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E-Commerce using Augmented Reality

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***Abstract*: Shopping furniture in the 21st Century has evolved from conventional shopping to online shopping. This paper presents the implementation of a mobile application system that enhances the shopping experience by projecting Augmented Reality (AR) objects into the real world. This AR visualization is used to improve the shopping experience by allowing the customer to visualize the product in the real world before buying. The mobile application uses a marker-less detection technique to detect the plane and superimpose the furniture in the real-world. The application can be extended by making it usable in head-mounted devices such as HoloLens. Cloud anchors can also be implemented which makes the 3D model viewable in multiple devices simultaneously.**

***Keywords*: Augmented reality, Anchors, Marker-less, Superimpose, Visualization.**

1. Introduction

Online shopping has become a popular shopping method ever since the internet declared a takeover. Furniture and other household items are some of the common things bought online. Although purchasing these products online is highly convenient, it comes with its own disadvantages. The major disadvantage of purchasing products online is that the customer solely relies on the picture offered on the website to determine if the product will fit in their home or in the required environment. However, in many cases, pictures are unable to convey the necessary information needed to determine if the furniture will fit in the required environment. For example, the size of the furniture will not fit in the available space, the color of the furniture might not go along with the background color. This ordeal can be overcome using augmented reality. Nowadays, smartphones are so common that they are being used by everyone. Therefore, this paper proposes the creation of a mobile application, to make the shopping experience more convenient. This application aims to provide an immersive experience for customers using augmented reality. People can view the three-dimensional model of the product to be purchased superimposed on the required environment using their smartphone before buying the product.

2. Existing system

The applications that are currently being used are based on marker detecting systems. It uses a marker-based detection to detect the plane and superimpose the furniture. The marker is usually a QR code, Bar Code or Image. Once the marker is seen and detected through the camera, the furniture is superimposed above the marker. This lets the customer see what it looks like in the real world.

It requires a physical marker such as a QR code, Bar code or an image to detect the plane. Only when the marker is detected the furniture can be superimposed in the real world. And the furniture can be placed only above the marker, it lacks the flexibility to be moved around and rotated. Furthermore, the application can superimpose only one furniture at a time. So it becomes a great ordeal when two furniture needs to be bought together. Also, the current system cannot detect depth enough to give a full-on immersive experience.

3. Literature survey

The paper [1] uses a marker-based detection technique to detect the plane and superimpose the 3D object.

Implementation of AR in STEM education is given in paper [3]. It recognizes the 2D images in textbook and with the help of TensorFlow, it recognizes the image and superimposes a 3D object of the image over it. It gives an immersive experience to the student and makes it easy to learn. Furthermore, it gives an idea about how to retrieve a 3D model from the cloud. The paper [4] deals with the creation of 3D objects with the help of depth sensors in the smartphone. Once the 3D model is created it is superimposed in the real world with the help of ARCore and Sceneform API. The paper also provides insights into how a Sceneform asset is created, geometric definitions and texture is applied.

Detecting a marker using Head Mounted Devices (HMD) with the help of color calibration is given in the paper [5]. It also uses the transformation algorithms to rotate and view 3D objects from different angles. The paper [6] gives the Gartner prediction about the use case of Augmented Reality applications in 2020. It also predicts the various industries where Augmented Reality can be applied and has a huge use case.

4. Proposed system

The proposed system uses ARCore and Sceneform to superimpose the furniture in the real world without any marker. The markerless detection of the plane is done using the sceneform API. Once the plane is detected a grid of white dots is laid on the surface. The 3D object is placed on the touched location. This is done with the help of anchors. Anchors are the

location in the physical world where the object needs to be placed. While the 3D object is being superimposed, the light estimation API and the Depth API makes the object more realistic to give the customer an immersive experience.

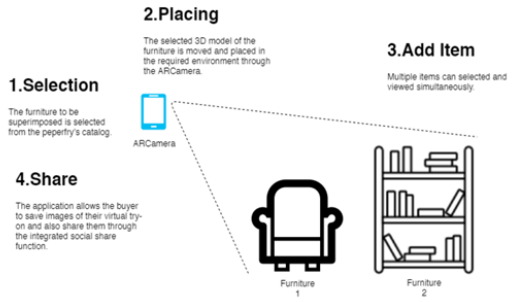

Fig. 1. Architecture of the system

ARCore was developed by Google as a software development kit. This enables the use of augmented reality applications in smartphones. It uses three technologies to fuse the virtual content with the real world as seen through the phone's camera. The three technologies are environmental understanding, six degrees of freedom and light estimation.

Sceneform is an application programming interface that renders a 3D scene without the use of OpenGL. It consists of a high-level scene based graph API, a realistic physically based renderer and an Android Studio plugin for viewing and importing 3D assets.

Depth-from motion algorithm that creates a depth map of the environment using the depth sensor. A Depth map enables the application to identify which objects are close to the camera sensor and thus determining whether a virtual object to be superimposed should appear overlapped by some real-world object or not.

The input feed is given in an image format for the Lighting Estimation API. This provides discrete visual cues and provides detailed information about the Lighting in the given scene. This information can be used when rendering virtual objects to light them similar to how they appear in the real world. These details can be mimicked to give an enhanced immersive experience for the customers.

The selection allows the user to select the furniture that needs to be superimposed. Once the furniture is selected, it needs to be placed in the real world. This is done by tapping on the detected plane. The detected plane is represented by a grid of white dots. Now the object is placed in the real word through AR. The superimposed furniture can be rotated and moved around to figure out the right place for the furniture. Multiple furniture's can also be superimposed at the same time, which makes it convenient for the customer to buy multiple furniture together. When the desired furniture and it's location to be placed is obtained, it can be screenshotted and shared.

5. Result

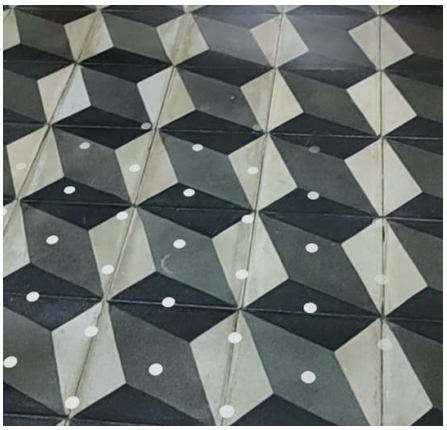

Fig. 2. A table being superimposed in the real world

Fig. 3. A couch being superimposed in the real world

Fig. 4. Multiple furniture superimposed simultaneously

The application superimposes the furniture in the real world enabling the user to experience how the furniture will look in the real world. The Fig. 1 shows the plane being detected. The detected plane is represented using white dots as seen in Fig. 2.

Touching anywhere on the white dot drops an anchor at that location. Fig. 3, represents the furniture being superimposed above the anchor. The list at the top of the screen will display all the available furniture. By tapping on multiple locations, multiple furniture can be superimposed at the same time as represented in Fig. 4. After viewing the furniture in the real-world the customer can make a decision about purchasing the furniture.

Furthermore, the use of Sceneform reduces the lines of code and making the application faster.

6. Conclusion and future scope

The application can be extended by using cloud store 3D models of the furniture, which makes the application lighter and occupies less space in the local device. Having the ability to generate a 3D model of the furniture with the help of a mobile camera will benefit the sellers. They won't have the need to create a 3D model, instead the application will create it for them.

To conclude, an AR-based shopping application lets the customer view the furniture in the real-world before it is being purchased. The application superimposes the 3D model of the furniture in the real world through the camera, this helps the customer to decide if the furniture is appropriate for the environment.

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