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educatAR

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Abstract

The integration of augmented reality (AR) technology in education has gained significant attention due to its potential to provide an immersive learning experience. In this paper, we explore the development of an AR application for educational purposes using Unity 3D and ARCore. The working of the applications depends on the scripts that were written in the C# Language. The AR application is designed to create an engaging and interactive learning environment by providing 3D models related to the subject matter. We discuss the development process of the AR application. The application was designed to be used on Android mobile devices, making it easily accessible to students. The benefits of using AR technology in education are also discussed, including increased student engagement, improved understanding of the subject matter. The paper also includes the results that shows the accurate working of the application.

Keywords: Augmented Reality, Unity 3D, ARCore.

Introduction

Augmented reality (AR) has emerged as a promising technology for education, providing an immersive learning experience that enhances student engagement and understanding. AR technology allows for the overlay of virtual information onto the real world, creating an interactive and dynamic learning environment. In recent years, the integration of AR in education has become more accessible due to the development of software and tools that enable the creation of AR applications without the need for specialized programming skills.

In this paper, we focus on the development of the application educatAR for educational purposes using Unity 3D, ARCore, and Sketchfab.

The AR application developed in this study is designed to create an engaging learning environment that enhances student learning outcomes. The application provides virtual content, including 3D models related to the subject

matter. The application uses ARCore for object recognition and tracking, allowing for the placement of 3D models in the real world. The Application detects the images from the student's respective textbook and overlays the 3d models related to the image.

This project uses AR core plug-in developed by google .AR core is an open-source plug-in which makes the AR android application development easier. This project uses marker based augmented reality. When a particular image or object is scanned it triggers an event which displays a 3d model onto the screen. We used marker images which can be considered as a set of reference images that results in triggering the event. A dictionary is created which maps the reference image to the corresponding prefab. The event triggered by scanning an image searches a dictionary of prefabs and the corresponding prefab is fetched. The prefab fetched is superimposed into the real time.

Literature Survey

In this literature survey, we will explore the use of AR in education and the development of an AR app using Unity 3D, ARCore, and Sketchfab.

The use of Augmented Reality in Education:

There has been a growing interest in using AR technology in education in recent years. Several studies have shown that AR can enhance students' learning experience and improve their understanding of complex concepts. For example, in a study by Kamarainen et al. (2013), students who used an AR app to learn about the solar system showed significantly better retention of the material than those who learned through traditional methods. Similarly, in a study by Akcayir and Akcayir (2017), students who used an AR app to learn about the human body showed better performance on post-tests than those who learned through traditional methods.

Development of AR apps using Unity 3D:

Unity 3D is a popular game engine that is commonly used for developing AR apps. Unity 3D provides a range of tools and features that make it easy to develop AR apps for various platforms. In a study by Duan et al. (2018), the authors developed an AR app for learning about historical buildings using Unity 3D. The app allowed users to explore 3D models of the buildings and learn about their history and architecture.

Development of AR apps using ARCore:

ARCore is a software development kit (SDK) developed by Google for creating AR apps for Android devices. ARCore provides tools and features that enable developers to create AR apps that use the device's camera and sensors to track the user's movements and position virtual objects in the real world. In a study by Schmidgall et al. (2019), the authors developed an AR app for learning about anatomy using ARCore. The app allowed users to explore

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3D models of the human body and learn about its various organs and systems.

Use of Sketchfab for 3D modeling:
Sketchfab is a popular platform for creating and sharing 3D models. Sketchfab provides a range of tools and features that make it easy to create and upload 3D models, which can then be viewed and interacted with using a web browser or a mobile device. In a study by Ramos et al. (2018), the authors used Sketchfab to create 3D models of historical sites and artifacts for an AR app that they developed using Unity 3D.

Problem Identification

There are several problems in the real world that lead to the development of educatAR application. Here are some potential areas:

a. Lack of engagement: Traditional educational methods such as lectures and textbooks can be dry and unengaging for some students, which can lead to disinterest and poor performance. AR applications can help to increase engagement and motivation by providing an immersive learning experience.

b. Difficulty in visualizing abstract concepts: Some educational concepts, such as those related to science or mathematics, can be difficult for students to visualize and understand. AR applications can help to visualize and

demonstrate these concepts in a more tangible way, making them easier to comprehend.

Methodology

Here is the methodology for developing educatAR application:

a. Define learning objectives: Define the learning objectives of the AR application, including the educational concepts that will be taught and the desired learning outcomes.

b. Choose the educational content: Select the educational content that will be included in the AR application, such as 3D models. This content should be aligned with the learning objectives.

c. Collect the 3D models: Use Sketchfab or another 3D model software to create or collect the 3D models that will be used in the AR application. Ensure that the models are high-quality, accurate, and visually appealing.

d. Develop the AR application: Use Unity 3D and ARCore to develop the AR application. This will involve creating the user interface, importing the 3D models, and programming the behaviors of the AR content.

e. Conduct user testing: Conduct user testing with students or educators to ensure that the AR application is effective and engaging. Gather feedback on the

usability, accessibility, and overall effectiveness of the AR application.

f. Iterate and improve: Use the feedback gathered during user testing to make improvements to the AR application. This may involve making changes to the educational content, improving the user interface, or optimizing the performance of the application.

System Implementation

Augmented reality (AR) applications have gained popularity in education due to their ability to create immersive and interactive learning experiences. To develop the AR educational application the following implementation steps were taken:

a. First, create a new project in Unity 3D and import the ARCore SDK.

b. Next, set up the scene by adding the ARCore device prefab and camera to the scene.

c. Create a UI canvas for the application's user interface and add buttons to control the AR experience.

d. Import educational 3D models from Sketchfab into the Unity project and place them in the scene.

e. Use ARCore's image recognition feature and write the script to identify physical images and overlay 3D models on them.

f. Test the AR application on a compatible device to ensure that it runs smoothly and accurately.

Test whether the respective 3D models are projecting on the images or not.

Results
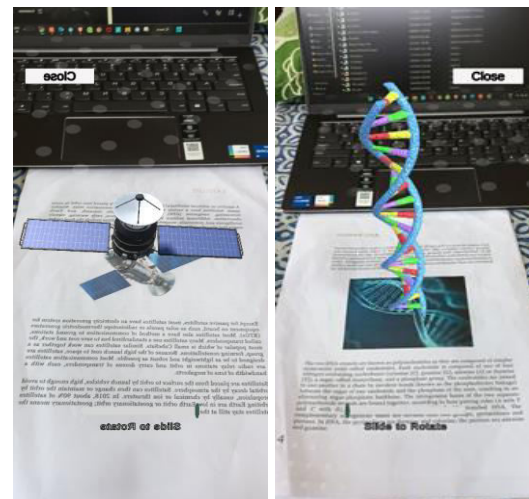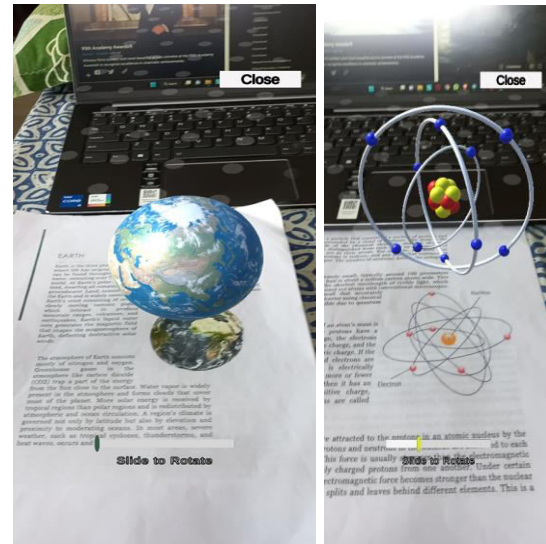
Conclusion

In conclusion, educatAR applications developed using Unity 3D, ARCore, and Sketchfab can provide an effective and engaging learning experience for students. This application can help to address real-world problems such as limited access to educational resources, lack of engagement, difficulty in visualizing abstract concepts, and the need for hands-on learning.

By following a methodology that includes defining learning objectives, choosing educational content, creating 3D models, developing the AR application, conducting user testing, iterating and improving, and releasing and evaluating, developers can create high-quality and effective AR applications for education.

educatAR application for education have the potential to enhance student learning outcomes, increase engagement and motivation, and provide a more immersive and interactive learning experience.

Limitations

While educatAR application has many benefits, there are also limitations to using AR technology in this context. Some of the limitations are:

1. Limited device compatibility: ARCore is only available on certain Android devices, which limits the number of potential users of the application.

2. Technical expertise required: Developing an AR application requires specialized technical skills in Unity 3D and ARCore, which may be a barrier for some educators or developers.

3. Limited mobility: AR experiences require a stable and open space to operate, which may not be possible in all educational settings.

4. Limited educational content: While there are many educational 3D models available on Sketchfab, there may not be enough content available to cover all subjects or meet all educational needs.

5. Hardware limitations: AR experiences may be limited by the capabilities of the device's camera, processing power, and battery life.

Future Scope

There are several potential future enhancements for educatAR including:

1. Integration with other technologies: Augmented reality applications can be further enhanced by integrating with other emerging technologies such as artificial intelligence, machine learning, and blockchain. This could enable the creation of more

personalized and adaptive learning experiences for students.

2. Multiplayer and collaborative experiences: Augmented reality applications could be designed to support multiplayer and collaborative experiences, allowing students to work together and learn from one another in a shared virtual environment.

3. Expanded device compatibility: As the technology for AR becomes more widespread and accessible, AR applications can be developed to run on a wider range of devices, including smartphones, tablets, and other wearable devices.

4. Customization and personalization: AR applications can be customized and personalized to meet the specific learning needs of individual students. This could include adaptive content, personalized feedback, and tailored learning paths.

5. Integration with the physical world: As AR technology continues to improve, it may become possible to seamlessly integrate AR content with the physical world, enabling students to interact with real-world objects and environments in new and exciting ways.

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