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Furnishing Using Augmented Reality

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Abstract: *This paper is a brief implementation of our application in Mobile Augmented Reality. In today's world, we believe Immersive Computing is the future of computing. AR (Augmented Reality) and VR(Virtual Reality [1]) make computing more natural and immersive.Interacting with your data in a more natural way is the future [2]. We've used Sceneform to overlay 3D graphics of Furniture on top of the real world. We've also used Motion Tracking to track your objects and Augmented Images to detect Images and overlay graphics on them. Now in our proposed system, we've made possible for users to actually try the furniture objects sitting in the home without visiting the shops*

Keywords: *Augmented Reality, Objecttracking, VirtualReality, VirtualEnvironment (VE), AR-Core, Marker-Less, Concurrent Mapping and Odometry.*

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I. Introduction

Augmented reality is a technology within which we can see the objects in physical world virtually, thus providing a composite view. It gathers a wide variety of user experiences. We are going to develop a system with augmented reality that lets user to try on virtual furniture in user's real home structure before buying. From this user will be able to choose furniture objects a lot easier. It will not be necessary to go shopping and long searching for the large user need, or use a measure tape to find out whether or not the furniture would fit in customer's room or not. The main purpose of this project is to develop an application for various furniture items in furniture stores virtually without using the actual means that is incredibly exhaustive and time-consuming activity. By using this application, it will be convenient for the user to do online shopping of furniture items [3]. This will additionally help the user to try out the furniture items in their room and they will be able to see how it will look after placing furniture in it. User can attempt multiple combination of furniture objects virtually without physically moving the furniture items. Our motivation here is to increase the time efficiency and additionally improve the accessibility of furniture try on by making this layout in augmented reality [4].

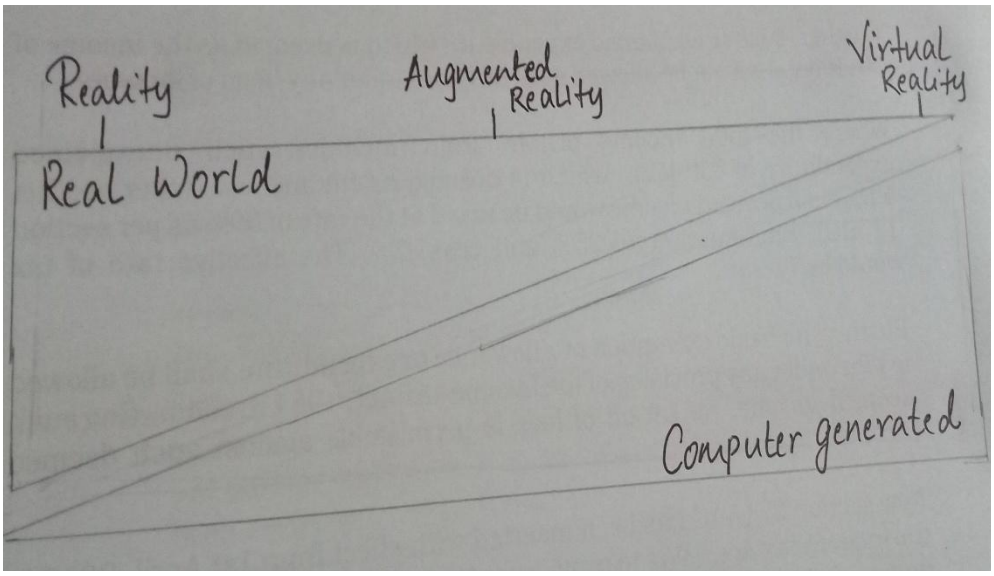

Figure 1: AR vs VR

II. Existing System

We conducted an intensive literature survey on numerous such applications and found out most of them were marker based Augmented Applications [2]. Marker based applications have one common limitation, that being a user has to carry a marker everywhere she wants to project Augmented Content which to us was inconvenient, which further degrades the user experience and user faces problems & has to wait for the image to process properly, even the graphics of the objects used for furniture are lower in resolution.

III. Problem Statement

We're building an Android app to bridge the gap between a seller and user to virtualize 3D furniture directly onto your smartphones. Our core stack being Java and AR Core, we'll preview furniture items right from your smartphones as if they were actually there.

IV. Proposed System

A Mobile Augmented Application which will be marker less using. AR Core is Google's platform for building augmented reality experiences. Using different APIs, AR Core enables your phone to sense its environment understand the world and interact with information.

Motion tracking uses visual input from the camera to detect unique features in the environment and it uses the camera's position and orientation which is understood through the inputs from the sensors on the Phone such as accelerometer and gyroscope. Our Algorithm is based on the SLAM (Simultaneous Localization and Mapping) [5]. The application superimposes the computer-generated object onto our real feed through the camera. This makes a perception as if the furniture actually exists.

V. Project Design

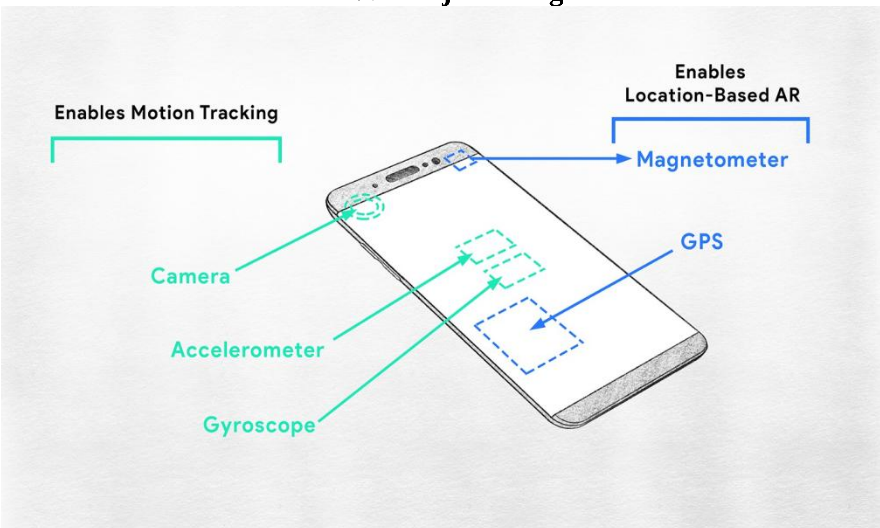

Figure 2: Motion Tracking for Our Application

2. Flowchart:

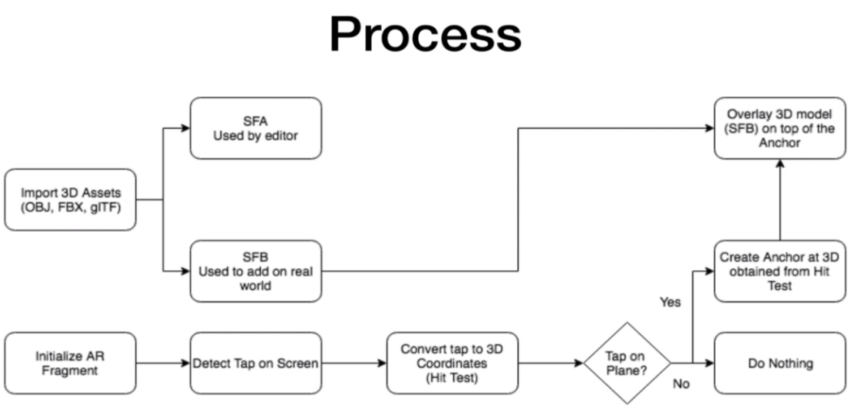

Figure 3: Project Flowchart

The above figure clearly explains about the whole summary of our project. First, we need to import all the 3D assets like the object file which are initially like the parts of furniture. Now to assemble them, we need to create a binary file of the image as SFB, Sceneform Binary which deals with binary semantics of the object file. We can here configure all the geometry aspects of the 3D model generated. SFA file, Sceneform Asset file is a human readable file of the primary SFB file.

AR Fragment is an object which we can use to detect planes, ask users to scan surroundings, etc. Hit-Test defines an intersection between a ray and estimated real-world geometry by converting a tap on screen to 3D coordinates. Finally, Anchors ensure that objects appear to stay at the same position and orientation in space, helping you maintain the illusion of virtual objects placed in the real world.

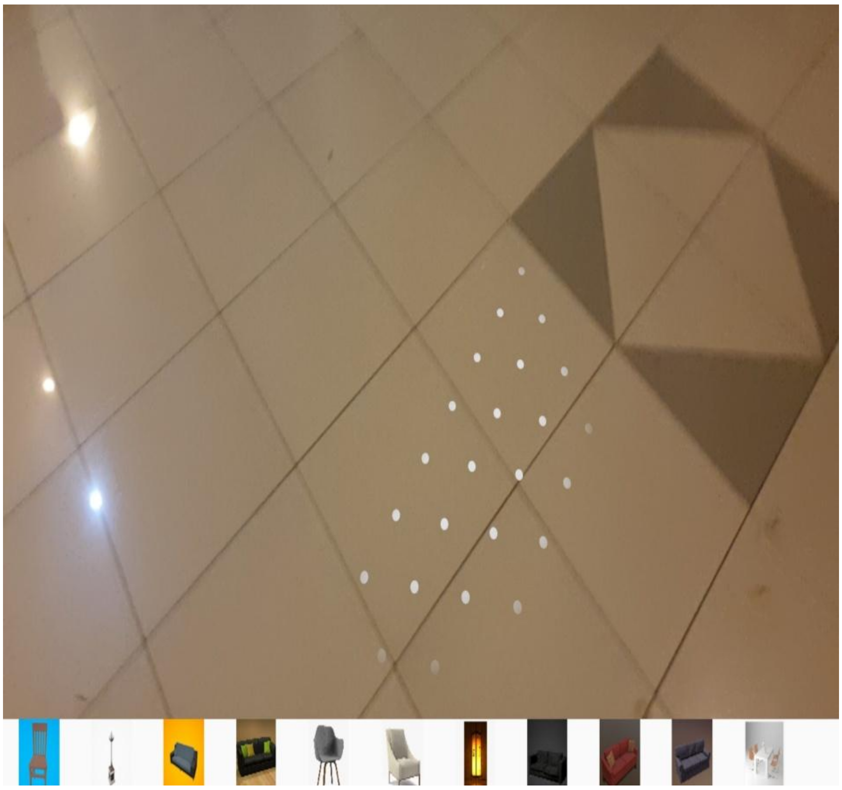

Figure 4: Fragments detection to user

Figure 5: Feature points detection and Object placing

Figure 6: Environment understanding and light estimation

VI. Plane Detection

Biggest challenge for our application was to detect horizontal planes without markers. Our smartphones are not capable enough to distinguish difference between vertical and horizontal plane. To solve this, we used two algorithms viz Concurrent Odometry and Mapping (COM) [6] and Simultaneous Localization and Mapping (SLAM).

This algorithm works as follows:

1. Initialize AR Camera and look for distinct features in the live feed. These features are called feature points and are visually appealing to the camera.
2. This visual information is combined with inertial measurements from the sensors of the smartphones. Position and Orientation is thus detected by the use of these measurements.
3. This alignment renders 3D content to users from correct perspective. The rendered image can be overplayed on top of the real-worldimage, making it appear as it is a true image.

VII. Environmental understanding

AR Core constantly keeps looking for clusters of distinct feature points that are present on common vertical and horizontal surfaces like for example,walls,tables,floor,etc. We can use this information to place virtual objects resting on flat surfaces.

VIII. Concurrent Odometry and Mapping

To map our surroundings reliably in Augmented Reality, we need to continually update our measurement data. With reference to a paper published by Lu, F., & Milios, E. as “Globally Consistent Range Scan Alignment for Environment Mapping"[7], we can understand how the issue of aligning the virtual world in our own world is solved. We also referred Google’s COM patent [8] which explained how this process worked.

Sensor: On mobiles, this is primarily Camera, augmented by accelerometer, gyroscope and depending on the device light sensor. Other than from Project Tango enabled phones, nobody had any sort of depth sensor for Android.

Front End: The feature extraction and anchor identification happen here as we described in previous post.
Back End: Does error correction to compensate for the drift and also takes care of localizing pose model and overall geometric reconstruction.

SLAM estimate: This is the result containing the tracked features and locations.

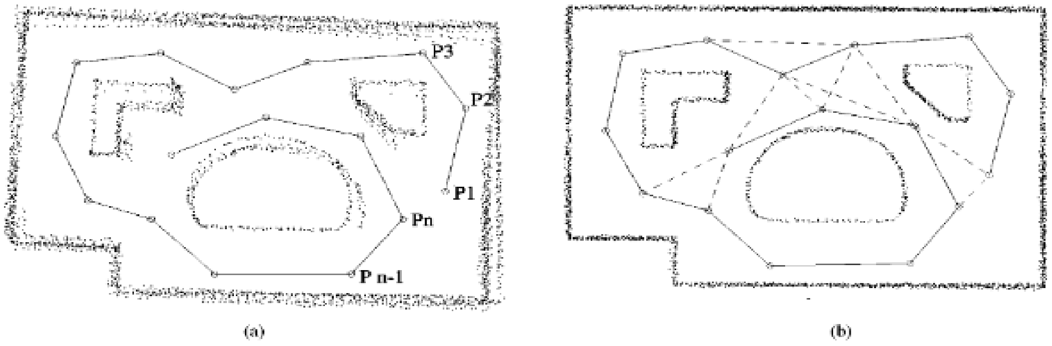

Figure 2. An example of consistently aligning a set of simulated scans: (a) original scans badly misaligned due to accumulated pose errors; (b) the result of aligning these scans based on a network of relative pose constraints. The constraints are indicated by line segments connecting pairs of poses. Two types of constraints are used: those derived from aligning a pair of scans (marked by both solid and dotted lines), and those from odometry measurements (marked by solid lines).

Figure 7: Globally consistent range scan alignment for environment mapping (Image credits: Lu, F., & Milios, E. (1997)).

IX. Future Scope

Our future scope regarding this project is to make the user experience as immersive as possible. We will try to make the AR Content as immersive and interactive as possible so as to make user actually think the product, he/she is viewing is an actual product!

X. Conclusion

This system will help and assist the customer to view the furniture object virtually in real environment before buying the object. Overall, using augmented reality applications businesses can personalize shopping experience, entertain and amaze customers, be ahead of competition and engage and retain customers. Similarly, users can find and try productsremotely, explore brand new ways to shop and make more informed and precise shopping decisions.

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References

[1]. “Taiki Fuji, Yasue Mitsukura, Toshio Moriya”,” Furniture Layout AR Application using Floor Plans based on Planar Object Tracking”, IEEE2012, pp-1-10.
[2]. “M. Calonder, V. Lepetit, M. Ozuysal, T. Trzinski, C. Strecha, and P. Fua”, “BRIEF: Computing a Local Binary Descriptor Very Fast”, IEEE 2012, Vol. 34, No. 7, pp. 1281-1298.
[3]. https://www.forbes.com/sites/veronikasonsev/2017/12/20/how-ar-is-giving-furniture-a-boost-in-sales/#47b0e43c1d3a
[4]. “D. W. F. van Krevelen, R. Poelman”,” A Survey of Augmented Reality Technologies, applications and Limitations”, The International Journal of Virtual Reality, Vol. 9, No. 2, IEEE 2010, pp. 1–20.
[5]. “SLAM: Simultaneous Localization and Mapping”, “Wolfram Burgard, Cyrill Stachniss, Kai Arras, Maren Bennewitz
[6]. “System and method for concurrent odometry and mapping”,Google US20170336511A1
[7]. Cesar Cadena; Luca Carlone; Henry Carrillo; Yasir Latif; Davide Scaramuzza; José Neira; Ian Reid, “Past, Present, and Future of Simultaneous Localization and Mapping: Toward the Robust-Perception Age”, IEEE Transactions on Robotics (Volume: 32, Issue: 6, Dec. 2016)
[8]. ART toolkit, http://www.wikitude.com

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