

## IMPLEMENTATION OF AUGMENTED REALITY FOR ISOMETRIC WORKS AT THE ANIMATION ART EXHIBITION (ANIMAXTION)

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**Abstract:** *In exhibitions, animated artwork also develops following technological advances and the needs of exhibition visitors. One of the concepts of the exhibition is to exhibit isometric drawings as shown in the exhibition, then visualize them in 3D animation using the Augmented Reality method. Augmented Reality is a technology that runs and combines digital content created by computers in real-time. In the results of the research that has been carried out, if the results of the implementation of Augmented Reality (AR) using Unity software have been successfully implemented on Android-based Smartphones and Tablets by practicing Isometric objects that are displayed when smartphones with the Android operating system or Tablet trigger prints of student work which contain printed images of work in Animaxtion.*

**Keywords:** *augmented reality; unity; animaxtion; isometric.*

### Introduction

An exhibition is an activity to show our works to the general public. The attempted activity displayed various works, ideas, and items arranged neatly with various accessories. Various new models or forms are offered in a way that is different from those on the market. According to the previous study, new artwork, new creations, new methods, and new forms become trends that attract audiences, so the items on display are more catchy (Mardi, 2021, p. 544). The methods used to display works have also changed and evolved. According to Nahak, today's globalization society has favored new methods and culture from the outside world, which are considered more practical than local and old meth-

ods, so adapting is one way that has the potential to maintain the existence of an activity, one of which is a work exhibition. A good exhibition space can evoke the emotional reaction of guests. An earlier study said that every decision in designing must convey a message that speaks to guests through digital media, form, space, material surfaces, lighting, and sound, so the exhibition space can create an atmosphere of space that evokes feelings and emotions in audiences (Locker, 2011). Therefore, further research on the revolution of new spaces in every exhibition must be explored.

However, if we reflect on several museums in Indonesia, which are sometimes not too crowded to visit, creative

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activists must innovate in enlivening the exhibitions of the works they create. One method that is relatively new and liked by young people is the Augmented Reality (AR) technique. Augmented Reality (AR) technology has become an important field of research in Indonesia. The potential for AR in Indonesia is snowballing, although it is less massive than what is being done abroad (Endra & Agustina, 2019). Augmented Reality (AR) is a variation of virtual space or more commonly called Virtual Reality (VR). VR technology can make users immersed in a synthetic area. When the user is immersed in the area, the user cannot see the real world.

In contrast, AR technology users can view the real world (Azuma, 1997) with virtual objects added to the real world. So, users perceive virtual and natural objects as being in the same place. Augmented Reality also has considerable potential to develop the value of work because, as explained by Azuma, it is as if we see the work in the real world, where it is difficult to realize it in the real world immediately.

Now, augmented reality is increasingly being supported by development technology, and many online platforms and applications are starting to be used to produce augmented reality. Augmented reality uses picture markers like patterned images, then placed on various primary media such as paper, walls, and anything. Applying augmented reality to works of art can be a creative solution in work exhibitions, one of which is Animaxtion.

The Animation Art Exhibition (Animaxtion) is an exhibition of works by first and third-semester students from Multimedia Nusantara Polytechnic which contains their mid-semester and final semester assignments. Students take the initiative to show the development of their work through an exhibition so they can get appreciation and develop their artistic aspects. The exhibition took place for almost

a month and is attached to the exhibition poster in Figure 1.



Figure 1. Animaxtion exhibition poster  
(Source: Animaxtion, 2023)

Animaxtion offers various display types of works, such as isometric design. According to the Glints website, isometric design is a design method that displays 3D objects using 2D techniques (Ismi, 2022). The isometric design makes it easier for designers to create objects by assisting them with the appropriate sizes and lines. The projects displayed in the exhibition are the work of mid-semester students at Multimedia Nusantara Polytechnic like in Figure 2.



Figure 2. An example of one student isometric work.  
(Source: Personal research documentation)

It is possible to create isometric art using augmented reality technology, allowing for marketing beyond the confines of 2D media. The technique applies to using the student's work as a trigger marker (printed arts) for the augmented reality system. So, when visitors use their mobile devices, such as phones or tablets, which have installed the exhibition team's augmented reality software, the camera responds to 3D visuals. With this approach, this application would eventually grow with other media and make upcoming exhibitions more advanced and futuristic. Also, this raises the number of people that visit the Animaxtion display. It may lead to the creation of new ways of communicating strategies for exhibition visitors.

In this study, the researcher aims to explain the methods and techniques for producing augmented reality applications that can help the imagination of exhibition visitors to increase the value and development of Animaxtion's exhibitions. The augmented reality production software used is Unity 3D, which is integrated to create games, simulations, and architectures. Then the base markers that use the student's drawings are processed through the Vuforia library. Vuforia is a software development kit used to create custom augmented reality. With Vuforia, electronic devices can recognize and track images, objects, text, and markers and reconstruct them into an actual form. (Sudana et al., 2016). By looking at how vital isometric sections are in the Animaxtion exhibition, this research will focus on developing Augmented Reality application products for student isometric works. This research produces an augmented reality application focusing on student isometric work called Animaxtion AR Isometric on Android smartphones and tablets. The final production results are also expected to become HKI so that the development of the creative industry will be more advanced.

This research also creates various questions that are answered through this research. Among them:

1. How is the production method of augmented reality applications implemented with isometric works?
2. What can be produced from the production of augmented reality applications in the isometric works of the Animaxtion exhibition?

## **Methodology**

This research has a project/work basis through a qualitative approach. The qualitative approach of the project was chosen because in this study, the researcher emphasized the substance of the observation of the phenomenon of the art exhibition. The researcher sees the need to interpret the visible and more impactful results to touch the hearts of the audience present. Hence, the researcher has the mindset to develop augmented reality software to try to see the difficulty level in developing this software which will affect the next animation exhibition. Furthermore, there are three reasons for using qualitative methods: the researcher's view of the world, then the nature of the research question, and how practical reasons are associated with the nature of qualitative methods. (Kasinath, 2016). This study collected data from several kinds of literature, observational studies, and experiments. The literature method is collected based on previous research regarding Augmented Reality. Then the researcher also solves the problem by researching the art exhibition through various journals and articles.

Observational studies are carried out by observing various Augmented Reality works outside art exhibitions and their production processes through various online tutorials. Through the various methods observed, the researcher hopes

to implement them through student animation exhibition works. After obtaining this data, the author and members of several animation students at Multimedia Nusantara Polytechnic experimented with the production method of augmented reality works for their exhibition. This process can be done after the student's work is ready to be processed into augmented reality products. In the APK building process, researchers were assisted by two students named George Kanino Mantiri and Dev Aras.

Therefore, a multimedia methodology is needed to develop this AR application. According to Binanto (2010), the multimedia development methodology comprises six stages: concept, design, material collecting, assembly, testing, and distribution. These six sessions cannot be exchanged. Even so, the concept session must be the first thing to do.

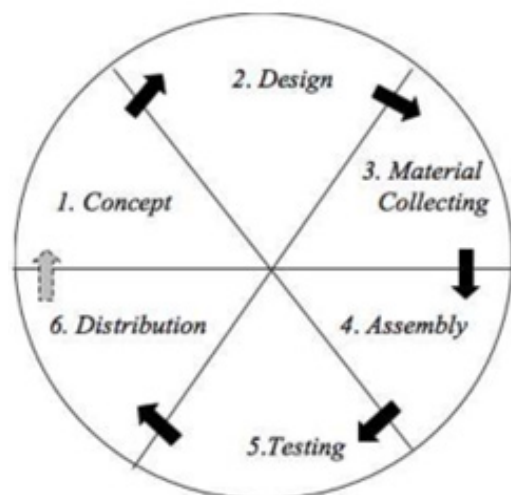


Figure 3. Multimedia Development Stages  
(Source: Yulsilviana, 2017)

### 1. Concept

The concept stage is the stage for determining the goals and who are the users of the program (audience identification). The goals and end users of the program affect the nuances of multimedia as a re-

flection of the program and the goals of creating works and multimedia later. In addition, this stage will also determine the type of application (presentation, interactive, and others.) and the purpose of the application (entertainment, training, learning, and others.). Basic design rules, for example, application size, targets, and others, are also defined at this stage. The concept that has been formed since the isometric work was created and started talking about the AR method as an optional exhibition allows the design of this application to be correctly conceptualized later.

### 2. Design

Design (design) is the process of making specifications to determine the style/style in a work creation process at the beginning of production. The design needs to be made as detailed as possible so that in the next session, namely collecting and assembling materials, a new decision maker is no longer needed. Just use the decisions that have been determined in this session. In practice, project work in the initial session will often experience material increases, reductions in application parts, or other changes. In the production of Isometric AR, there are two design stages: the design of the Isometric and the design of the Augmented Reality program in figure 4. Because the two are different things in the production process, but still cannot be separated. For Isometric, students have designed before their isometric 3D production through sketches. As for the design of the AR application, we can start by laying out the position of the button layout and what features are in Augmented Reality.



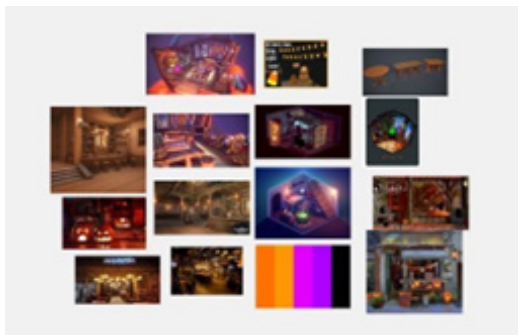


Figure 4. Isometric work design stage  
(Source: Personal research documentation)



Figure 5. Isometric work design stage  
(Source: Personal research documentation)

### 3. Material Collecting

Material Collecting is the stage of collecting materials according to the work needs. At the time that Isometric Augmented Reality works, the material used is the work of students who have been processed in 3D software, then designed through Augmented Reality production software. This stage can be done in parallel with the assembly stage. So, the process will run simultaneously during the assembly stage.

### 4. Assembly

The Assembly stage is the stage of making all multimedia objects or materials. Application development is based on the design, process and navigation stages. This stage will take much time in the production field. In the production process of Isometric Augmented Reality, several software are used:

#### a. Blender

Blender is an engine for producing 3D animation. Both are widely used in the animation industry for production. Blender has modeling, simulation, rendering progress, and compositing capabilities that offer a comprehensive creative feature set on a highly extensible production platform like in Figure 5. Blender is provided free on the internet.

#### b. Unity 3D

Unity 3D is a cross-platform game engine. Unity is an integrated tool for creating games, building architecture and simulations. However, Unity is not designed for the design or modeling process because it is not a tool for designing and modeling 3D. If we want to design, use another 3D editor like Autodesk Maya or Blender. In Unity, 3D scripting features support three programming languages, JavaScript, C#, and Boo, used to edit AR scripts.

#### c. Vuforia SDK

Vuforia is an Augmented Reality Software Development Kit (SDK) for mobile devices that enables the creation of AR applications. The Vuforia SDK can also be combined with Unity, namely the Vuforia AR Extension for Unity. Vuforia is an SDK provided by Qualcomm to help developers create Augmented Reality (AR) applications on mobile phones (iOS, Android). AR Vuforia provides a way of interacting that utilizes the camera of a mobile phone to be used as an input device, as an electronic eye that recognizes specific markers.

### 5. Testing

After completing the production process (assembly), the testing stage is at-

tempted by running the application or program and seeing whether there are errors. Generally, the initial stages in this session are carried out through an alpha testing process where the tests are carried out by trials or the manufacturing area in the project. After passing the alpha test, Beta testing involving end use can be run.

## 6. Distribution

After the testing phase is carried out and cleaning bugs and errors in the application is made and carrying out the final export the application will be stored in a storage medium. Sometimes the more content components in the application, the larger the size of the application. Then a compression step for the application will be carried out. The distribution process also distributes the production results so that consumers can try the products created. This stage can also be called the evaluation stage for developing finished products so that they become better. The results of this evaluation can be used as input for the concept stage in further product development.

In this case, the researcher distributes works with samples of Animaxtion events held throughout January. This activity is part of a series of Multimedia Nusantara Polytechnic Campus Visits, which invite various Vocational High School students around Tangerang. Approximately 50 students visited the animation exhibition providing 3D Augmented Reality rides. Because this research focuses on production techniques, the number of viewers, audience ratings, and their responses will be used as material for improving future applications

Later, this research will entirely focus on post-production monitoring of 3D modeling production and focus on Unity and Vuforia. Blender is only a tool for extracting 3D files, as discussed in the re-

sults section.

## Result

Making isometrics more attractive in exhibitions is an important work where the implementation of augmented reality into works is an effort to attract more modern communication methods. Broadly speaking, isometric production to an advanced augmented reality form requires a very long journey so that the applications created run perfectly. Depiction through a short diagram can be seen in Figure 6 , below:

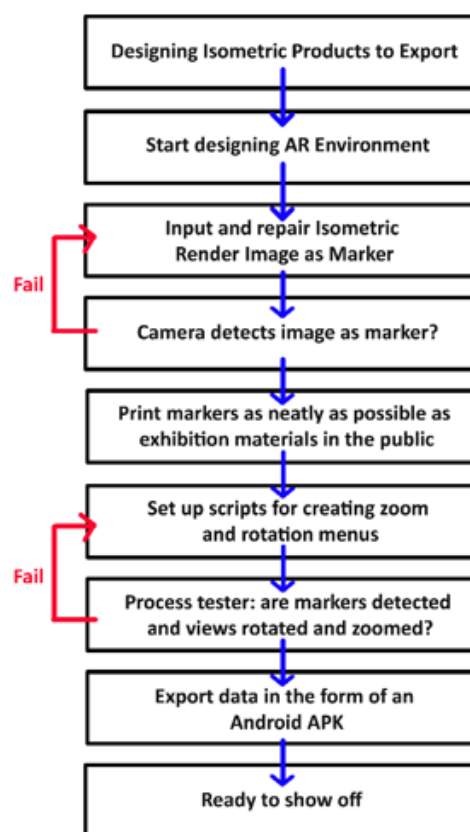


Figure 6. System Flowchart  
(Source: Personal research documentation)

The diagram above has explained the various steps so that the AR application can be used, but researchers try to describe some crucial points in the AR production process.

### **1. Export 3D Isometric to AR environment.**

Isometric artworks are a mid-semester assignment for MNP animation students, so when these AR productions are made, their work has been assessed and curated according to the needs of the Animaxtion exhibition. This is done in order to maximize the exhibition space and work effectiveness. Curation was also carried out to whip up other students whose works still needed to be selected to try even harder for the next exhibition. Export is done through the blender software; after improvements, the isometric 3D work is ready to be exported.

After the work has been repaired, the first step is to export the data file to FBX format. FBX files are perfect for VR and AR because they support various data types, including geometry, animation, skinning, and lighting (Vivian, 2022). Researchers carry out the baking process (the process of transferring texture data from one 3D model to another 3D model. Speaking, people are doing this generally when they are trying to take a high-poly model and convert it to a low-poly model) because in the process, we won't be using the shading and lighting from Unity 3D, but from Blender. The steps for exporting in Blender like in Figure 7:

### **File > Export > FBX (.fbx)**

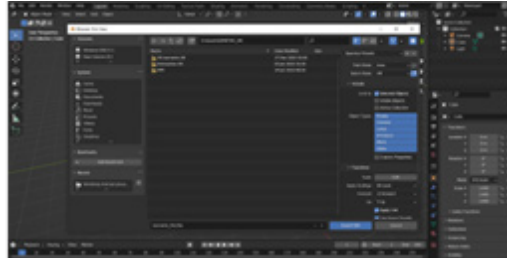


Figure 7. display export fbx from blender  
(Source: Personal research documentation)

After it has been exported, the file is ready to be imported into the Unity 3D software as an Augmented Reality production engine.

### **2. Making Augmented Reality Applications.**

This process is the main focus in research because it is a crucial part in the process of making AR. The first step is of course to create an Augmented Reality project with Unity 3D software. here I use the 2020 version because I feel that I am quite familiar with the tools that are presented. After the project is finished, the next step is to export the FBX file that was created earlier in Blender. In Figure 8, shows the progress described earlier.

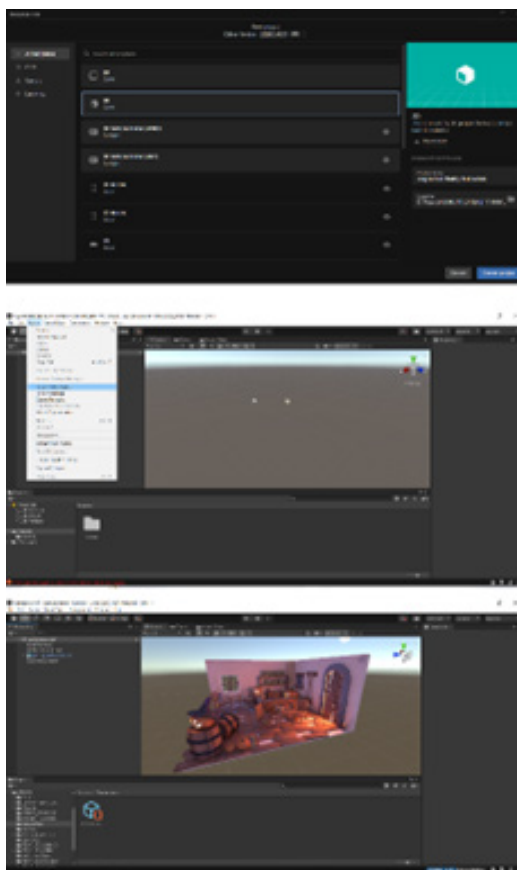


Figure 8. Overview of creating projects and exporting FBX

(Source: Personal research documentation)

The next step is to create an AR camera. To make all AR needs from databases, licenses, triggers and AR settings, researchers use additional software engines with the Vuforia SDK plugin. The Vuforia SDK can be accessed and downloaded for free on the Vuforia site. After all needs have been exported and the data processed, then make sure the Vuforia SDK is integrated with Unity 3D. In Vuforia, there is a system that creates image triggers as our Augmented Reality markers, so that when we finish printing the physical form of the work that becomes our program marker, the system will automatically read it and display the AR screen. However, there is a star system in Vuforia which is useful for

indicating the level of accuracy of reading markers. The more stars, the more easily the image will be read as a trigger for the AR program. So try to have as many stars as possible in our image.

After everything is integrated, we have to export all the plugins that we have created and downloaded in the Vuforia SDK earlier. Steps to export plugins from Vuforia SDK to Unity 3D: Unity 3D > Assets > import package > custom package > select Vuforia Plugin. Each progress can be followed according to Figures 9 and 10 and see the progress response in the future.

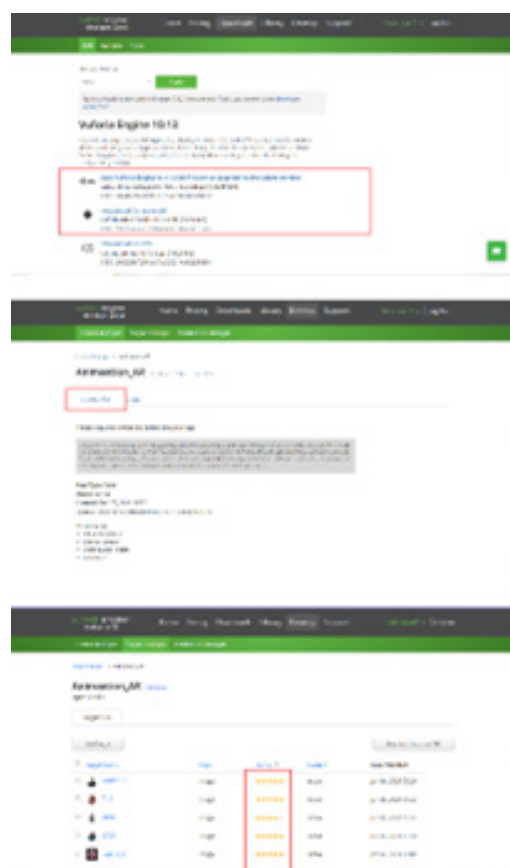


Figure 9. Important data in Vuforia SDK  
(Source: Personal research documentation)



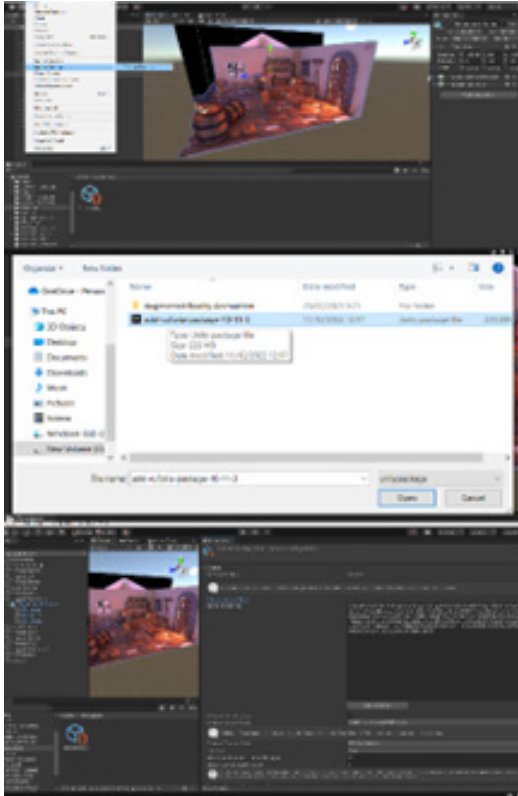


Figure 10. Vuforia Configuration in Unity 3D  
(Source: Personal research documentation)

After that, Vuforia has integrated successfully. How to activate Vuforia in Unity 3D: GameObject > Vuforia Engine > select as needed, such as an AR camera (as a special camera for AR products) or Image Target (create a Trigger in the project).

The next step is to put the rendering image into the target image form in AR. Make the position of the virtual trigger in the Unity 3D engine as close as possible so that later when testing the AR camera trigger, it will be in the position designed in Unity 3D. After everything is installed, the researcher can try the AR camera test by pressing the play button on the project desktop as can be seen in Figure 11.

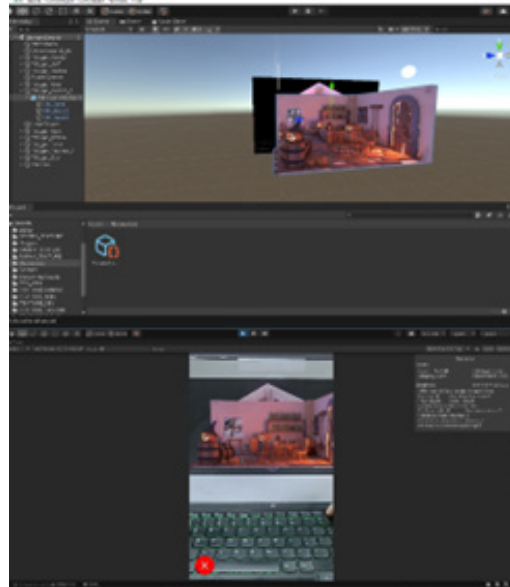


Figure 11. Integration of Image Target as Marker and testing camera was successful.  
(Source: Personal research documentation)

If the camera test fails, then the Image Target import process must be repeated again. Usually, the main cause is a weak trigger (if the Vuforia SDK menu had a low star) so the marker is not readable. However, if it has been read, then the AR-making process has been completed. However, if we refer to this default menu, AR cannot be rotated and zoomed because there is no such menu in Vuforia. Actually, there is a built-in plugin from Unity to adjust the zoom and rotate the display, namely Lean Touch. However, if the settings presented are inappropriate, the book changes the default script that was created with Microsoft Visual Studio. As in Figure 12, the coding process for adding figures is carried out sequentially at each step of the process.

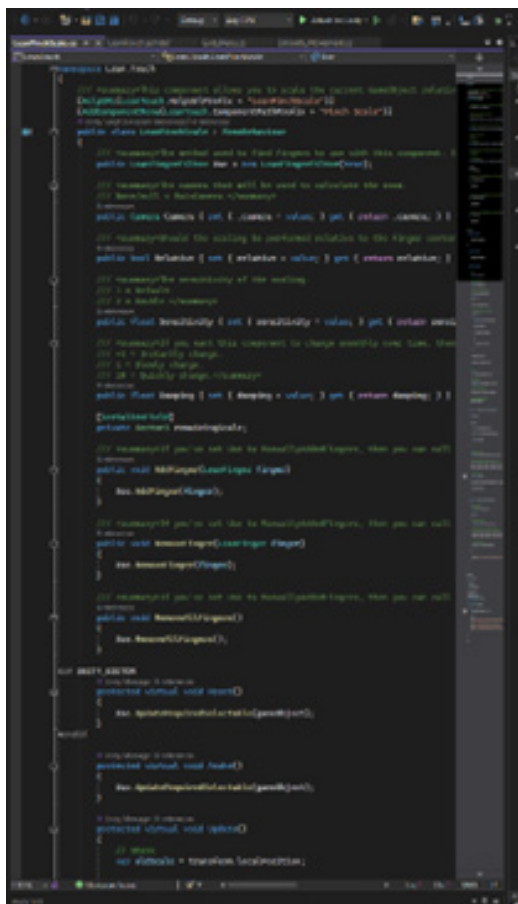


Figure 12. Editing zoom and rotate script from Lean Touch with Microsoft Visual Studio.  
(Source: Personal research documentation)

If all processes have been completed, the researcher tries to make the main menu display UI as an introduction to the customer before entering the application. Researchers also hope that one day they can include various ornaments in the UI for the main menu display, such as sponsors, campuses, and other menus. The researcher made two main buttons and two images that could directly access various websites. The Start button functions to enter the AR camera menu with the Augmented Reality application that we have created. Meanwhile, the exit button functions to exit the Augmented Reality program. Then there are two introducto-

ry images that the researcher inserts in the main menu display of the research application, namely the Animaxtion logo image, which when clicked it immediately connects to the Animaxtion Instagram event. Meanwhile, there is the Multimedia Nusantara Polytechnic logo under the menu, where if clicked, it will go to the campus's website like in Figure 13.

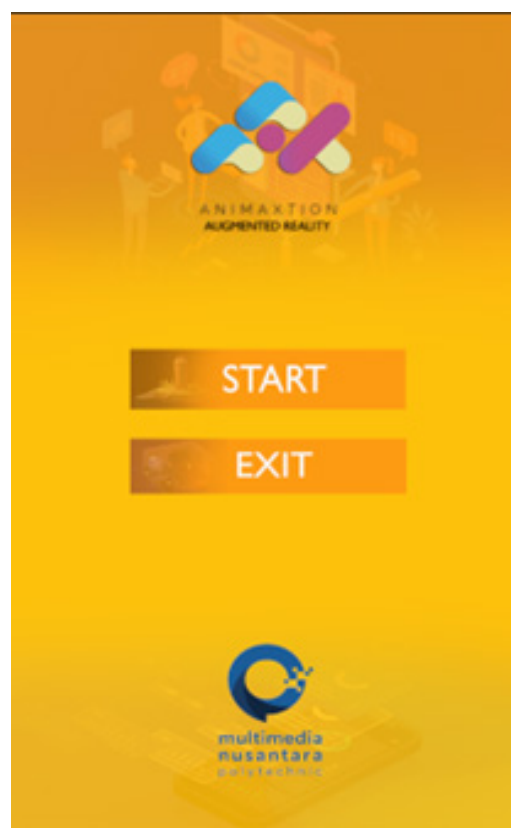


Figure 13. Display UI Home Screen application AR Animaxtion  
(Source: Personal research documentation)

The production method is almost the same as creating a zoom and rotate script, but the packaging is smaller. So, it does not require as many script commands as zoom and rotate earlier in Figure 14.

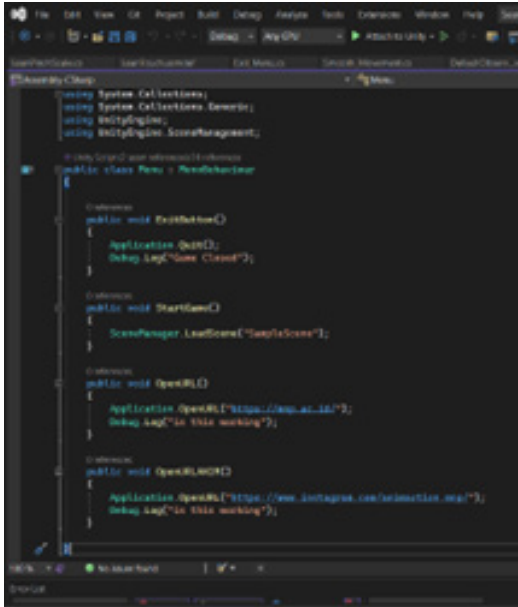


Figure 14. Scripting in UI Home Screen  
(Source: Personal research documentation)

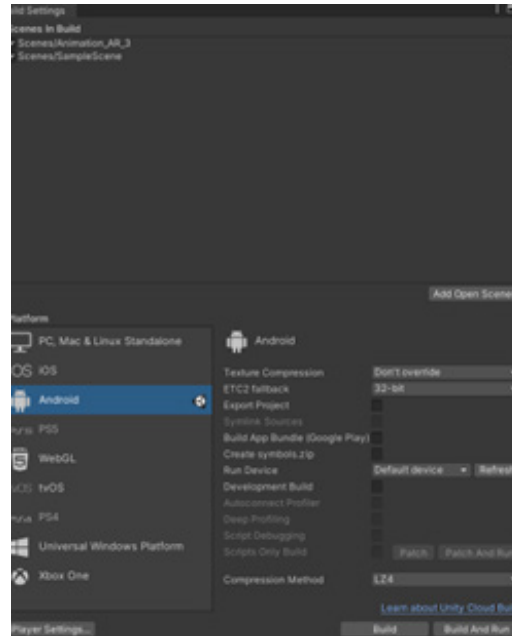


Figure 15. Display build and settings in Unity  
(Source: Personal research documentation)

Suppose there are no more problems regarding the process that has been running and all trials in Unity 3D are successful. In that case, the research can proceed to the next stage, exporting Augmented Reality data into APK form.

### 3. Export Augmented Reality data into APK.

The following process can be carried out if all stages of the AR production process in Unity have been carried out. Test trials via the AR camera have also been tested. After all the AR tests and designs have been completed, the next step is the Export AR process to APK form. In the process, researchers encountered a few problems. Researchers only need to set the type of APK that was created to be used for what device. For now, researchers are trying to make APKs that support Android only. APK build process:

**File > Build and Settings.**

Before pressing the Build button, it would be wiser to check all the requirements in the Player Settings, which are in the column at the bottom of Build and Settings as can be seen in Figure 15. In the Project Setting menu, we focus more on the Player section to set various types of apk profile settings later. The most important thing here is to change the name of the Package Name, so that it will make it easier later in the apk creation process. Then the Minimum API Level is used as a Limitation on the types of Android that can use this APK. As of Unity 2020 and Vuforia has an Android 6.0 “Marshmallow” Limit (API level 26) as the lowest limit for Android devices capable of running APKs. Then the Target Architectures themselves are set in ARM64 mode because most smartphone and tablet devices currently use 64-bit apk types.

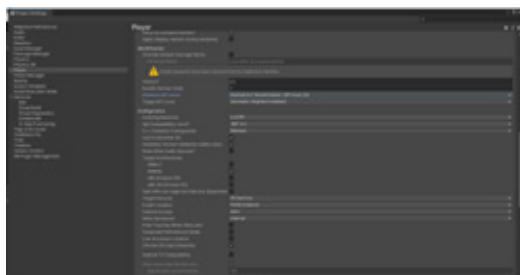


Figure 16. Player Setting in Build Setting Unity 3D  
(Source: Personal research documentation)

If we have done the setting process, the next step is to do the Build. Always keep an eye on the Build process because sometimes there are errors in the progress. If there are no obstacles, an APK file will be created, which can be directly extracted to a smartphone or tablet device. As in Figure 17, the APK is formed with the icon that we have set during the export process in Unity 3D earlier.

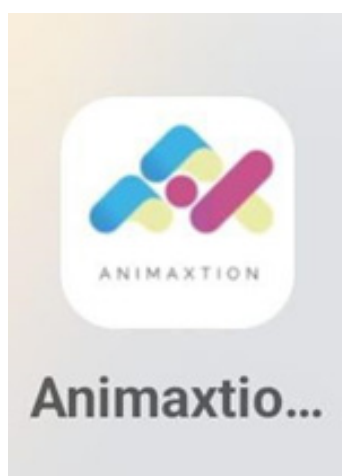


Figure 17. display APK Animaxtion AR in Android  
(Source: Personal research documentation)

## Discussion

While making an Augmented Reality application, the process and flow follow several other research results even though they do not use the same target. Previous researchers found obstacles to markers like what they did, and there are prob-

lems with markers made with ARToolkit (Yulsilviana et al., 2017). ARToolkit has several problems regarding markers with different positions. This study found that the support for AR features is growing through the presence of the Vuforia SDK, which is easier to store and markers are more easily triggered on smartphone or tablet devices.

The researchers followed when the event took place from January 10 to 27, where the 3D Isometric AR stand was quite popular in the eyes of visitors. However, researchers found several limitations and affordability of the applications that researchers created. In Figure 18, shows visitors enjoying exhibition activities and shows the limitations of visitors in using tools, so further improvement is needed on this matter. Visitors question access to apk for the public, where researchers' limitations on the Playstore license affect visitor comments about the need for online media to support AR. Researchers hope to develop this AR application into a more affordable media for the wider community in future studies.

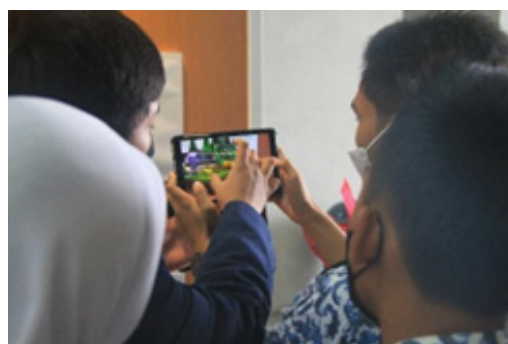


Figure 18. Visitor tried Animaxtion AR in Exhibition  
(Source: Personal research documentation)

## Conclusion

From this stage, AR production actually has a large and structured scope of production. However, because the production of works was assisted by



mid-semester works from MNP animation students in the form of 3D isometrics, it became easy for researchers to design systems where several students also assisted researchers. This AR production makes this kind of production system capable of being run by students, and it is hoped that in the future, it can help the New Media college learning system where AR is attractive to exhibitions. The animation production process which is almost entirely implemented coupled with the application of new media AR can be an innovation in future learning and visualization development.

This can be seen from several observations of the Animaxtion exhibition that has been running where the Isometric 3D AR arts have been visited and tried by visitors and attracted the attention of visitors so that it becomes the main attraction in art exhibitions.

However, all methods have drawbacks. Researchers got a good response from the audience, but due to limited devices because the application devices have yet to be widely disseminated so the system is still offline the thing to complain about. The researchers hope that for further development of Augmented Reality applications, it can develop to a more modern online level.

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