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"AN APPROACH FOR INTERIOR DÉCOR PLANNING USING SLAMWITH MARKER BASED AR"

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Abstract:

The demand in the interior industry is increasing more and more. Initially, the facility was used for lavish events, but gradually it became available to everyone. Augmented reality applications have the potential to transform this industry by allowing consumers to plan their home or office interiors on their own time, on their phone or system. This application helps in virtual design and planning of floor space with many options to choose from. The implemented system works not only by using images captured by the device's camera, but also by using the orientation of the camera relative to the ground that needs to be detected. The Unity SDK performs instant tracking to determine the relative distance between the camera and the aircraft by focusing on the ground. This provides consumers with a more realistic view to efficiently determine fit based on item dimensions, saving the manual effort of moving furniture. The implemented system is evaluated in terms of deployment times for different models and performance at different distances.

Keywords: - Augmented Reality, AR app, AR Furniture, ArCore, Android App

Introduction:

The e-commerce industry in India is growing exponentially. There is no growth without evolution, so the e-commerce industry must constantly add new technologies if it is to grow. One of these additions will be the use of augmented reality to attract new customers and users. For the sake of furniture application, the field of e-commerce that we have chosen is the furniture industry.

There are already a few big players in the furniture industry, but there is a lot of potential for anyone who can bring something unique to the table. The Furniture App aims to offer its customers all the products contained in their online furniture store in a way that no other store has managed before, through the use of open reality wide.

Augmented reality and virtual reality seem to be two sides of the same coin. Augmented reality lets you place objects in your own environment, while virtual reality places you in a developer-created environment. Although augmented reality is somewhat used in industries such as design and modeling, virtual reality is known to be an effective training technology for industry workers, especially those working in the industry. work in factories with hazardous environments.

Here are the main contributions of the article:

1. Recommend an e-commerce app with augmented reality support.
2. Use the Unity SDK that includes the PBR (Physical Rendering Engine) to facilitate product rendering in the real environment.

3. Use the GLB file format to render models at runtime with greater efficiency

Background:

In this section, you can get a detailed understanding of the software requirements, the concepts used, and a brief explanation of the overall results.

1. Android SDK

The Android SDK (Software Development Kit) provides all the components needed to create apps on the Android platform.

Core Android SDK components include:

1. SDK build tools: Includes all the tools needed to build discrete application components.

2. Android Emulator: Used to test the Android application in the development environment itself, if there is no physical device.

3. Platform Tools: These are tools that provide support for running apps on the current Android API.

4. SDK Platform: Target API level (Android level) to run the app.

5. Google APIs - Make it easier to build apps by providing APIs for different interfaces.

Unity SDK: Building AR apps in Android traditionally requires one to learn OpenGL, which is the API for developing 2D and 3D vector graphics. However, the Unity SDK allows users to create dynamic AR applications without knowing much about OpenGL and makes the process seamless. The Unity SDK consists of 3 main components, a high level scene graph API, a filament powered physics renderer, and an Android Studio plugin that integrates the sdk with Android Studio for the aforementioned development workflow.

3. Scene graph: A scene graph is basically a data structure used in vector graphics applications, containing scene data in the form of nodes. In 3D graphics, nodes can be used to define relationships between digital objects in a virtual environment. In the provided application, transformable buttons will be used to anchor 3D objects in the scene, along with the ability to scale and transform.

4. Physical rendering: This is a type of rendering technique that renders all 2D/3D models in the correct view for the lighting conditions. Thus, PBR allows rendering of objects in the environment by improving textures, shadows, reflections, and more. Different types of surfaces such as metal, wood surfaces also appear optical.

5. ARCore: ARCore enables AR functionality in Android devices without using external sensors. Previously, Tango was used to provide AR support for Android devices, today enhanced by ARCore. ARCore works with Unity to import 3D content into apps and create runtime models that are rendered in the environment using the on-device camera

There are three basic concepts used in ARCore [2]:

a. Motion tracking: Models shown in AR are first created in a virtual environment and placed in the real environment using the device's camera. Motion tracking estimates the device's position relative to the world in real time, so models are precisely fixed in the world relative to the user.

b. Environment savvy: To place models in any environment, ARCore requires a plane on which to place the object. It finds a suitable plane by finding a group of seemingly horizontal points and providing that flat surface on which to place the object.

c. Light Estimation: ARCore has the ability to estimate the lighting information in a given environment, i.e. the amount of current light or lighting conditions in the model scene that will be displayed.

This allows the model to be rendered with the right lighting, making the scene look more realistic. If light estimation is not done, the model will appear out of place in the given environment.

SYSTEM DESIGN:

A. Android device and camera

Mobile device used to run the app must have at least Android level Android 7.0 (Nougat) with API level 24 for the app to work properly. The device must have a good quality camera and related sensors for best results.

B. User Interface

The user interface designed for this application uses a modern e-commerce layout. Google Fonts Inter fonts are used on all pages - Login, Home, Product details, etc. The user interface is interactive enough for customers to easily navigate the funnel.

C. Database

Data related to users, transactions, and products must be stored in a consistent database, so in the case of provisioned apps, the Firebase database is maintained. choose. Firebase is easily compatible with mobile apps and can also be used for free within certain standard data limits. Therefore, it is also perfect for testing different segments of the application.

D. Unity

Includes several scene dependencies added to the project, namely scene core, plugins, ux and assets. It works with Google's ARCore and creates a model at runtime instead of creating a separate asset file (.sfb) for each model

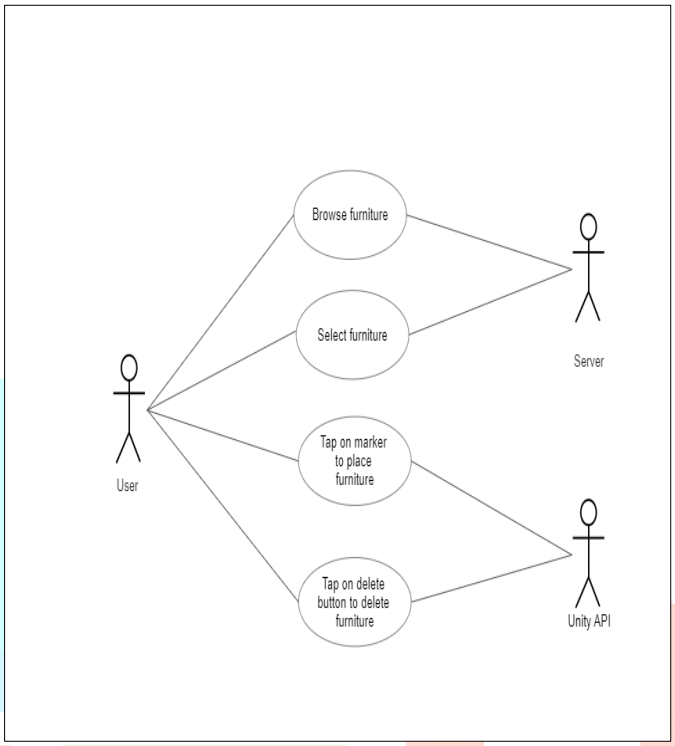

Figure: System Design

SLAM ALGORITHM

SLAM stands for Simultaneous Localization and Mapping. SLAM (Simultaneous Localization and Mapping) is a technology, which understands the physical world through feature points.

SLAM enables AR applications to recognize 3D objects & scenes, as well as to instantly track the world, and to overlay digital interactive augmentations.

Features of SLAM:

- Instant Tracking:
  Instant tracking allows you to place digital content indoors and outdoors without the need for a target. Unlike Image and Object Recognition, which rely on pre-mapped targets to trigger the display of digitally augmented elements, Instant Tracking is marker less. Therefore, instead of requiring a target, it tracks features of the physical environment itself to overlay AR content.

- Object and Scene Recognition:
  Object recognition enables real time and 360 degrees augmented reality experiences around real world objects that were pre-defined by you.
  The practical applications are numerous, so whether you are building your next interactive marketing campaign, enhancing in-store experiences or remotely assisting workers on a factory floor, object recognition will close the gap between the physical and digital worlds.
- 3D Model Object Tracking:
  Create high-performing Unity object tracking AR experiences for iOS and Android using 3D models (CAD, glTF 2.0 and more). Work with reflective and feature-poor objects such as vehicles, large-scale industrial machines, home appliances, toys and more.

Conclusion:

The developed application is easier to use, does not rely on external hardware, and is highly accessible to customers, allowing efficient floor planning. The system developed here is analyzed for different model deployment times and object tracking is done in real time at different distances.

Dynamic model update is available for future deployments. Instead of building an application using coded models, users have the option of uploading the models they want.

The developed application has increased ease of use, independence of external hardware and accessibility to customers, allowing them to plan their floors efficiently. The system developed here is analyzed in terms of deployment time of different models, and the tracking of objects is done in real time with different distances.

Dynamic model updates may be used in future deployments. Instead of building apps with coded templates, users can choose to download the templates they want.

The developed application has increased ease of use, independence of external hardware and accessibility to customers, allowing them to plan their floors efficiently. The system developed here is analyzed in terms of deployment time of different models, and the tracking of objects is done in real time with different distances.

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