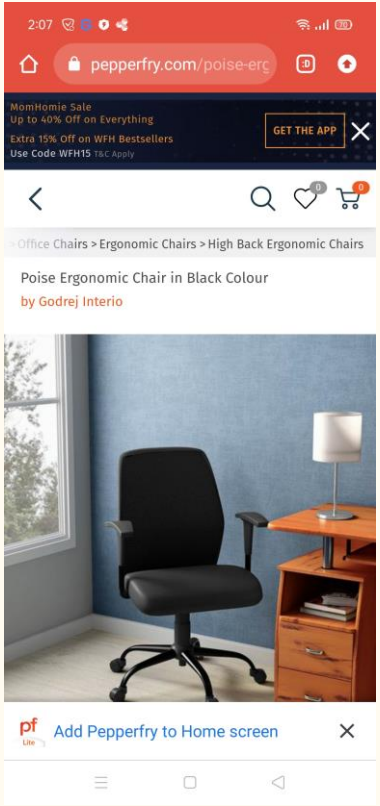
Disable Ground Plane Detection



Furniture Shadow



Furniture Information



Redirect to Website for Buying

6. Conclusion and Future Scope

- In this AR environment, the user is able to adjust the properties of virtual furniture and create its own arrangements in the real world.
- Through the mobile camera the user can detect the plan surface and select the furniture through the application and place it on the screen.
- As a design solution, this application can help cut the prototyping costs and help simulate a better experience for the customer.
- It also enables the User to be the designer themselves and make their home as they want it to be.
- This application will also prove beneficial to the companies for boosting sales online.
- Adding More Feature like Measuring Distance using AR will user ease to find the dimensions of furniture before order it.

References

- R. Aggarwal and A. Singhal, ”Augmented Reality and its effect on our life,” 2019 9thInternational Conference on Cloud Computing, Data Science Engineering (Confluence),2019
- P. Reuksupasompon, M. Aruncharathorn and S. Vittayakorn, ”AR Development For Room Design,” 2018 15th International Joint Conference on Computer Science and Soft-ware Engineering (JCSSE), 2018
- Dhotre, Dipti Rajan. “Research on Object Based Augmented Reality Using Unity3d in Education System.” (2016).
- Carvalho, Elizabeth Ma ̧c ̃aes, Gustavo Varaj ̃ao, Isabel Sousa, Nuno Brito, Paulo.(2011). Use of Augmented Reality in the furniture industry.
- Unity 3D Documentation. URL: https://docs.unity3d.com/Manual/index.html
- Unity 3D Forum. URL: https://forum.unity.com/
- Google ARCore. URL: https://developers.google.com/ar/

Thank You