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Mobile Marker-based Augmented Reality

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Abstract

This project is regarding the Augmented reality, in which 3-D virtual objects are integrated into a 3-D real environment in real-time. This project describes the 3D AR of an Architecture building, The algorithm used here is called SLAM (Simultaneous localization and mapping), and marker-based augmented reality is the classification used. At events AR Can create a real-life experience and allow every user in the room to experience the same and see similar images, making it perfect for boosting the Client.The event industry is embracing this advanced technology to shape and change how weinteract, attend, and market our businesses. In marketing augmented reality is used to increase sales strategies. It allows brands to give customers unique experiences by tapping into their mobile devices. AR visualization is a great way to display informationto users.

Keywords: Android Phone, 3D asset, Marker.

1. Introduction

The blueprint could be the most awkward part of a user's experience with a device. Users are avoiding posters, magazines, and manuals as long as possible, while designers try to develop interfaces so there will be no need for them. Yet, both users and designers, agree upon the continued presence of the posters, magazines, and manuals. In the Architecture model, the blueprint is supposed to be used to ensure the safe and proper use of an Architecture model. Since the Architecture model is turning into an environment with complex devices, all using different interfaces, software, and hardware, Still the model seems to be a comprehensive and complicated document. Documents that seldom are being used by the Architecture model personnel, who seem to prefer getting hands-on experience with the device or getting instructions from a more experienced colleague. Augmented Reality, AR, is a technology that is creating an interface between our digital and physical worlds. By populating the world with Information, it could provide the user with the pre-structure of their home or office, even though AR has been started to get around the world, the technology is still being seen in its infancy. One success factor for AR seems to be the fast development of mobile devices. Due to their availability, flexibility, and pricing, they are becoming attractive targets for AR. One report published in March 2014 has estimated the market for AR between 2013-2018 and concludes that the development of AR strives towards smartphone applications and that the maximum share of global AR revenue will be held by mobile device-based AR. Together with the better performing mobile devices and also with the wearable technologies entering the market, AR seems to move into a position where it will create useful applications, especially

in the Architecture model.

2. Main goal

Augmented reality is increasingly used through smartphones, tablets, and head-mounted displays to enhance the real world with virtual elements in an interactive manner. The primary goal of the project is to make an Architecture model and an easy-to-use 3D modeler. The user should be able to rotate and look at the model from different angles effortlessly, even while simultaneously working on the model. The software should also be easy for any user to try out, without having to invest in expensive equipment, as is often the case when new techniques are introduced. To investigate how a mobile AR Architecture model could be developed. By implementing such an application as a proof-of-concept, an evaluation could further assess different opportunities, and difficulties and whether such an application could create a more efficient and intuitive Architecture model. In construction, AR can be used in everything from project planning to communications. Consider the following use cases: Project presentation. AR can layer certain details and elements onto a building plan so stakeholders can get a better understanding of the project. AR can also be used to showcase 3D models and even provide tours, giving clients a solid idea of what a building would look like before it's built. Want to show the client what a new installation would look like on-site AR can also bring that vision to life. Progress capture. Augmented can be used to track and document how projects are progressing. Several solutions in the market let construction pros capture project progress. These apps use your device's augmented reality features to identify where you are in the floor plan and automatically take pictures at every capture point. Doing so ensures that team members always capture at the same location over time, thus improving progress capture efficiency and accuracy. Better collaboration. AR can streamline collaboration in remote environments by letting teams share 3D images and videos with team members who aren't on-site. Thanks to augmented reality, stakeholders can view images or videos in greater detail so they can identify errors or issues without having to be in the actual building location. 7 Enhanced safeties. AR technology can also improve safety on the job site. Some AR devices (like glasses or mobile devices) can scan tags or labels placed in specific areas or objects. These labels can then bring up the text or even 3D models to communicate safety or hazard information. Construction training. When it comes to teaching people how to use complex equipment or heavy machinery, AR can assist educators through life-like demos, so workers can see the equipment in action before heading to the site. Firms can also use augmented reality to demonstrate hazardous materials or situations without exposing team members to the real thing. This will focus on marker-based AR systems using marker detection, i.e., a camera will be used to perceive our world populated with markers. The visualization of virtual objects will be made using monitor-based visualization, i.e., using a mobile device.

3. System analysis

3.1 Existing system:

System analysis three different types of architectural designmodels are existing before and now.

1. Concept design model. During the initial stage of your design ideas, it can be helpful to see

the beginning form and shape. While a 2D sketch is how most designers start the first phase of design, a basic model can offer a different perspective in the design process. Conceptual models are often made out of inexpensive materials like balsa wood or foam and quickly put together.

2. Working design model. Once you develop a fuller idea of what you're creating, you can turn it into a working design model. If you've encountered any flaws or issues with your initial design, building the design model can help you address them, and possibly shed light on new, innovative ideas you can implement. Model makers commonly use sturdier materials like wood, concrete, and metal to create a working design model.

3. Concept presentation model. A presentation model has a higher level of detail than your initial physical model that better reflects your finished product's materials and scale. Concept presentation models are for when you're ready to present your ideas to your client or the public. Model makers use high-quality materials like resin or even a 3D printer to create a presentation model.

You can make architectural models from a variety of materials, depending on where you're at in the process. Some of the more workable materials for model building are:1. Cardboard 2. Wood 3. Foam 4. Cork 5. Metal

Drawbacks:

- The issues about privacy.
- Break soon.
- Need to change the whole model if any mistake comes.
- Cannot take to other places with secure.

3.2 Proposed system:

Augmented reality on 3d architecture model for homes is developed in this project which helps to display the architecture model in the 3d model for the customer and also helps in making more interest in the architecture project and helps them to understandclearly.

Advantages:

- learning and instruction
- Communication and interaction
- Business improvement
- Navigation and tourism

4.Literature

The literature study and article search were made to gain a deeper knowledge of AR and its current application in the Architecture Building Model. Questions such as how AR is being used today, what the most recent technology is, and how the future AR will look were sought to be answered. The focus lay on the Architecture building model and instructional applications but general AR applications were also examined. Physical architectural models can be categorized into two levels: scale and use. According to scale, models can vary from urban models, site plans, building models, and interior models to detail

models. According to use, models can be conceptual models, working models, or finished presentation models (Knoll and Hechinger, 2008). Conceptual models and working models would be crucial in the design process since they solidify architectural ideas and concepts and invite feedback on architectural forms and relationships of building elements among themselves and their surroundings. In addition, working models are beneficial for running building energy performance simulations and their design could be modified based on their performance. For instance, putting a working model into a heliodon would simulate its lighting performance whereas putting it into a wind tunnel would simulate its wind distribution and airflow. On the other hand, presentation models showcase an accurate and realistic form that would be as close as to the final building design so they are widely preferred in marketing. With the introduction of Computer-Aided Design (CAD), virtual modeling promised an easier, faster, and more precise way of 3D visualization as an alternative method to architectural physical modeling. In our research, we aimed to integrate the tangible properties of physical modeling with the possibilities that digital tools offer. Augmented Reality (AR) presents an effective medium for this integration to work. AR can display virtual objects in physical environments

5. Project description

To start the project, get a first-class jpg file for the marker, install UNITY Engine, visit Vuforia Engine which is an SDK (software development kit), login to Vuforia after downloading the marker license, now use unity to create the 3d object using the markerin the background after rendering the 3d object successfully use UNITY android to bakethe project and send the android file to the android mobile and now scan the marker to display the 3d object in augmented reality. The project execution process is shown in the Figure 1,2 and 3.

Flow chart -1

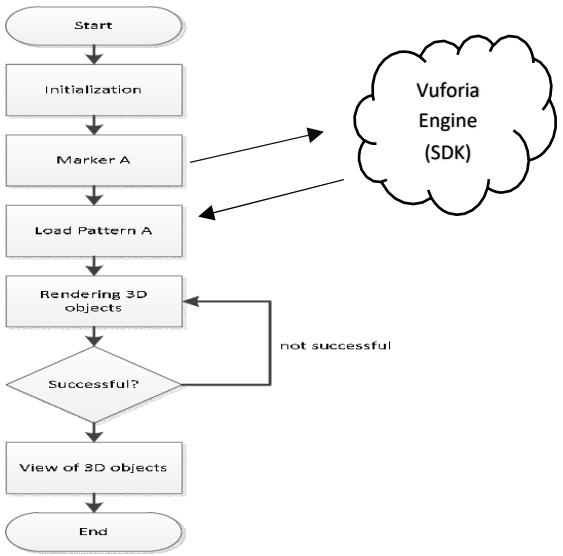

Figure 1: Flowchart -1

Flow chart -2

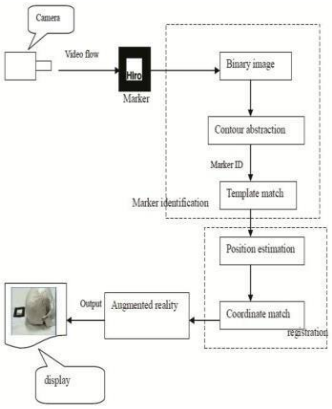

Figure2: Flow Chart 2

Block Diagram of the Project

Figure 3: Block Diagram

Augmented Reality Ideation Template as an INPUT DESIGN

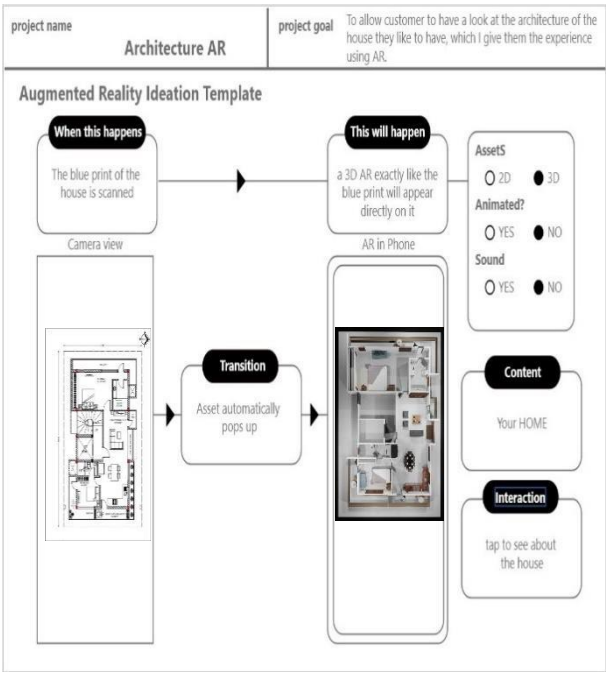

Figure 4: Input design

6. Output design

The design of output is the most important task of any system. During output design, developers identify the type of outputs needed and consider the necessary output controls and prototype report layouts. This output will show the architecture of the home interior, in the 3D model so the customer will understand The Output Of what their future home should looks as in Figure 5.

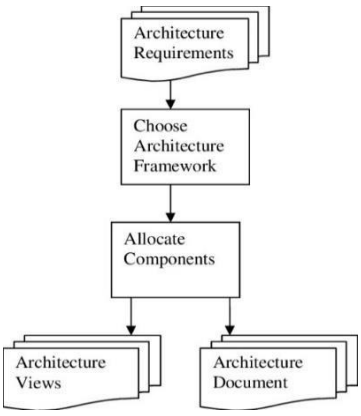

Figure 5: Output Design

7. Software testing

Augmented reality-based testing (ARBT) is a test method that combines augmented reality and software testing to enhance testing by inserting an additional dimension into the tester's field of view. For example, a tester wearing a head-mounted display (HMD) or Augmented reality contact lenses that places images of both the physical world and registered virtual graphical objects over the user's view of the world can detect virtual labels on areas of a system to clarify test operating instructions for a tester who is performing tests on a complex system.

In 2009 as a spin-off to augmented reality for maintenance and repair (ARMAR), Alexander Radenkovic coined the idea of 'augmented reality-based testing', introducing the idea of using augmented reality together with software testing.

8. System implementation

The implementation phase was begun with a brainstorming focusing on the comprehensive questions; what, for whom, and where? What kind of information is the user in need of? Who is the user and where is the user located? Different features and interesting aspects were written down in form of a wish list. The applications and features were implemented using Unity3D together with the Vuforia extension. The programming was made within Mon Develop using C#. We implemented a mobile AR system for building maintenance workers based on the participatory design of the system requirements. The technical implementation relies on hybrid tracking, combining computer vision tools, sensors, and indoor location. The application was tested in a pilot case by end-users in field tests, where the users were able to evaluate the system that had been developed based on their specifications. The results indicate good user acceptance and strong potential for utilizing Building information modeling (BIM) data and mobile AR solutions in building maintenance work, as well as for other building life cycle applications.

Setup

The setup for the implementation includes the building environments Unity3D and Xcode as well as the Vuforia package for Unity. This setup is used to create iOS applications, to create Android applications, The project was built in Unity3D. A separate scene for each application was created to build the AR environment. By importing the Vuforia package to Unity, an "AR Camera" can be assessed to control the detection and tracking of the scene. There are also several different so-called prefabs included, that can be recognized by the AR Camera, e.g., frame markers, image targets, words, cylinder targets, etc. In our case, the frame marker's prefab was used.

Building the models

Since there were no 3D models available for the chosen object, these were modeled in Unity3Dusing simple geometrical shapes. The accuracy of the virtual objects' positioning will depend upon how similar the model is compared to the real object.

9. Conclusion and future enhancement

Conclusion

The possibility of using marker-based AR technology in measuring the size and shape of the room was explored in this research. The objective is to use this technology to manage the usage of the rooms in the factories or manufacturing facilities such as warehouses or containers. Results from the measurement in three rooms with different sizes confirmed that the algorithm for measuring the distance using marker-based AR could give high precision in measurement. This technique can be applied for other purposes, such as calculating the volume occupied by the products or goods in the warehouse.

Scope for future enhancement

Augmented Reality is the technology which had captured our imagination like no other before.This technology is often presented as a futuristic technology, but its form has been taken around for years. From being a science-based concept to science-based reality, augmented reality has grown from consumer space to corporate space. There has been a time when the cost of augmented reality was so substantial that the designers could only dream of working on designprojects that involved it but now it has changed and is available on mobile phones as well. According to the experts, the AR market could be worth $122 billion by 2024 to mix reality with fiction in images. Some more challenges in AR are still to resolve. Ex: GPS is only accurate to within 30 feet and does not work in indoors but with improved image recognition technology it may get resolved. AR technology has much more to offer to the industry than just entertainment. By the year 2025, the Architecture model industry will generate revenue of around $5 billion, and some technology insiders expect to see the most advancement in the Architecture model industry because of augmented reality technology. The travel industry is expected to boom as 84% of consumers worldwide, among which 42% believe that AR is the future of tourism. The future will belong to AR when it comes to improving task efficiency or the quality of the output of an experience for the user. Jessica Lowry writes for the Next Web that, AR is the future of design as we know that mobile phones play a significant role in everyone's lives, therefore this technology will provide opportunities to enhance the user experience beyond measurement.

10. Result

According to the proposed plan, the outcome of this paper leads to the development of Marker-based Augmented Reality.

Figure 6: Result 1

Figure 7: Result 2

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