

## Augmented Reality for Guiding Students Through Nawroz University's Buildings using Unity Platform

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### ABSTRACT

Artificial intelligence (AI) applications and technologies aim to increase the intelligence of the machines and computers around us, while virtual reality (VR) and augmented reality (AR) technologies aim to create an entirely new scene that cannot be physically touched but is perceptually perceptible through a variety of artificial visual and auditory effects. The new artificial world that any of these two technologies may produce is different, and virtual and augmented reality will not give us the same understanding or awareness of this fake reality. This is to say, even if the main objectives of virtual and augmented reality technologies are identical.

This system is for guiding students in Nawroz University by AR. And the application is on android operating system. This application is useful for students at Nawroz University. The application doesn't need much of feature, basic iPhone and android smartphone with a camera and AR capability, So the phone needs to be android 8.0 or higher.

**Keywords:** Augmented Reality, Virtual Reality, Nawroz University, Unity, Maya.

### 1. Introduction

Virtual reality is described as a technology with full immersion, where the user is completely absorbed in the produced scene and all of its effects, giving the impression that it is real. The user of augmented reality, on the other hand, will also be surrounded by artificial scenery in addition to the real world we live in. This is known as partial immersion technology.[1] The user is completely cut off from the real world when using virtual reality technology. In other words, when wearing virtual reality goggles, the user will only be able to see, touch, and move objects that are actually existing in the synthetic world he is viewing. The user won't be cut off from the real world with augmented reality; rather, they'll remain connected to it. It might be argued that augmented reality technology produces a new reality by fusing images from an artificial digital reality with the actual environment, as opposed to virtual reality technology, which merely replaces our physical experience with an artificial digital one.[1]

#### Aims and Objectives

The main objective of the application is to help new student to navigate and guide themselves to register at the university without the need of a person of Knowlagent.

- Ease to navigate through Nawroz university's Campus.
- Obtaining information about the university, Activities, Departments and achievements.
- To allow the desired student to tour in the campus.

- To experience the University without the hustle of being there in real life.
- To provide simple visual guide to the student.

### 2. Literature Review

#### 2.1 UNITY

A cross-platform game engine called Unity was created by Unity Technologies and debuted as a Mac OS X-only game engine at Apple Inc.'s Worldwide Developers Conference in June 2005. Since then, support for a range of desktop, mobile, console, and virtual reality platforms has been steadily added to the engine. Pokémon Go, Monument Valley, Call of Duty: Mobile, Beat Saber, and Cuphead are just a few of the games that have used it. It is especially well-liked for iOS and Android mobile game development. It is touted as being utilized by novice developers and is well-liked for developing independent video games. Formerly supported platforms were Wii, PlayStation 3, Xbox 360, Tizen, PlayStation Vita, 3DS, BlackBerry 10, Windows Phone 8, Samsung Smart TV, Gear VR, Daydream, Vuforia, and Facebook Gameroom.[2]

#### 2.2 Autodesk Maya

Originally created by Alias Systems Corporation (formerly known as Alias | Wavefront), Autodesk now owns and develops Maya, a 3D computer graphics tool that works on Windows, macOS, and Linux. It is used to produce elements for animated movies, TV shows, and visual effects, as well as interactive 3D applications (like video games).[3]

### 2.3 Vuforia

Vuforia utilizes image recognition by default. When a camera recognizes a predefined image and knows what to do with it, for example, rendering some content above it, this process is known as pattern recognition, also known as Tracker Recognition or image tracking. This works best when the tracking image in some way corresponds to the content; for instance, rendering floor plans look good over an image of a building. Selecting a high-quality picture for tracking is crucial. Before beginning development, you should upload the chosen picture to the developer portal when using Vuforia to validate the tracking quality. The image is given a grade by the developer portal, but its "highlights" are what matter most. The distinctive points (feature points) must be evenly dispersed across the image and there must be no repeated patterns for the tracer to work well. The camera searches for these unique spots throughout runtime in order to determine their location in relation to the picture.[4]

### 2.4 Application Fundamentals

Java and C# are used to create Unity programs. The code, data, and resource files are combined by Android SDK tools to create an APK (Android package). The whole content of the software is often included in a single APK file. Each program is run on an own virtual machine (VM), allowing it to operate independently of other apps. The least privilege concept guides the operation of the Android system. Each program can only access the resources that are necessary for it to function. However, there are methods for an app to exchange data with other programs. For instance, apps can share Linux user ids or ask for permission to access data on the device, such as the SD card, contacts, etc. [5]

### 2.5 Game Objects Unity Components

Any component of our game scene is referred to as a gameobject. It is the fundamental component of the game, and its growth is dependent on how they interact with one another.

The tool or program that renders the scene is known as the scene generator. Since only a few virtual objects need to be drawn and are frequently not required to be rendered realistically in order to serve the purposes of the application, rendering is not currently one of the major issues in AR.[6]

### 2.6 Tracking System

One of the most significant issues with AR systems' tracking systems is the registration issue. The illusion that the two worlds coexist will be shattered if the items in the actual and virtual worlds are not appropriately aligned with regard to one another. For the industry, several applications, particularly those involving medical systems, need for precise registration. [7]

### 2.7 Display

Solutions rely on design choices, and AR technology is still in development. Although head-mounted

displays (HMDs) make up the majority of AR displays, there are alternative options (see section 3). There are two main options for fusing the actual and virtual worlds: optical and video technologies. Depending on variables like resolution, flexibility, field-of-view, registration procedures, and others, each of them has various costs. The advancement of display technology continues to be a barrier to AR system development. See-through displays with enough brightness, resolution, field of view, and contrast to seamlessly combine a variety of real and virtual imagery still don't exist. Furthermore, many technologies that start to approach these objectives are still too large, heavy, and expensive. But as we'll see in a moment, there have been some developments in see-through display technology in recent years.[7]

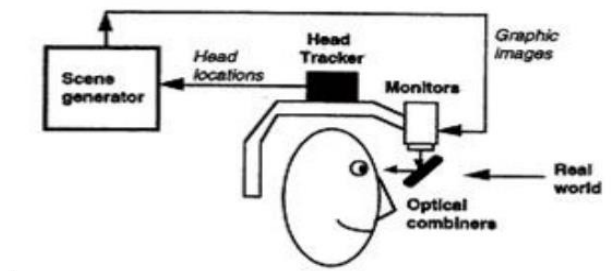


Figure 2-4 Optical See-Through Schem

## 3. Implementation and Design

The design of the search, the server, how to connect it with the application, the database, and the project's step-by-step implementation are all explained in this article.

### 3.1 Client Side

How to select a programming language and mobile application is covered in the client-side section, including:

#### 3.2 Programming Language

The breadth of the application you are constructing and your language experience both factor into the choice of programming language. While only one language is frequently used to design small applications, numerous languages are frequently used to produce big systems. The proposed application will not be a web application that requires access to the internet; rather, it will be a stand-alone program. C# was chosen as the programming language to be used for this software. The Basic programming language has a fairly straightforward structure, especially when it comes to the executable code. Inheritance, interfaces, and the numerous new and improved features that make C# an effective object-oriented programming language include overloading. Creating graphical user interfaces and connecting them to handler methods made available by the application is very simple.[8]

#### 3.3 Unity Engine AR SDK

Because AR apps provide a more engaging and dynamic user experience, they are one of the most widely used technologies in modern application

development. Among the most well-liked toolkits that provide the resources required to create an augmented reality app are ARKit, ARCore, and Vuforia. The creation of AR apps has been made simpler by these. While each of these has useful capabilities, there are a few minor differences that developers should be aware of and take into account when selecting the best tools, frameworks, and SDKs for AR app development.[8]

### 3.4 ARkit and ARcore

The augmented reality foundation for Android is called ARCore, and for iOS, ARKit. With the aid of these frameworks, developers may utilize cutting-edge AR techniques to create better, more realistic experiences and realistic goals.

With the use of these technologies, for instance, developers may include advanced motion tracking into their augmented reality applications, giving the technology a deeper understanding of its surroundings. Similar to this, phones can estimate the size and location of objects like tables and chairs using technologies like ARCore and ARKit to provide a more accurate impression of any given scene.[9]

This is how Google Arcore defines it:

In essence, ARCore does two tasks: it tracks the position of a mobile device as it travels and creates a model of the actual environment for itself.

Although Apple uses different verbiage to describe ARKit, the point remains the same, and Google's description applies to both platforms.[10]

### 3.5 Using Vuforia inside Unity

First the registration needed on the Vuforia page before using it, and then should acquire a Vuforia license online. [11,12] The photographs (in jpg format) that is needed to utilize as markers within our application must then be uploaded on the Vuforia website. Each image will be given a quality rating on the web, ranging from 0 to 5, indicating how suitable it is to be used as an augmented reality marker (0 stars indicates that the image does not serve as a marker and five that the image is perfect as a marker). Using QR codes as markers was the option used for this project. When using AR in Unity, the primary camera must be turned off or removed, and the AR camera must be available in the GameObject menu and selectable from the Vuforia Engine drop-down menu. [13,14]

### 3.6 Implementation

A new system is created, installed, and made ready for use during the system implementation stage of the life cycle. At this time, the requirement specification's specifics and focal points have all been partially developed. As a result, system implementation is a crucial phase whose performance greatly influences the success of the new system. After all is said and done, the system is currently suitably prepared for implementation.[15,16]

### 3.7 Main Menu

The Main Menu interface will be shown to the user when the application is opened as shown in the Figure 3.1.

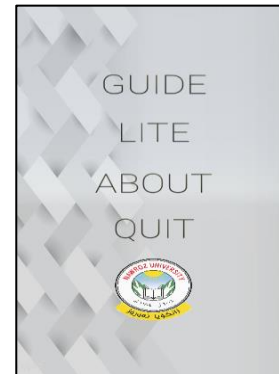


Figure 3.1: Menu

### 3.8 Guide

The first Button (GUIDE) is responsible for entering Nawroz University's campus as shown in the Figure 3.4.



Figure 3.4: GUIDE

### 3.9 Movement

Movement is by white button it goes forward for which each direction is the user facing as shown in the Figure 3.5.



Figure Error! No text of specified style in document.3.5: Movement

### 3.10 Movement Up Down

If the user needs to go on stairs or some obstacles either by going up or down the user need to press the up button or down button as shown in the Figure 3.6.

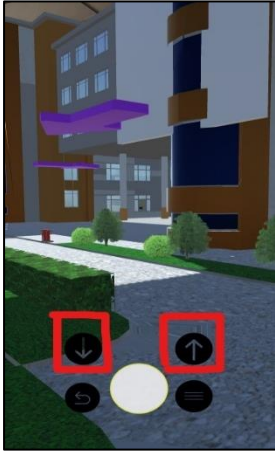


Figure 3.6: Movement Up Down

**3.11 Reset**

The reset button is responsible for resting user position to the begging of the campus if the user is lost or tracking is lost from the ground as shown in the Figure 3.7.



Figure 3.7: Reset Position

**3.12 Menu Button**

The menu button is responsible for opening the GUIDE menu for extra option as shown in the Figure 3.8 and Figure 3.9.



Figure 3.8: Menu Button Figure 3.9: Menu Active

**3.13 Guide Menu**

When The menu button is pressed the GUIDE Menu will open as this menu consist of 6 button each button is for a different function as shown in the Figure 3.10.



Figure 3.10 In Level Menu

**3.14 Destination Buttons**

These group of buttons are responsible for which destination the user want to go next, even skipping some destinations or going back to a desired destinations as shown in the Figure 3.11.



Figure 3.11: Level Menu Buttons

**3.15 Home Button**

The function of this button is to go back to the main menu as shown in the Figure 3.12.



Figure 3.12: Home Button

**3.16 Building**

The user most select a building before proceeding to the next destination as shown in the Figure 3.13.

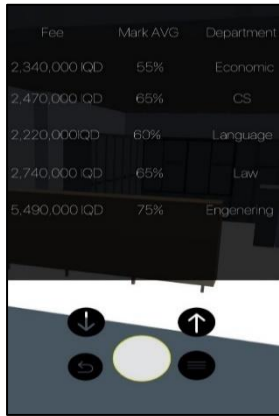


Figure 3.13: Department Buttons

### 3.17 All Destination

The user most go to all four destinations (Predentary, Department, Bank, Accountment) as shown in the Figure 3.14 to Figure 3.17.



Figure 3.14: Predentary Figure 3.15 Department

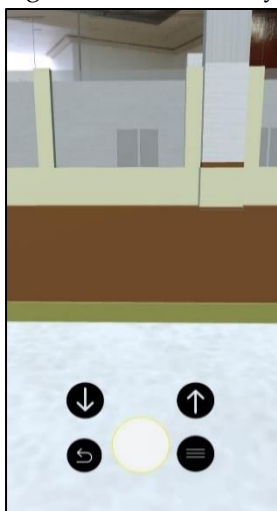


Figure 3.16: Bank

Figure 3.17 Accountant

### 3.18 Lite

Lite as the name suggest is a light version of Nawroz University Campus as shown in the figure 3.18.

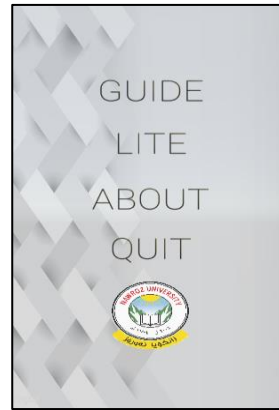


Figure 3.18 Menu

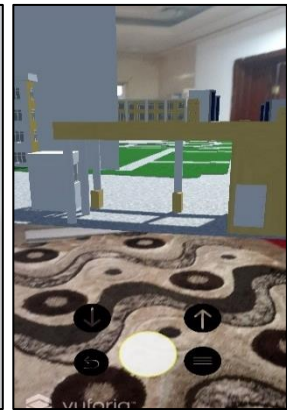


Figure 3.19 Lite

## 4. Conclusion

NU Guide by AR is an education application for new student who desire to come to Nawroz university, The application is helpful for lots of users specially the new student, a student can get to see the university without actually being there and experience some of it aspect, it will help the student to register without needing a help from someone who is in knowledge of such procedure, It would benefit the university and attract new student.

### 4.1 Benefits of The Project

- Help new students to be guided easily
- Attract new students for the new technology and university.

## REFERENCE

[1] Aziz, Faieza Abdul, Journal of Engineering and Technological Sciences.

[2] Graham, Peter (October 4, 2017). "Unity 2017.2 Featuring Optimised Support for ARCore and ARKit launching This Month". VR Focus. Retrieved December 4, 2018.

[3]Almufti, S. M., Ahmad, H. B., Marqas, R. B., & Asaad, R. R. (2021). Grey wolf optimizer: Overview, modifications and applications. International Research Journal of Science, Technology, Education, and Management, 1(1),1-1.

[4] Takahashi, Dean (September 15, 2018). "John Riccitiello Q&A: How Unity CEO views Epic's Fortnite success". VentureBeat. Archived from the original on September 17, 2018. Retrieved October 17, 2018.

[5] Rajab Asaad, R., & Masoud Abdulhakim, R. (2021). The Concept of Data Mining and Knowledge Extraction Techniques. Qubahan Academic Journal, 1(2), 17-20. <https://doi.org/10.48161/qaj.v1n2a43>

[6] "Mobile game developer survey leans heavily toward iOS, Unity". Gamasutra. May 24, 2012. Archived from the original on July 3, 2014. Retrieved July 14, 2014.

[7] Asaad, R. R., Sulaiman, Z. A., & Abdulmajeed, S. S. (2019). Proposed System for Education Augmented

- Reality Self English Learning. Academic Journal of Nawroz University, 8(3), 27-32. <https://doi.org/10.25007/ajnu.v8n3a366>
- [8] "Unity officially releases its new game engine: Unity 5". The Verge. March 3, 2015. Archived from the original on December 8, 2015. Retrieved November 26, 2015.
- [9] Boya Marqas, R., M. Almufti, S., & Rajab Asaad, R. (2022). FIREBASE EFFICIENCY IN CSV DATA EXCHANGE THROUGH PHP-BASED WEBSITES. Academic Journal of Nawroz University, 11(3), 410-414. <https://doi.org/10.25007/ajnu.v11n3a1480>
- [10] "Vuforia SDK Native - Android & iOS API Reference". Vuforia Developer.
- [11] Autodesk (October 4, 2005). "Autodesk Signs Definitive Agreement to Acquire Alias". Archived from the original on January 10, 2016. Retrieved October 23, 2015.
- [12] Sellers, Dennis (14 January 2003). "Maya gets Oscar for Technical Achievement". Macworld. Retrieved 8 January 2019.
- [13] Ihsan, R. R., Almufti, S. M., Ormani, B. M., Asaad, R. R., & Marqas, R. B. (2021). A survey on Cat Swarm Optimization algorithm. Asian J. Res. Comput. Sci, 10, 22-32.
- [14] Asaad, Renas Rajab. (2014). An Investigation of the Neuronal Dynamics Under Noisy Rate Functions. Thesis (M.S.), Eastern Mediterranean University, Institute of Graduate Studies and Research, Dept. of Computer Engineering, Famagusta: North Cyprus.
- [15] Abdulfattah, G. M., Ahmad, M. N., & Asaad, R. R. (2018). A reliable binarization method for offline signature system based on unique signer's profile. INTERNATIONAL JOURNAL OF INNOVATIVE COMPUTING INFORMATION AND CONTROL, 14(2), 573-586.
- [16] Asaad, R. R., Abdulrahman, S. M., & Hani, A. A. (2017). Advanced Encryption Standard Enhancement with Output Feedback Block Mode Operation. Academic Journal of Nawroz University, 6(3), 1-10. <https://doi.org/10.25007/ajnu.v6n3a70>
- [17] Almufti, S. M., Ahmad, H. B., Marqas, R. B., & Asaad, R. R. (2021). Grey wolf optimizer: Overview, modifications and applications. International Research Journal of Science, Technology, Education, and Management, 1(1), 1-1.
- [18] Ihsan, R. R., Almufti, S. M., Ormani, B. M., Asaad, R. R., & Marqas, R. B. (2021). A survey on Cat Swarm Optimization algorithm. Asian J. Res. Comput. Sci, 10, 22-32.
- [19] Asaad, R. R., Ahmad, H. B., & Ali, R. I. (2020). A Review: Big Data Technologies with Hadoop Distributed Filesystem and Implementing M/R. Academic Journal of Nawroz University, 9(1), 25-33. <https://doi.org/10.25007/ajnu.v9n1a530>
- [20] Asaad, R. R. (2019). Güler and Linaro et al Model in an Investigation of the Neuronal Dynamics using noise Comparative Study. Academic Journal of Nawroz University, 8(3), 10-16. <https://doi.org/10.25007/ajnu.v8n3a360>
- [21] Asaad, R. R., Abdulrahman, S. M., & Hani, A. A. (2017). Partial Image Encryption using RC4 Stream Cipher Approach and Embedded in an Image. Academic Journal of Nawroz University, 6(3), 40-45. <https://doi.org/10.25007/ajnu.v6n3a76>
- [22] Abdulfattah, G. M., Ahmad, M. N., & Asaad, R. R. (2018). A reliable binarization method for offline signature system based on unique signer's profile. INTERNATIONAL JOURNAL OF INNOVATIVE COMPUTING INFORMATION AND CONTROL, 14(2), 573-586.
- [23] Asaad, R. R., Abdulrahman, S. M., & Hani, A. A. (2017). Advanced Encryption Standard Enhancement with Output Feedback Block Mode Operation. Academic Journal of Nawroz University, 6(3), 1-10. <https://doi.org/10.25007/ajnu.v6n3a70>
- [24] Asaad, Renas Rajab. (2014). An Investigation of the Neuronal Dynamics Under Noisy Rate Functions. Thesis (M.S.), Eastern Mediterranean University, Institute of Graduate Studies and Research, Dept. of Computer Engineering, Famagusta: North Cyprus.
- [25] Asaad, R. R., Sulaiman, Z. A., & Abdulmajeed, S. S. (2019). Proposed System for Education Augmented Reality Self English Learning. Academic Journal of Nawroz University, 8(3), 27-32. <https://doi.org/10.25007/ajnu.v8n3a366>