

With the escalation of online shopping, comes some drawbacks and problems. Most of the time, the customer's imagination alone is not enough to make furniture purchase decisions. It costs customers and sellers a lot of money when customers only depend on their imagination to purchase furniture and then it turns out that it does not fit the place as they thought it would as shown in figure 1. Researches have shown that about 50 percent of furniture purchased online is returned. This is a very huge problem as furniture is very expensive in shipping and restocking.



Literature Review

Hasler O. et al made a research to test whether AR could be used to measure the dimensions of a room or not [8]. The system the authors made used Marker-based AR. It first used tracking to detect surfaces and then place markers on each end of the surfaces. the markers are identified using IDs, positions, and rotation angles. after that, 3 steps took place, 1-detecting marker candidates 2-marker analysis 2-Pose estimation technique. after these steps, the system will be having surfaces detected with and markers over them. The last step is measuring the distances between them. To do this, the markers on the same surface must be captured in the same picture. the markers used in this system were ArUco. This system was created using Unity and OpenCV [9].

Stenbeck et al. proposed a methodology for using AR in the dimensional measurement of vertical surfaces in their research [7]. Their methodology depended on using Unity ARKit and proved the ability to make approximate but not accurate vertical distance measurements.

Boonrahm et al. proposed an algorithm in their research paper that used markerbased AR for dimensional measurement [10]. The algorithm is developed using OpenCV [9] and Unity. The authors' general idea was designing markers marker-based based AR and then using them to be able to mark the positions between which the distance will be taken. Information about these markers is stored; like their rotation and position. This information was then used to calculate the dimensions of the surface. For testing the algorithm, the authors were running the experiment in 3 different rooms with different shapes and sizes. The results of the algorithm proved a great amount of accuracy with an error of only 3%.

Seker M. et al took a similar approach and penetrated a new benchmark to automatically detect social distancing violations in images [11]. Their algorithm is based on taking images and using YOLOv4 for person detection. OpenPose is then used to get human poses and saving the pixel locations of the human pose key points. The python algorithm then measures the distance between the points of one person and the corresponding points in the people around that person. The algorithm was tested in one outdoor scene and an indoor scene of people being in different distances from each other. The results of the algorithm were compared to the actual manual measurements and proved to have only 28.9 percent error in distance estimation and 92 percent correct human detection.

In another research, Mustafina et al. proposed a very simple algorithm for creating a basic AR app [5]. For the creation of this algorithm, they used Unity, Vuforia [12], and some c code. The authors at the end of this study implemented an AR app that runs on android. when the camera detected the image target, the app augmented the fighting Unity-Chan on it.

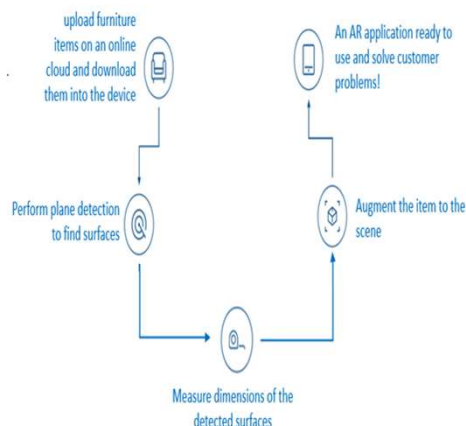
Problem Statement

In our research, we will use depth and color sensors available in smart devices along with the Augmented Reality (AR) technology 2.1.1 to create an application that performs dimensional sensibility 2.1.3 to enable the customer to visualize the product and its dimensions before making the furniture purchase decision. This application will first detect the surface, measure its dimensions, then augment the furniture item with accurate relative distances. Our application will be based on Unity [3] and C#. This App will help consumers evaluate products, encourage purchases and minimize confusion.



Methodology

This project is created using Unity and C#. It is created by first making an online cloud to store the furniture items. Surface detection is done by detecting feature points and connecting them. It will then measure The plane's dimensions by calculating the distances between the feature points. ARFoundation and raycasting are used for plane detection. ARCore is used for dimensional sensibility. Finally, the user choses the furniture item from a simple UI and then our AR technology will augment it into the scene. Figure 2 is a rough block diagram of our methodology.



Results

Figure 3 is the expected result from our research project. The application performs surface detection and dimensional sensibility. It then augments the object the user choses with accurate relative dimensions. The app provides a user Friendly and simple UI to ensure a satisfying customer experience. All the furniture Items are also uploaded on an online cloud to facilitate the process updating the app with the items in stock



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