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Augmented Reality Object Recognition and Visualization Using Mobile Phone

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ABSTRACT: At the forefront of a technological revolution that will eventually combine the digital and physical domains is modelling for augmented reality (AR). AR modelling has advanced quickly and has a wide range of applications in several industries thanks to the incorporation of computer-generated content into the user's actual surroundings. In an effort to give a concise overview of this game-changing technology, this short assessment examines the origins, uses, difficulties, and potential future developments of AR modelling. As augmented reality (AR) continues to spread throughout many industries, realizing the subtleties of its modelling is crucial to realizing its full potential.

KEYWORDS: Augmented reality (AR), AR modelling , Virtual Reality (VR), digital and physical domain

I. INTRODUCTION

Finding the ideal piece to enhance the aesthetics of our space might seem like an unending quest in the world of interior design and home furniture. This search has been transformed with the introduction of Augmented Reality (AR) technology, enabling customers to envision the future of their houses with a never-before-seen degree of accuracy and customization. Before deciding to buy, picture having the ability to not only envision but also see how a stylish new dining table set would appear in your own living room. This overview of augmented reality in furniture viewing applications dives into the core of this amazing piece of technology. It involves more than just putting a digital image over a real-world environment; it involves reinventing the shopping experience and fusing the virtual and actual worlds to produce a smooth fusion of precision and creativity. We'll examine the revolutionary effects of AR modeling on the furniture sector as we peel back the layers, providing a glimpse into a future in which finding harmony between your own style and the decor of your house is as simple as swiping.

II. OBJECTIVES

1. AI-Driven Recommendations: Apply machine learning algorithms to offer customized furniture suggestions according to customer tastes, historical usage patterns, and room measurements.
2. Interior Design Collaboration: Assist clients in selecting better
furnishings by collaborating with interior designers who can utilize the app to provide virtual design consultation services within the app.
3. Custom Furniture Design: Provide an option for consumers to alter furniture's dimensions, color, fabric, and other details and see it in augmented reality (AR) before making a purchase.
4. Interactive Features: Include interactive features like material swaps, color adjustments, or 3D animations that show how the furniture works (e.g., drawers opening, extendable components).

III. RELATED WORK

A combination of silhouette and photoconsistency constraints is used in to recover 3D shape and appearance from multiple views. However, this method is based on global optimisation and requires votes from several cameras to calculate a cost function for each voxel, and therefore cannot operate while the video is being captured. Representing a 3D model as a mesh rather than voxels, Isidoro et al. iteratively estimates the geometry of the mesh and its texture by perturbing the mesh vertices and measuring the resulting change in photoconsistency.[1]

- A significant advantage of the method we propose is that it is not necessary to interactively model the foreground object. The user is required only to point the camera at the object as the camera is moved, reducing the required interaction to the point whereby the camera can be used as the interface.[1]
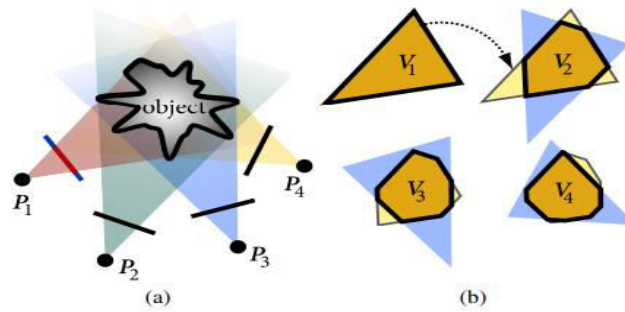

Fig 1 The 3D visual[1]

- This India's e-commerce sector continues to grow significantly. But, it's only possible to have change with growth, thus, for the e-commerce sector to prosper, new technology developments must be periodically adopted. One such innovation might be the use of augmented Reality to draw in both current and potential clients[2]

- To show product data, and 3D models, perform feature tracking and determine locations superimposed on top of a picture of the actual world, the software first analyses photos acquired by the device's rear camera. It then applies either marker tracking or marker-less tracking to those photos[2]

- First is the Combination of real with the virtual, second is the Real-Time interaction and finally, third is the Three-Dimensional Registration

IV. PROPOSED ALGORITHM

A. *Software prototype design*

Fig 2

B) Algorithm

1. ***Start:***
   - *Assign the **furniture** GameObject with a product from **StateNameController**.*
   - *Add interaction components to the **furniture** for rotation (**LeanTwistRotateAxis**) and drag translation (**LeanDragTranslate**).*
2. ***Update (Runs every frame):***
   - *Check if the screen is being touched.*
   - *If there's a touch beginning (user just touched the screen):*
     - *Perform an AR raycast from the touch position to detect if it hits any AR planes within the camera's view.*
     - *If an object isn't already placed, the touch isn't on a UI element (button), and the raycast hits an AR plane:*
       - *Instantiate a new **furniture** object at the position and orientation (rotation) where the raycast hit the AR plane.*
       - *After placing the furniture, disable the visibility of all AR planes for a clearer view.*
3. ***Helper Methods:***
   - ***isPressed**(): Checks if the current touch is on a UI button.*
   - ***OnDestroy**(): When the script or object it's attached to is destroyed, it also destroys the instantiated furniture object, if any.*
   - ***SwitchFurniture(GameObject NewFurniture)**: Changes the **furniture** GameObject to a new one, allowing for different furniture to be placed in the AR scene.*

V. WORKING PROGRAM

```csharp
using System.Collections;
using System.Collections.Generic;
using Unity.XR.CoreUtils;
using UnityEngine.UI;
using UnityEngine.EventSystems;
using UnityEngine;
using UnityEngine.XR.ARFoundation;
using UnityEngine.XR.ARSubsystems;
using UnityEngine.Networking;
using Lean.Touch;
public class FurniturePlacementManager : MonoBehaviour
{
    public GameObject furniture;
    public XROrigin sessionOrigin;
    public ARRaycastManager raycastManager;
    public ARPlaneManager planeManager;
    //public TouchControl controls;
    GameObject _object;
    private List<ARRaycastHit> raycastHits = new List<ARRaycastHit>();

    private void Start()
    {
        furniture = StateNameController.Product;
        furniture.AddComponent<LeanTwistRotateAxis>();
        furniture.AddComponent<LeanDragTranslate>();
    }

    private void Update()
    {

    if(Input.touchCount > 0)
        {
```

```csharp
        if (Input.GetTouch(0).phase==TouchPhase.Began)
        {
            bool collision = raycastManager.Raycast(Input.GetTouch(0).position, raycastHits,
TrackableType.PlaneWithinPolygon);
            if (_object==null&&collision && !isPressed())
            {
                _object = Instantiate(furniture);

                _object.transform.position = raycastHits[0].pose.position;
                _object.transform.rotation = raycastHits[0].pose.rotation;
            }
            foreach(var planes in planeManager.trackables)
            {
                planes.gameObject.SetActive(false);
            }

        }
    }
}

public bool isPressed()
{
    if (EventSystem.current.currentSelectedGameObject?.GetComponent<Button>() == null)
    {
        return false;
    }
    else
    {
        return true;
    }
}
public void OnDestroy()
{
    if( _object != null ) { Destroy(_object); }
}
public void SwitchFirniture(GameObject Newfurniture)
{
    furniture = Newfurniture;
}

}
```

VI. SIMULATION RESULTS

Fig 3

VII. FUTURE WORK

We can incorporate the following concepts into the potential future scope of our application such as Cost details section/option can be included to make the user experience more appealing ,feedback page to improve our system a feedback page can be included and room measurement tool include an augmented reality tool that uses the room's measurements to determine the optimal furniture placement.

VIII. CONCLUSION

 In summary, augmented reality is a revolution that is changing the way we interact with our living spaces rather than just a new tool in the interior design toolbox. More than just a convenience, the ability to preview and customize furniture in our homes with augmented reality technology signifies a fundamental change in the way that consumers interact with brands. AR promises to improve our spatial perception as we continue this digital revolution, allowing us to more fully connect the imaginary and the actual world. This smooth adoption of augmented reality in the furniture sector is more than simply a passing fad; it's a window into a time when our surroundings will be able to automatically adjust to our tastes. In summary, augmented reality is a revolution that is changing the way we interact with our living spaces rather than just a new tool in the interior design toolbox. More than just a convenience, the ability to preview and customize furniture in our homes with augmented reality technology signifies a fundamental change in the way that consumers interact with brands. AR promises to improve our spatial perception as we continue this digital revolution, allowing us to more fully connect the imaginary and the actual world.

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