

An Education App Using AR and VR Technology

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Abstract— The application of Augmented Reality (AR) & Virtual Reality based on mobile terminals is a hot topic of interests for mobile applications and human-machine interaction. Mobile AR technique combines the intelligent display, registration tracking, virtual and reality convergence, and human-computer interactions through portable devices or intelligent terminals. This allows the 3D virtual object to be fully docked with the customer's actual scene, thus increasing the perceived range. This study uses Unity 3D modelling to create a three-dimensional model of the scene and to detect and track the totem functions of the Vuforia engine. It can set animation and play video. Interactions between virtual buttons and virtual reality can also be created as virtual buttons. The AR application in the Vuforia SDK is a hub that connects the virtual world with reality. The monitor of the mobile terminal merges the actual video and the virtual object, enabling three-dimensional tracking and registration. This article shows you how to design your game and apply AR technology in a Unity 3D environment.

Introduction

AR is a new technology evolving from virtual reality. This method mainly enhances the user's perception of the real world based on the information offered by computer system and reality can be "augmented" by means of overlaying the computer-generated virtual objects, scenarios and system prompts to the real scene. It primarily assists human beings in displaying the unreachable scenes in the real world. Vuforia AR Software Development Kit(Vuforia AR SDK) is designed by Qualcomm for AR applications of mobile devices. It identifies and captures planar images or simple

three-dimensional objects(such as boxes) timely by means of computer vision technology. Then it permits developers placing virtual objects through camera viewfinder and adjusting its position in front of the lens. AR is a technology that seamlessly integrates real-world and virtual information. The physical information(visual information, sound, taste, smell, etc.) that is not easy to experience in the real world in a certain time and space is simulated and superimposed by using computing technology. Virtual information is applied to the real world and perceived by human beings. So the experience surpassing the reality is achieved. Real environment and virtual objects are superimposed on the same screen or space in real time. AR contains various technology multimedia, 3D modelling, real-time video display and management, fusion of multiple sensors, real-time tracking and registration, scene combination and other new technologies and new tools. AR provides information that is disparate from human perception in half of the cases. This paper researches the application of Unity 3D -the integrated game development tool of multiple platform. It employs the mobile device augmentation of the real application software development kit developed by Qualcomm. People can experience AR which is also known as the hybrid reality in the Unity 3D environment. The application of AR technology in Unity 3D can be reflected through the design of a game and the basic use of enhancing the reality can be researched

2. Literature Survey

In this section of the proposed paper, the literature review has been conducted. The documentation of relevant works and examination of the collected sources fundamentally is demonstrated. Unity, a multi-platform game engine, commercially available and is used for 2d and 3D video games

production accompanied by visualizations and non-game interactive simulations. Moreover, Unity is one of the popular engines for games that is easily accessible, and in the current epoch is communal amid the developers due to its ease, flexibility, efficiency, and power consumption. Multiple tools have been featured in the Unity Editor that permits rapid iteration and editing in the cycles of development comprised of smart previews play mode in real-time [2]. Furthermore, Unity is offered on Mac, Linux, and Windows it contains an artist friendly range of tools for immersive designing and game worlds, in addition to a strong developer tools suite for implementing high-performance gameplay and game logic [3]. Moreover, Unity supports 3D and 2D development with functionalities and features for the specific needs that are further focused on categories so been included in Unity that permits to create NPCs that logically move around the world of gaming [28]. navigation meshes have been used in the system that is automatically created from the scene geometry, or sometimes even from the dynamic obstacles, to change the character's navigation at runtime. Unity Prefabs that are known as the pre-configured objects of gaming provide the workflow flexibility and efficiency that permit in the confident working without nerve-wracking about the time-consuming errors [5]. According to [6] it has been found that Unity built-in UI system permits to create the UI intuitively and smartly with less consumption of time. Unity takes Box2D advantage the novel DOTS-based NVIDIA PhysX and Physics system that aids in the provision of high-performance and high realistic gameplay. Developers can extend the Editor of Unity with tools need to match the workflow of teams. It also supports the creation and customizing of the extensions that feature many possessions, extensions, and tools for the sake of speediness of the According to [2] one of the feature highlights of this discharge for Android is the accessibility of a seen form of Adaptive Performance for Samsung Galaxy leads. In contrast to PC and consoles, gaming on cell phones characteristically impediment of warmth the board and power utilization. Lovely looking and smooth-messing around have escalated handling needs, which can rapidly warm up your gadget. PC and consoles handle this issue through their dynamic cooling frameworks, yet since telephones don't include dynamic cooling equipment (yet), the telephone winds up throttling execution to hold the temperature within proper limits. The issue turns out to be much progressively risky considering the wide scope of equipment accessible, and the shifting execution and throttling situations. In addition, some of the key features of unity are related to the simple workflow that allows developers to quickly combine scenes in a workspace referred to as (intuitive

editor). It also supports creating high-quality games like AAA images, high definition sound, and action at full speed with no gaps on the screen [32]. Also, some extra features are [33] access the components, coroutine and return types, creating and destroying Game Objects, dealing with vector variables and timing variables, events for Game Object, and physics-oriented events. Primarily, Unity supports scripting in C#, and there are two ways to design C# scripts in Unity: object-oriented design, which is the more traditional and widely used approach, and data-oriented design, which is now possible in Unity. Moreover, according to [1] game designers handle this issue through two fundamental methodologies: guaranteeing the most extreme similarity by giving up realistic loyalty and casing rate, or by foreseeing equipment conduct, which is hard to execute. Solidarity and Samsung have teamed up for a component called "Versatile Performance", which gives a superior method to oversee thermals and execution of games continuously. After you introduce Adaptive Performance through the Unity Package Manager, Unity will consequently add the Samsung Gamed subsystem to your undertaking. During runtime and on upheld gadgets [7]. Unity will make and begin an Adaptive Performance Manager which will give criticism about the warm condition of the gadget [30]. Engineers would then be able to decide to buy into occasions or inquiry the data from the Adaptive Performance Manager during runtime to make responses progressively concerning warm patterns. For example, when the gadget started throttling in the beginning periods, the game could tune quality settings, target outline rate, and different parameters to guarantee that the game can squeeze out increasingly continued execution.

3. Problem Statement

Build an android application that provide an education to student from primary to secondary section in Indian schooling system. We will building an android application that would allow the students to make profile using registration page, then the student can able to go login page if it is already registered , then can able to explore the main contains of the application such as AR and VR models .Instead of using books, video or manual, mobile AR can be an alternative that can be used in education and training. In this case, mobile AR will not only reduce the cost of training but also simplify the training manual - especially in the field of education. As an education app it will show the models with detail information it totally not like giving only models to the students and not displaying any information to the following models for the same but it will display all the small details

of the models with information and give the students or the person on the interface a smooth user friendly interface.

3.1 objectives

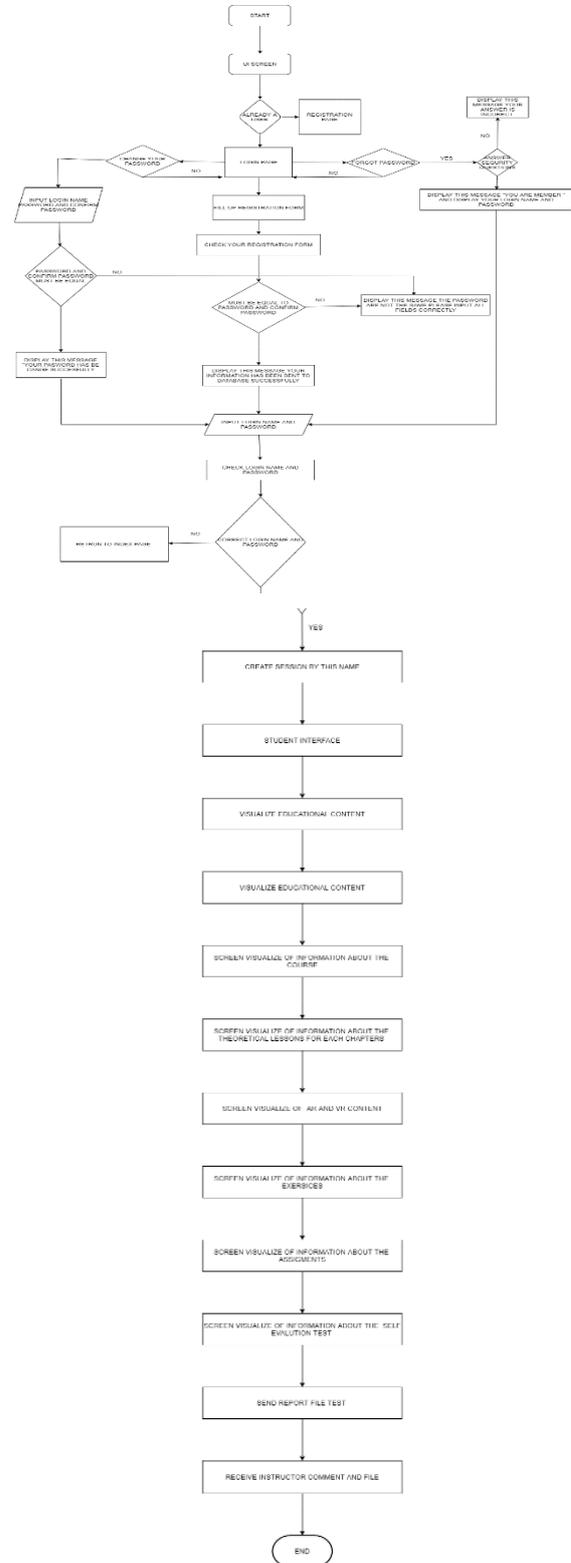
- 1.It will have a splash screen page for user.
- 2.It will have a Registration page for user.
- 3.It will have authentication page for verification
- 4.There will be an option for section selection
- 5.There will be an option of primary section.
- 6.There will be an option of secondary section.
- 7.There will be an option of assignments.
- 8.We will consider various types of skills
- 9.We will consider software quality like security, scalability etc.

3.2 Scope

1. It will provide platform to student to Get education
- 2.It will provide student a wide concept Of knowledge and information about the topics
- 3.This is where virtual reality (VR) and augmented reality (AR) can add real value to the learning process. These “extended reality” (AR,VR) technologies can create immersive worlds where students can visualize concepts and learn new skills and information in an interactive way
- 4.An individual student can perform the action
- 5.I t will maximize the student rate of language School to take information and get knowledge

4.Proposed Work

4.1 System Design



4.2 System Architecture

The typical AR application is principally composed of off-line and on-line processing. The off-line processing covers the selection and treatment of identification objects in advance, geometric model of objects in the virtual world, establishment of physical model, generation of behaviour model and three-dimensional scene. This part is mainly completed by Unity 3D. The on-line one also includes identification of objects, and produces the corresponding feedback information in real time and real scene. The virtual object is added to reality and the human-computer interaction is realized. This process is mainly performed by Vuforia SDK.

Unity 3D

Unity 3D is a cross-platform integrated 3D game engine developed by Unity Technologies Co.Ltd. It can superpose the virtual onto reality and realizes human-computer interaction with some AR development tools. It allows Vuforia SDK extension plug-ins to detect and track under the corresponding ports and creates AR applications and games. It provides ample development box functions to create games and other interactive 3D content[8]. Unity 3D can append sunlight, fog, wind, sky box, water and other physical materials, ambient sound and animated video to the virtual scene. Meanwhile, you can browse, test and edit 3D application scenarios. Also it is available to release to the required platforms, such as Windows, iOS, Android and so on. Vuforia SDK Vuforia SDK is an AR software development kit for mobile devices launched by Qualcomm. It utilizes computer vision technology to recognize and capture planar images or 3D objects in real time and permits developers placing virtual objects through the viewfinder of the camera and adjusting the position of objects on the background of the camera. Vuforia SDK supports types of 2D and 3D objects including multiple target configurations, images with fewer symbol and frame tags. There is an added function in the SDK. It takes advantage of virtual buttons to detect localized occlusion. Moreover it can select and reconfigure the target image in real time and create a target set according to the scheme. The data flow diagram of the Vuforia SDK . The data stream of Vuforia SDK is divided into four modules: inputting, database, tracking and matching and render output. Mobile phones can seize images of each frame in the present real scene through the camera and then matches identification objects in the database timely according to the pixel format conversion. After that, it adds pre-set virtual objects such as 3D model,

animation or video to real scenes. It can also interact with these virtual objects, render and output information at mobile terminals

Firestore

Firestore is considered as web application platform. It helps developers" builds high-quality apps. It stores the data in JavaScript Object Notation (JSON) format which doesn't use query for inserting, updating, deleting or adding data to it. It is the backend of a system that is used as a database for storing data.

Firestore Auth

Firestore Auth supports social login provider like Facebook, Google GitHub, and Twitter. It is a service that can authenticate users using only client-side code and it is a paid service. It also includes a user management system whereby developers can enable user authentication with email and password login stored with Firestore.

Real-time

Firestore provides services like a real-time database and backend. An API is provided to the application developer which allows application data to be synchronized across clients and stored on Firestore's cloud. The client libraries are provided by the company which enables integration with Android, IOS, and JavaScript applications

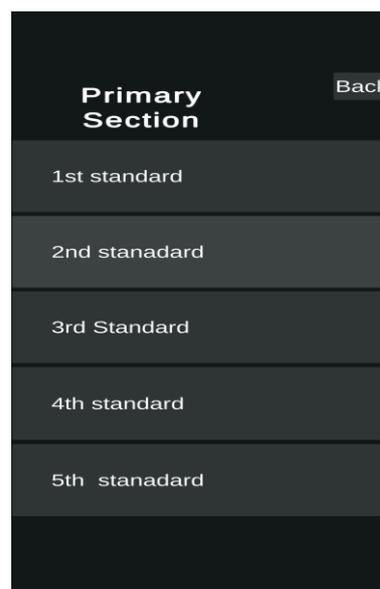
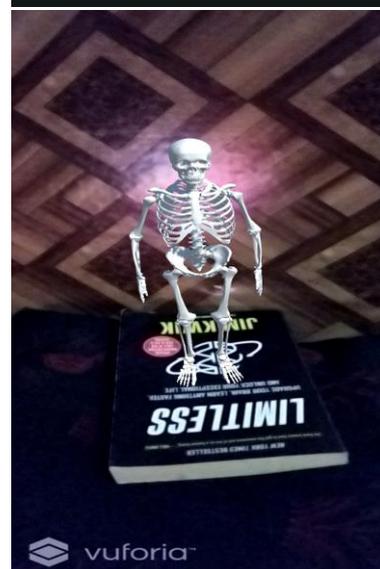
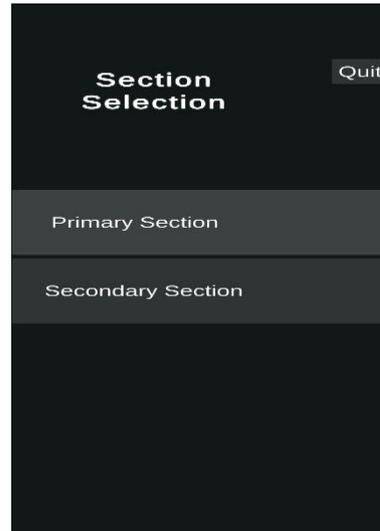
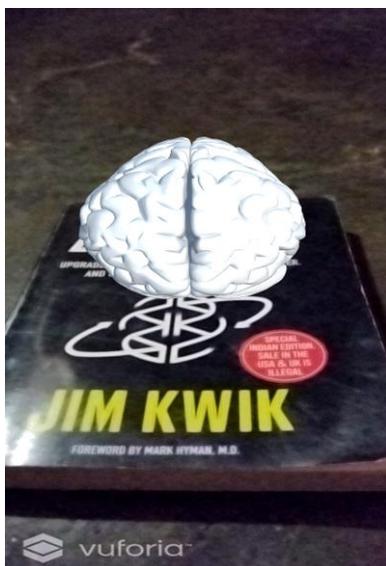
Firestore Storage It facilitates easy and secure file transfer regardless of network quality for the Firestore apps. It is backed by Google Cloud Storage which is cost-effective object storage service. The developer can use it to store images, audio, video, or other user-generated content

Using all features of firestore in the Android application is very easy and is just a few lines of code. The features like authentication, database, and storage have been discussed in section. The other more detail about the features are available on Google Firestore guide link listed in the reference section. The methodology to use some features are as follow: Authentication: After adding firestore and authentication dependency to the Android application, the user can create login id by the following code:

```
FirestoreAuthauth=FirestoreAuth.getInstance()  
;  
auth.signInWithEmailAndPassword(email,  
password)
```

```
addOnCompleteListener(new OnCompleteListener() {  
    @Override  
    public void onComplete (Task task) {  
        if(task.isSuccessful())  
        {  
            Firebase User user=task.getResult().getUser();  
            String email=user.getEmail();  
            //...  
        }  
    }  
});
```

5.Result



6. Conclusion

This paper emphasizes the Unity 3D technology and Qualcomm QCAR development tool, Vuforia and then introduces the basic concepts and framework. Based on this, the three-dimensional model of scene is simulated by the means of Unity 3D. The Vuforia engine can detect and track identification features and fabricate corresponding 3D model in accordance with the relative position and attitude information of sundry identifiers on the visual plane, the

video and interact the virtual and reality via virtual button mode. Furthermore, the whole process of the game environment can be displayed. Images fused after multi-angle observations make the experimental effect more vivid and almost real. The real-time synchronization satisfies the users in the real world to feel the virtual space, thus strengthening the spice and interaction. There are numerous proven advantages of using VR & AR technology in education. First of all, Overprovides outstanding visualization, which cannot be obtained in traditional classroom. It reflects the world that young generations feels comfortable in. It is inclusive, allowing everybody, everywhere, regardless of status, financial situation and disability to participate in education process. It gives virtually unlimited access to information, books or articles. Modern technology used in classroom increases engagement, stimulates cooperation and involvement. It is used for highly efficient blended learning, encouraging self-study and individual pursuit of knowledge

7. Future Scope

With AR & VR, classroom education can be extraordinary and more interactive, as AR & VR can enable teachers to show virtual examples of concepts and add gaming elements to provide textbook material support. This will enable students to learn faster and memorize information.

8. References

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