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DEVELOPMENT OF AUGMENTED REALITY ANDROID-BASED APPLICATION FOR SAFETY PLAN ARRANGEMENT

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DEVELOPMENT OF AUGMENTED REALITY ANDROID-BASED APPLICATION FOR SAFETY PLAN ARRANGEMENT

BACHELOR THESIS

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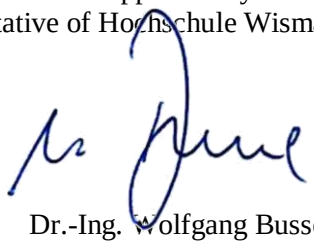

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DEVELOPMENT OF AUGMENTED REALITY ANDROID-BASED APPLICATION FOR SAFETY PLAN ARRANGEMENT

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ABSTRACT

The development of technology in this era is growing to fast with the mark of technological changes that can facilitate the work of every human technological development in the maritime industry. To understand in detail requires a visual learning pattern that is direct observation of the object of the ship. It is also not easy in practice, because it must go through various permits to the company concerned, the availability of time and various other aspects. Technology and information are needed to help complete aspects that are difficult to reach so that the learning process can continue to run efficiently and interactively. Augmented Reality is a combination of the real and virtual world, is interactive in real time, and is a 3D animation. Augmented reality (AR) aims to take the real world as a basis by combining several virtual technologies and adding contextual data so that human understanding as its users becomes clearer. In this case marker – based tracking will be applied, One method that has long been recognized in augmented reality technology is the Marker-based Tracking. This method requires markers in the form of images that can be analyzed to form reality. The distinctive picture that can be recognized by the device is called the marker. A marker can be anything, as long as it has enough unique visual points. Images with lots of corners and edges work especially well. Typical examples include any print media, such as logos, packaging, posters or brochures. Or objects, often a product itself such as a drinks can, bottle, or even machinery. Augmented Reality (AR) is an innovation in the field of technology and is expected to be able to add experience in learning media.

The purpose of this research is to develop a safety plan arrangement application on the Android-based Meratus Benoa ship by combining AR and mobile technology. This application was developed using AR technology which was added to the specified markers which can be detected on mobile phones and then visualized in 3D models. the results of this study can display a 3D shape of a safety plan arrangement from the deck of ships and the location of the equipment. AR technology is expected to be able to provide an innovation in learning media and be able to improve student learning outcomes, especially in the maritime field.

Keywords: Augmented Reality, Android Application, Educational Media, Safety Plan Arrangement.

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PENGEMBANGAN APLIKASI AUGMENTED REALITY BERBASIS ANDROID UNTUK PENGATURAN RENCANA KESELAMATAN

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ABSTRAK

Perkembangan teknologi di era ini semakin berkembang pesat dengan ditandi dengan perubahan teknologi yang dapat memudahkan setiap pekerjaan khususnya teknologi di bidang maritim. Dalam mempelajari materi pembuatan kapal, mahasiswa harus memahami proses pembuatan kapal secara detail. Untuk memahami secara detail dibutuhkan pola pembelajaran visual yaitu pengamatan langsung terhadap objek kapal. Ini juga tidak mudah dalam praktiknya karena harus melalui berbagai perizinan kepada perusahaan yang bersangkutan, ketersediaan waktu dan berbagai aspek lainnya. Teknologi dan informasi dibutuhkan untuk membantu menyelesaikan aspek-aspek yang sulit dijangkau sehingga proses pembelajaran dapat terus perjalan secara efisien dan interaktif. Augmented reality adalah kombinasi dari dunia nyata dan virtual interaktif dalam waktu nyata dan merupakan animasi 3D. Dalam hal ini pelacakan berbasis penanda akan diterapkan, salah satu metode yang telah lama dikenal dalam teknologi augmented reality adalah pelacakan berbasis *marker*/penanda. Metode ini membutuhkan penanda dalam bentuk gambar 2D yang dapat dianalisis untuk merubah menjadi gambar 3D. Gambar khas yang dapat dikenali oleh perangkat disebut penanda. Penanda Dapat berupa apa saja, asalkan memiliki titik visual yang cukup unik. Gambar dengan banyak sudut dan tepian dapat bekerja dengan sangat baik. Contoh umum termasuk media cetak, logo, poster, atau brosur. Augmented Reality adalah inovasi di bidang teknologi dan diharapkan dapat menambah pengalaman dalam media pembelajaran.

Tujuan dari penelitian ini adalah untuk mengembangkan aplikasi pengaturan reancana keselamatan pada kapal MV. Meratus Benoa berbasis Android dengan menggabungkan teknologi AR dan ponsel. Aplikasi ini dikembangkan menggunakan teknologi AR yang ditambahkan ke penanda yang telah ditentukan yang dapat dideteksi pada ponsel dan kemudian divisualisasikan dalam model 3D. Hasil penelitian ini dapat menampilkan 3D dari rencana pengaturan keselamatan dari 4 geladak kapal dan lokasi peralatan. Teknologi AR diharapkan mampu memberikan indovasi dalam media pembelajaran dan mampu meningkatkan hasil belajar siswa khususnya di bidang *Maritime*

Keywords: Augmented Reality, Aplikasi Android, Media Pembelajaran, Rencana Pengaturan Keselamatan

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PREFACE

All praise the authors say into the presence of God Almighty, who has provided his grace so that the author can complete this thesis titled "Development of Augmented Reality Android-Based Application For Safety Plan Arrangement". This thesis is supposed to fulfill the Bachelor Thesis course at authors study and also be hoped that authors gain more information regarding this thesis in the future.

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The author concerns in the imperfections of this thesis. Therefore, any criticisms and suggestions that are built from the reader will be expected. The author hopes this thesis provides benefits primarily for readers and additional for the author in the process of teaching and learning.

Surabaya, January 2020

Author

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CHAPTER I
INTRODUCTION

1.1 Background

In general ship arrangements, in some technical considerations one must pay attention to safety. The safety plan arrangement on a ship is part of the initial stages in planning the construction of a ship, which must meet safety aspects. The safety aspect is very supportive in an emergency while the completeness of the safety aspect includes evacuation equipment, evacuation routes and various other safety aspects. This information is usually found in the safety plan arrangement.

Safety plan arrangements are all general guidelines of the ship relating to the safety instrument information available on the ship. Safety equipment must be available on board in accordance with SOLAS 2004. Safety plan arrangement are one of the plans of safety equipment already regulated by SOLAS (Safety of Life at Sea). That appliances is safety In learning shipbuilding material, students must understand the shipbuilding process in detail. To understand in detail requires a visual learning pattern that is direct observation of the object of the ship. It is also not easy in practice, because it must go through various permits to the company concerned, the availability of time and various other aspects. Technology and information are needed to help complete aspects that are difficult to reach so that the learning process can continue to run efficiently and interactively.equipment. There are some symbol that has a function as a information about safety equipment and also the location of deck.

Learning with multimedia methods is a favorite of most students because it can hone interactive skills by users, one of them with the help of a smartphone as a learning resource. Understanding multimedia, as the integration of more than one media in communicating or combining various media in a computer system. Interactive learning media is an effective computer-based communication system that is able to create, store, present, and access information again in the form of text, graphics, sound, video or animation (Soenarto, 2009). There are many benefits to learning from using visual media tools to explore the emotional honesty of individuals, creating effective communication and providing flexibility in learning activities. The use of cellular technology as an educational medium expands opportunities for students to be able to improve their learning.

The level of popularity of cellular technology is at a constant level and continues to increase in demand. Mobile devices are increasingly showing their use in daily activities, to help facilitate various jobs and can be used as a medium of entertainment. (Ballagas, et al 2006). Technology smartphones and tablets opens up new opportunities for interaction and with the evolution of technology there are emerging devices with high computing capabilities. As a result, interest in implementing the Augmented Reality (AR) application on cellular systems has increased significantly.

Figure 1 . 1 Augmented Reality Technology
Source : https://servicepower.com

The history of augmented reality starts from 1957-1962, when an inventor named Morton Heilig, a cinematographer, created and patented a simulator called Sensorama with visuals, vibrations and smells. In 1966, Ivan Sutherland invented the head-mounted display that he claimed was, a window into the virtual world. In 1975 a scientist named Myron Krueger discovered Videoplace that allows users to interact with virtual objects for the first time. In 1989, Jaron Lanier, introduced virtual reality and created the first commercial business in cyberspace, in 1992 developed augmented reality to make improvements to Boeing aircraft, and in the same year, L.B. Rosenberg developed one of the functions of an AR system, called virtual fixtures, which is used in the US Air Force Armstrong Labs, and shows its benefits to humans, and in 1992 also, Steven Feiner, Blair Maclntyre and dorée Seligmann, introduced for the first time the Major Paper for the development of the augmented reality Prototype.

In 1999, Hirokazu Kato, developed ArToolkit on HITLab and was demonstrated at SIGGRAPH, in 2000, Bruce. H. Thomas, developed ARQuake, an AR Mobile Game that was shown at the International Symposium on Wearable Computers (Ramadar, 2014). In 2008, Wikitude AR Travel Guide, introduced the Android G1 Telephone with AR technology. In 2009, Saqoosha introduced FLARToolkit which is a development of ArToolkit. FLARToolkit allows us to install AR technology on a website, because FLARToolkit's output is in the form of Flash. In the same year, Wikitude Drive launched an AR technology navigation system on the Android Platform. In 2010, Acrossair used AR technology on iPhone 3Gs (Sutoyo, 2009).

In general, Augmented Reality (AR) is a combination of virtual objects with real objects. For example, it is when a television station, broadcasts a soccer match, is held a virtual object, about the score of an ongoing match. (Ronald Azuma, 1997), Augmented Reality is a combination of the real and virtual world, is interactive in real time, and is a 3D animation. Augmented reality (AR) aims

to take the real world as a basis by combining several virtual technologies and adding contextual data so that human understanding as its users becomes clearer. This contextual data can be in the form of audio commentary, location data, historical context, or in other forms (Rahmat, 2011). With the help of Augmented Reality technology, the real environment around us will be able to interact in digital (virtual) form. Information about objects and the environment around us can be added to the Augmented Reality system which then displays the information above the real world layer in real time as if the information is real (Fernando, 2013). The function of augmented reality (AR) is to improve one's perception of the world around them and make a part of the virtual and real world a new interface capable of displaying relevant information that is very helpful in education, training, repair or maintenance,

Some examples of Augmented Reality (AR) applications:

1. Use of Augmented Reality to assist operations.
2. Display that shows the geographical location on the car. The display can display the names of buildings and streets.
3. Teleconferencing where users can see each other the same model environment for discussion.

Augmented Reality is the appearance of the results of virtual objects that have been integrated into the real environment in real time. AR equips the real world with virtual objects, produced by computers, that appear to co-exist in the same space as the real world (Krevelen, 2007) in other words, AR is a way to improve the quality of the real world and that can be achieved by adding virtual objects above the real world. The biggest advantage of augmented reality is the cost of purchase or zero because it uses conventional hardware that is used in many cases. (Petr, 2014).

The potential contained in AR is growing rapidly at the beginning of the millennium era and this is very beneficial for educational media and scientists have further researched for the development of AR to come. Since then, many variations and approaches have been taken in the design of AR used for pedagogical purposes and the need for an overview of what has been learned in the field.

Figure 1. 2 Application Augmented Reality
Source : https://information-age.com

This system, is very easy and safe to operate by users, because it integrates reality with virtual elements. That happens because the movements occur naturally, are easy to learn and can be as simple as moving a body part or object. Augmented Reality can be useful in any application that needs to display information that is not available or cannot be detected directly by the human senses. Therefore, by being seen, it is possible to increase the sense of realism and immersion in this technology.

Representation of Reality - Virtual (VR) The Augmented Reality continuum adds virtual content to the real environment, while Augmented Virtuality adds real content (real content) to a more dominant virtual environment (Olwal A., 2009). Augmented Reality Technology is a visual technology that combines objects or virtual worlds into real-world views in real time (Rekimoto J. and Ayatsuka Y., 2000).

There are several types of tracking that can be used in Augmented Reality : 1. Marker based tracking: marker based tracking is an AR method that uses markers to bring up virtual objects. 2. Marker-less: using the marker-less method the user does not need a marker to display virtual objects. The marker-less method can be applied using GPS, motion (gesture), face tracking. In this study later, to visualize the anatomy of human organs will use the AR Marker Based Tracking technique. UCD (User Center Design) User Center Design (UCD) is an approach to building interactive systems where the main focus is to make systems or applications that are easy to use (ISO / IEC, 1999). By adopting the UCD approach in designing the system interface, the final result of the system is expected to fulfill the following: 1. Assist users in achieving their goals 2. Make people want to use the system 3. Users easily understand how to use the system 4. Successful system used by users 5. Satisfying for users 6. Reducing the possibility of errors from users Vuforia SDK Vuforia is an Augmented Reality Software Development Kit (SDK). Vuforia SDK allows the development of Augmented Reality on mobile devices. Vuforia was also known as QCAR (Qualcomm Company Augmented Reality). (Raj K., A. D Souza, A., Shanbhag, C., and D Shouza, D., 2015)

1.2 Research Problem

1. How to visualize the form of Safety plan arrangement of MV. Meratus Benoa on augmented reality model?
2. How to provide safety plan arrangement information based on its location on board?
3. How to develop augmented reality application as a media in learning?

1.3 Objectives

1. To visualize the form of safety plan arrangement on augmented reality model
2. To Provide safety plan arrangement information based on its location on board
3. To develop augmented reality application as a media inlearning

1.4 Research limitations

1. The application is made for android-based mobile devices
2. Using the marker method in the object input process
3. Only provide Live Saving Appliances location based on safety plan arrangement
4. Only visualize the safety plan arrangement of MV. Meratus Benoa

1.5 Benefit

1. Provide visualization the form of safety plan arrangement on augmented reality
2. Provide safety plan arrangement information based on its location on board
3. Provide augmented reality application as a media in learning.

CHAPTER II
LITERATURE STUDY

2.1 Safety Plan Arrangement

2.1.1 General Definition of Safety Plan Arrangement

Safety Plan Arrangement is a safety standard that must be met in a ship, to ensure the safety of the crew in the event of a disaster. All equipment and procedures must be approved by the class. Before approval is given, all of safety equipment must go through a series of tests to meet existing standards and work according to their functions properly. In addition, the certificate documents regarding the validity of the safety equipment were also checked. Class has the authority to approve or cancel if deemed necessary.

Figure 2. 2 Safety Plan
Source: (ARS co. Ship Design & Consulting Company, 2019)

2.1.2 Safety Plan Objectives

The purpose of this safety plan is to make it useful for providing life safety equipment that occurs during a disaster or in an emergency. This refers to the international convention for the safety of life at sea (SOLAS), 1974. 2 On and after 1 July 1998, the requirements of this Code will be mandatory under the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. Any future amendment to the Code will be adopted and brought into force in accordance with the procedure laid down in Article VIII of that Convention.

2.1.3 Safety Plan Function

The function of this safety plan is to facilitate all life-saving equipment and easy-to-reach site planning to overcome difficulties. All of which form the basis of this safety plan have been compiled in the LSA code and SOLAS 1974 chapter III.

LSA code is a code which provides international requirements for the life-saving appliances that are required by chapter III of the 1974 *SOLAS* Convention, including personal life-saving appliances (for example, lifebuoys, lifejackets, immersion suits, anti-exposure suits and thermal protective aids), visual aids (parachute flares, hand flares and buoyant smoke signals), survival craft (liferafts and lifeboats), rescue boats, launching and embarkation appliances and marine evacuation systems, line-throwing appliances; and general alarm and public address systems.

The International Life-Saving Appliance (LSA) Code gives specific technical requirements for LSAs and is mandatory under Regulation 34, which states that all life-saving appliances and arrangements shall comply with the applicable requirements of the LSA Code.

2.2 Augmented Reality

2.2.1 Definition of Augmented Reality

Augmented reality is a term for an environment that combines real world and virtual worlds made by computers so that the boundary between the two becomes very thin. Virtual objects are added instead of replacing real objects. Whereas, the purpose of augmented reality is to simplify the real object by bringing virtual objects into it, so that it can deliver information to users who interact with the user interface of the real object. (Afissunani, 2014). Augmented reality is an interaction technology that can combine 2-dimensional or 3-dimensional virtual objects that will be added into the real environment and combine them so as to create mixed reality and project it into real time, so that augmented reality is a technology that combines interaction between the real world and virtual world.

Augmented reality is defined as a system that combines elements from the real world with virtual elements (3D) and that allows interactivity between objects (real and virtual) in real time (Azuma, 1997). Those virtual elements allow user to display certain information, which a given user cannot detect directly only through their own senses. Thus, augmented reality changes the way human see the world, which increases the perception and interaction of a user with reality.

Figure 2. 2 Augmented Reality Display
Source: https://revfine.com

2.2.2 Method of Augmented Reality

There are two types of imaging methods in augmented reality (Lyu, 2012) namely:

1) Marker-based Tracking

One method that has long been recognized in augmented reality technology is the Marker-based Tracking. This method requires markers in the form of images that can be analyzed to form reality. The distinctive picture that can be recognized by the device is called the marker. A marker can be anything, as long as it has enough unique visual points. Images with lots of corners and edges work especially well. Typical examples include any print media, such as logos, packaging, posters or brochures. Or objects, often a product itself such as a drinks can, bottle, or even machinery.

Marker-based AR has a characteristic that is using the camera feature on the device for analyzing the captured marker to display virtual objects such as video and image. Users can move the device to see virtual objects at various different angles. So that users can see virtual objects from all sides.

Figure 2. 3 Marked Based Tracking Display Principles
Source: (V&B Augmented Reality App, 2019)

2) Markerless AR

Another method of augmented reality that is currently developing is the Marker-less AR method. With this method the user no longer needs to use a marker to display objects or digital elements. This approach eliminated the need for 3D object tracking systems, overcoming the interactivity limitations marker-based augmented reality placed on the range of images encapsulated within the markers. A marker-less application recognizes objects that were not directly provided to the application beforehand. This scenario is much more difficult to implement because the recognition algorithm running in the AR application has to identify patterns, colors or some other features that may exist in camera frames. For example, if the algorithm is able to identify dogs, it means that the AR application will be able to trigger AR actions whenever a dog is detected in a camera frame, without user having to provide images with all the dogs in the real environment when developing the application.

Examples of marker-less AR are Face Tracking, 3D Object Tracking, and Motion Tracking. In addition, there are also AR that uses GPS or digital compass features. GPS Based Tracking technique utilizes the GPS and compass features in the smartphone, the application will display it in the form of a direction or place that the user wants in real time.

Figure 2. 4 Marker-less Display Principles
Source: (Niantic, 2019)

2.3 Unity

Unity is a software that can be used to build games with various technologies which include graphics, audio, physics, interactions, and networking (Unity, 2019). Unity 3D is a game engine based on multi-platform, so unity is used to create games that can be used on personal computer, Android and iPhone smartphones, PlayStation and Xbox consoles. The mission of Unity is "democratize game development", which means that Unity will make the development tools are easy to use, has a good quality 3D games, and capable of running on multiple platforms. The main functions provided by Unity game engines include an engine renderer that is useful for rendering 2D or 3D graphics, a physics engine to make 3D objects act like real objects, sound, scripts, animation, artificial intelligence (AI), network, streaming, and animated graphics.

In addition, Unity is not only used to build games but also can be used as an interactive 3D or 2D software development tool such as training simulations for industrial purposes, architectural visualization, mobile-based applications, laptops, web, consoles and various other platforms. Developing a virtual 3D by using a game engine is a strategy to combine various multimedia data into one platform. Characteristics of game engines that are installed interactively, allowing users to explore and engage with game objects (Indraprastha, 2009).

Figure 2.5 Unity Software User Interface
Source: (Unity, 2019)

Unity has a complete framework for the development of various professional technologies. This engine system uses several choices of programming languages, including C #, JavaScript and Boo. To support diverse functions of the software, Unity has various features that can be used, including the following:

a) Scripting

Programmers can use UnityScript, C #, or Boo as the programming language. Starting with the release of version 3.0, Unity includes a version of MonoDevelop which is used for script debugging.

b) Animation

With the animation display feature on Unity, it allows developers to create and edit animated clips directly in Unity. This feature is made so that Unity can create additional functions to create 3D animations.

c) Platform

Unity supports software development on various platforms. In a project, the developer has control to create software to mobile devices, web browsers, desktops or consoles. Unity also allows texture compression specifications and resolution settings on each supported platform. The supported platforms are Windows, Mac, Linux, Android, iOS, Windows Phone, Unity Web Player, Adobe Flash, PlayStation 3, Xbox 360, Wii U and Wii. In this development, the application will only run on the Android platform.

d) Asset Store

Unity Asset Store is a resource available to Unity editors. Asset store consists of a collection of massive asset packages, along with 3D models, textures and materials, sound effects, tutorials and projects, package scripting, editor extensions and networking.

2.4 Vuforia

Vuforia is an augmented reality Software Development Kit (SDK) that can be called a plugin to create augmented reality application that can be used on mobile devices. Vuforia software is used as additional compulsory software (plugins) in the Unity software so that the software can produce augmented reality applications used on mobile devices and the plugin software is free (open source) to download. Vuforia SDK has the ability to detect and recognize an object with its computer vision technology. The object recognition feature is as follows:

a) Image Targets

Image Targets are flat images, such as print media or on the packaging of a product. Image Targets represent images that Vuforia Engine can detect and track.

b) Multi-Targets

A Multi-Target is an object created with more than one image target in a defined geometric arrangement.

c) **Cylinder Targets**

Cylinder Targets are images that line cylindrical shaped objects such as bottles, cups, sodas, etc.

d) Text Recognition

Text Recognition allows developers to build applications that can detect words on Vuforia word list, which are more than 100,000 words in English.

e) Object Recognition

Object Recognition allows developers to create applications that can detect irregular objects.

f) Smart Terrain

Smart Terrain allows developers to build game or visualization applications that can present visual interactions that their content can interact with physical objects in the real environment.

Establishment of the Augmented Reality system requires several aspects that must be considered (Shapiro, 2001):

A. 3D models of objects to be combined with the real world.
B. Correspondence between the real world and 3D models through calibration.
C. Tracking is used to determine the user's point of view of the real world.
D. Real-Time Display that is combined with the original image and also computer graphics made based on the model.
E. Response time to motion and accuracy between images and graphics greatly affect the effectiveness of the system.

2.5 Augmented Reality Component

In its application, augmented reality technology has several components that must be present to support the performance of digital image processing. The components are as follows (Sylva, et al. 2003):

a) Scene Generator

Scene Generator is a device or software that functions to do rendering. Rendering is the process of building images or certain objects in AR.

b) Display

There are several factors that need to be considered in the development of the AR system, such as the factor of resolution, flexibility, point of view, and tracking area. On the tracking area, the lighting factor becomes a matter that needs to be considered because it can affect the display process.

c) Tracking

Tracking system is the most important component in augmented reality. In the tracking process, a detection of virtual objects is carried out with real objects with certain patterns

d) AR Device

AR can be used on several operating systems on smartphones. At present, several applications with AR technology are available on Android, iPhone, Windows Phone, and others. In addition, AR can also be used on PCs and televisions connected with cameras such as webcams.

2.6 Component To Develop

Some of the components needed in the manufacture and development of AR applications are as follows:

a) Computer.

The computer functions as a device used to control all processes that will occur in an application. The use of this computer is adapted to the conditions of the application to be used. Then the application output will be displayed via the monitor.

b) Marker.

Markers function as images in black and white in a square shape. By using this marker, the tracking process when the application is used. The computer will recognize the position and orientation of the marker and will create a virtual object in the form of a 3D object at points (0, 0, 0) and 3 axes (X, Y, Z).

c) Camera.

The camera is a device that functions as a recording sensor. The camera is connected to a computer that will process images captured by the camera. If the camera captures an image that contains a marker, the application on the computer is able to recognize the marker. Next, the computer will calculate the position and distance of the marker. Then, the computer will display the 3D object above the marker.

2.7 Working Principle of Augmented Reality

The figure below explains the working principle of Augmented Reality (AR). The work process is as follows:

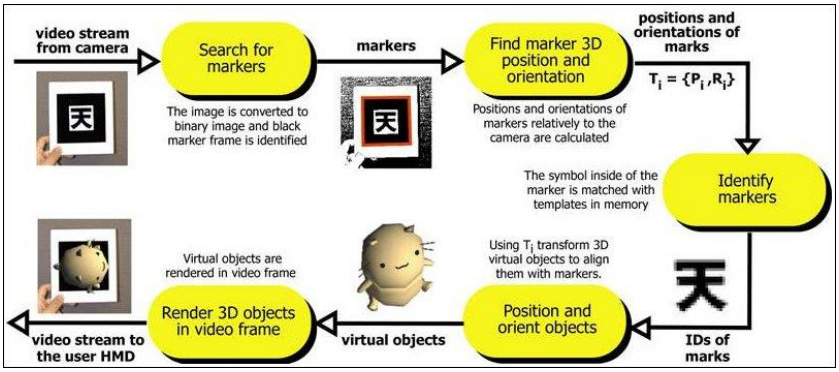


Figure 2.6 Working Principles
(Source : http://www.hitl.washington.edu)

1. The camera captures data from markers in the real world and sends the information to the computer.
2. Software on the computer will track the box shape of the marker and detect how many video frames.
3. When the box has been found, the software uses mathematical calculations to calculate the position of the camera relative to the black box on the marker.
4. After calculating, the graphical model will appear in the same position and be inside the scope of the black box, then displayed to the screen to see graphics in the real world.
5. This model is taken above the video from the real world and looks trapped in a square marker.
6. The final output is displayed again on the handheld screen, so when users look through the screen they see a superimposed graph in the real world.

CHAPTER III
METHODOLOGY

3.1 Methodology Flowchart

The methodology flowchart shows every step of doing this final project which is shown in figure below:

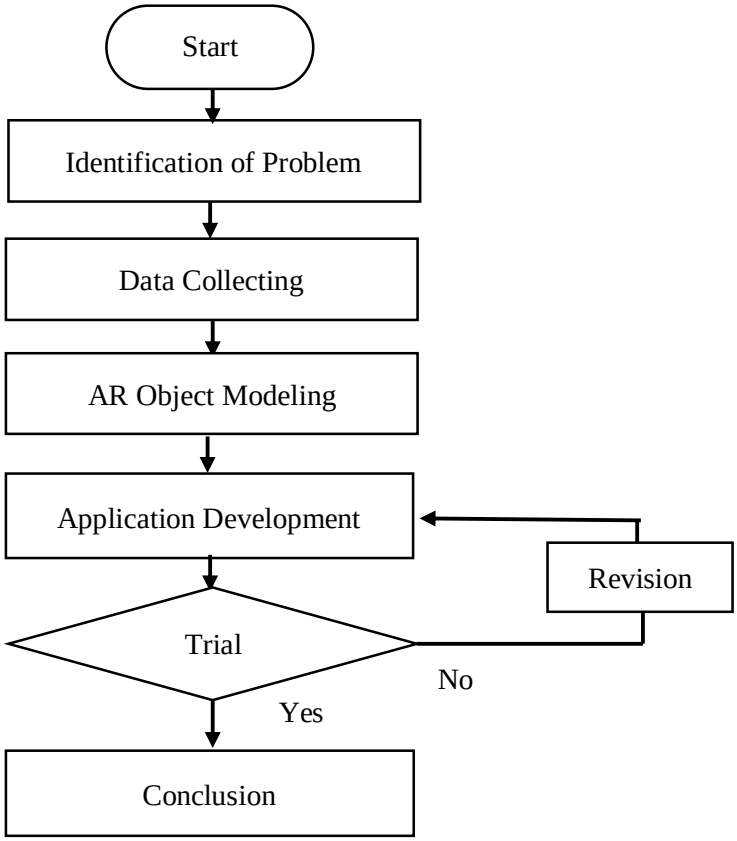


Figure 3.1 Methodology

3.2 Description of Methodology Flowchart

- **Identification of problem**

Identification of problem is the first step to determine the concern of the research by identifying why the research is done and what the benefits of the research are. In this case, the problem is started because the needs of advanced educational media to understand the safety plan arrangement With the growth of information and technology, then the research will offer solution to overcome the problems by developing an augmented reality application for the educational media. There are various problems that will occur in this research process, including: In the survey process, there was a problem with the position of the Meratus Benoa ship, whose position was not necessarily in the port of Tanjung Perak Surabaya. In the Design process constrained by safety equipment on board and 3D design products in augmented reality are not in accordance with expectations.

- **Data Collecting**

Data collecting is a step to gather the data needs for the application development such as the safety plan arrangement list , and the equipment location on board. It is done by doing a visual survey to the one of Meratus Line's ship which is MV. Meratus Benoa in Tanjung Perak Port. From this activity, it will obtain the required data.

- **AR Object Modeling**

The object modelling is a step to design of safety plan arrangement 3D model that consists of ship model, safety plan arrangement, etc. It is done by analyzing the data obtained from the survey that have been conducted. By comparing and sorting the data, then will be obtained the final 3D model of ship's decks, and safety plan arrangement along with the location and its information. The 3D model will be drawn in Blender which is a free and open source 3D computer graphics software used for creating 3D models, visual effects, 3D interactive application, etc. The model will be finalized into as close as the actual object. After the final 3D rendered, the model will be added to the Unity which is also a free and open source cross-platform game engine software. The independent object that has been made in Blender such as the ship decks and safety plan arrangement will be put together. Application Development
Application Development is the step after the modeling is complete which will later be included in Android application.

- **Application Development**

The supporting tools used in developing the application are Vuforia SDK (Software Development Kit) as the additional script to be used as the augmented reality plugin. This plugin is used to make the 3D model can be transforming into an interactive augmented reality model. Android SDK, it includes sample projects with source code, development tools, an emulator, and required libraries to build

Android applications. The last tool is the main software that provides comprehensive facilities for software development. There are many options can be used as the main software, such as Android Studio, Microsoft Visual Studio, Eclipse, etc. In this research, Android Studio have become the main software development of the application. These tools can simplify the work of augmented reality Android application development because all of the components already integrate one another.

- **Trial**

Trial is a step to run a trial for the functionality check of the application to make it sure that the application can
perform its functionality flawlessly. It is done when the early version of application has been made to check any possibilities of bugs or errors. And perform final check when the final version of the application has been made to ensure the application run smoothly without any errors when it will be released later.

- **Conclusion**

The final step is providing the conclusion and report after completing the development of augmented reality Android application-based with its modeling and design as an educational media.

CHAPTER IV
DATA ANALYSIS

4.1 Data Collection

4.1.1 Ship Data

The Data Consists of :

1. General info of the ship and the machineries
   The data is used as the basis to create the environment in virtual reality application.
2. General Arrangement and Safety Plan
   The General Arrangement and Safety Plan is used for make an inspection training plan scenario in virtual reality application and defining every objects that need to build in VR simulation
3. Life Saving Appliances Equipment Certificate
   Certificate collection from some of the equipment needed to support the creation of virtual reality applications.

4.1.2 Research Object

The first step of creation the Virtual Reality Application is to choose what are to be analyzed. Here I choose the vessels available at the PT Meratus Line company to be surveyed. As vessel under research is MV. Meratus Benoa.

Figure 4.1 MV. Meratus Benoa

Table 4.1 General Info of MV. Meratus Benoa

4.1.3 General Info

IMO	9569865
MMSI	525025059
Call Sign	PNNW
Flag	Indonesia [ID]
AIS Vessel Type	Unspecified
Ship Type	Container Ship
Gross Tonnage	3668
Deadweight	5108 t
Length Overall x Breadth Extreme	106.68m × 20.6m
Draught	3.4 m
Speed	7.5 kn
TEU	368
Year Built	2010

4.2 Safety Plan

Safety Plan consist of the general arrangement of ship plan, safety plan equipment on board, etc. those object will be drawn into a 3D model so that later targeted as an object in the augmented reality application. Safety plan that has been obtained will then be used as a guidance in making the 3D model of the ship.

Figure 4.2 Safety Plan

4.2.1 Life Saving Appliance list

Symbol	Item	Quantitiy
	LifeJacket	20
	Lifebouy	2
	Liferaft	2
	Lifeboat	2
	Red Flare Rocket	12
	Red Flare Signal	6
	Bouyant Smoke Signal	**2**

	Embarkation Ledder	2
	Line Throwing Appliances	1
	Immersion Suite	3
	Fire Man Outfit	2
	Breathing Aparatus	2

4.2.1.1 Lifejacket

Figure 4.3 Lifejacket

Lifejacket shall not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds. at least 75% of persons, who are completely unfamiliar with the lifejacket, can correctly don it within a period of one min without assistance, guidance or prior demonstration. after demonstration, all persons can correctly don it within a period of one minute without assistance. it is clearly capable of being worn in only one way or, as far as is practicable, cannot be donned incorrectly. it is comfortable to wear. it allows the wearer to jump from a height of at least 4.5 m into the water without injury and without dislodging or damaging the lifejacket. shall have buoyancy which is not reduced by more than 5% after 24h submersion in fresh water. shall be fitted with a whistle firmly secured by a cord

4.2.1.2 Lifebuoy

Figure 4.4 lifebuoy

Lifebuoy have an outer diameter of not more than 800 mm and an inner diameter of not less than400 mm. be constructed of inherently buoyant material; it shall not depend upon rushes, cork shavings or granulated cork, any other loose granulated material or any air compartment which depends on inflation for buoyancy. be capable of supporting not less than 14.5 kg of iron in fresh water for a period of 24 hours. have a mass of not less than 2.5 kg. not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds. be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest seagoing condition or 30 m, whichever is the greater, without impairing either its operating capability or that of its attached components

4.2.1.3 Liferaft

Figure 4.5 Liferaft

Every liferaft shall be so constructed as to be capable of withstanding exposure for 30 days afloat in all sea conditions. The liferaft shall be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate satisfactorily. If the liferaft is to be stowed at a height of more than 18 m above the waterline in the lightest seagoing condition, it shall be of a type which has been satisfactorily drop-tested from at least that height. The floating liferaft shall be capable of withstanding repeated jumps on to it from a height of at least 4.5 m above its floor both with and without the canopy erected. The liferaft and its fittings shall be so constructed as to enable it to be towed at a speed of 3 knots in calm water when loaded with its full complement of persons and equipment and with one of its sea-anchors streamed.

4.2.1.4 Lifeboat

Figure 4.6 Lifeboat

All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage.

4.2.1.5 Rocket Parachute Flares

Figure 4.7 Red Flare Rocket

The rocket parachute flare shall be contained in a water-resistant casing. have brief instructions or diagrams clearly illustrating the use of the rocket parachute flare printed on its casing. have integral means of ignition. be so designed as not to cause discomfort to the person holding the casing when used in accordance with the manufacturer's operating instructions.

4.2.1.6 Red Flare Signal

Figure 4.8 Red Flare Signal

The hand flare shall be contained in a water-resistant casing. have brief instructions or diagrams clearly illustrating the use of the hand flare printed on its casing. have a self-contained means of ignition and be so designed as not to cause discomfort to the person holding the casing and not endanger the survival craft by burning or glowing residues when used in accordance with the manufacturer's operating instructions.

4.2.1.7 Bouyant Smoke Signal

Figure 4.9 Bouyant Smoke Signal

The buoyant smoke signal shall be contained in a water-resistant casing. not ignite explosively when used in accordance with the manufacturer's operating instructions have brief instructions or diagrams clearly illustrating the use of the buoyant smoke signal printed on its casing.

The buoyant smoke signal shall emit smoke of a highly visible color at a uniform rate for a period of not less than 3 min when floating in calm water. not emit any flame during the entire smoke emission time. not be swamped in a seaway. continue to emit smoke when submerged in water for a period of 10 s under 100 mm of water.

4.2.1.8 Embarkation Ledder

Figure 4.10 Embarkation Ledder

Handholds shall be provided to ensure a safe passage from the deck to the head of the ladder and vice versa.

The steps of the ladder shall be made of hardwood, free from knots or other irregularities, smoothly machined and free from sharp edges and splinters, or of suitable material of equivalent properties. provided with an efficient nonslip surface either by longitudinal grooving or by the application of an approved nonslip coating. not less than 480 mm long, 115 mm wide and 25 mm in depth, excluding any nonslip surface or coating. equally spaced not less than 300 mm or more than 380 mm apart and secured in such a manner that they will remain horizontal. The side ropes of the ladder shall consist of two uncovered manila ropes not less than 65 mm in circumference on each side. Each rope shall be continuous with no joints below the top step. Other materials may be used provided the dimensions, breaking strain, weathering, stretching and gripping properties are at least equivalent to those of manila rope. All rope ends shall be secured to prevent unraveling.

4.2.1.9 Line-Throwing Appliances

Figure 4.11 Line Throwing Appliances

Every line throwing appliance shall be capable of throwing a line with reasonable accuracy. include not less than four projectiles each capable of carrying the line at least 230 m in calm weather. include not less than four lines each having a breaking strength of not less than 2 kN. have brief instructions or diagrams clearly illustrating the use of the line-throwing appliance.

4.2.1.10 Immersion Suite

Figure 4.12 Immersion Suit

An immersion suit which has buoyancy and is designed to be worn without a lifejacket shall be fitted with a light and the whistle complying with the requirements for life-jackets. If the immersion suit is to be worn in conjunction with a lifejacket, the lifejacket shall be worn over the immersion suit. A person wearing such an immersion suit shall be able to don a lifejacket without assistance.

4.2.1.11 Fireman Outfit

Figure 4.13 Fireman Outfit

Required according to SOLAS regulations Chapter II Reguation 17. “All ships shall carry at least two fireman’s outfits complying with the requirements.”
In addition, two fireman’s outfits shall be provided for tankers. One set contains Protective Clothing, Boots, Gloves, Helmets, Electric Safety Lamp and Axe. However, electric safety lamp and axe are not included in the unit.

4.2.1.12 Breathing Apparatus

Figure 4.14 Breathing Apparatus

A self-contained breathing apparatus (SCBA), sometimes referred to as a compressed air breathing apparatus (CABA) or simply breathing apparatus (BA), is a device worn by rescue workers, firefighters, and others to provide breathable air in an immediately dangerous to life or health atmosphere (IDLH). When not used underwater, they are sometimes called industrial breathing sets. The term self-contained means that the breathing set is not dependent on a remote supply (e.g., through a long hose). If designed for use under water, it is called SCUBA (self-contained underwater breathing apparatus)

4.2.2 Spesification of Life Saving Appliance

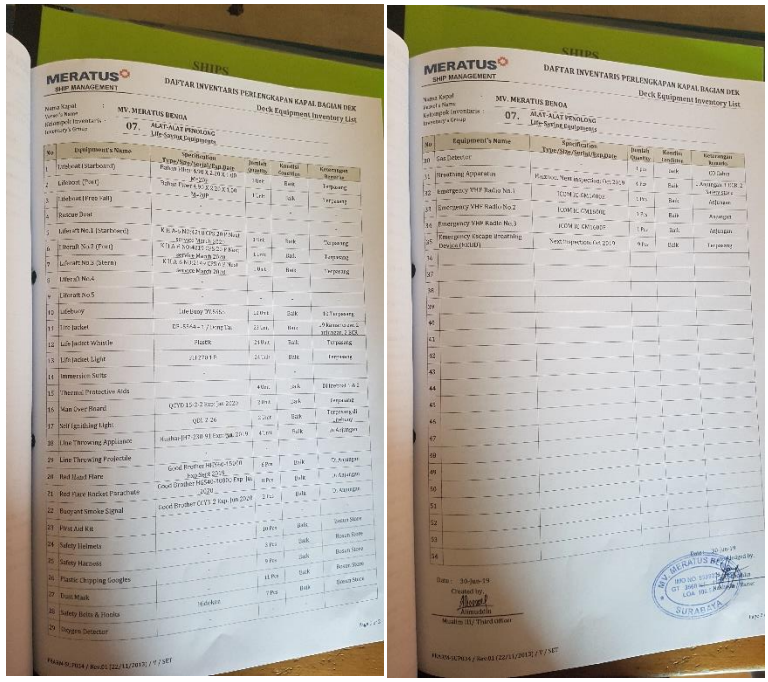


Figure 4.15 Inventory List

The inventory list is used to find out some specifications of life saving equipment on board and see the expiration date of each equipment. This is very useful to facilitate learning from the equipment so that happens when the compilation is used really in an emergency.

4.2.2.1 Table of Inventory list

Vesel's Name : Meratus Benoa
Inventory's Group : Life – Saving Equipment

No.	Equipment's Name	Spesification	Qty.	Condition	Remarks
1	Lifeboat (Starboard)	Fiber 4.90 x 2.20 x 1.00 M=20P	1	Good	Installed
2	Lifeboat (Portside)	Fiber 4.90 x 2.20 x 1.00 M=20P	1	Good	Installed
3	Lifeboat (Free fall)	-	-	-	-
4	Rescue boat	-	-	-	-
5	Liferaft no.1 (Starboard)	KHA-6 No.4218 CPS:20 P EXP :March 2020	1	Good	Installed
6	Liferaft no.2 (Portside)	KHA-6 No.4219 CPS:20 P EXP :March 2020	1	Good	Installed
7	Liferaft no.3 (Stern)	KHA-6 No.2149 CPS:20 P EXP :March 2020	1	Good	Installed
8	Liferaft no.4	-	-	-	-
9	Liferaft no.5	-	-	-	-
10	Lifebuoy	DY.5555	10	Good	10 Installed
11	Lifejacket	DF-5564-1/Dong Tai	23	Good	19 Crew Room, 2 ND, 2 ECR
12	Lifejacket whistle	Plastic	24	Good	Installed
13	Lifejacket light	PH 270 1 B			
14	Immersion suits	-	-	-	-
15	Thermal Protective aids	-	-	-	-
16	Man over board	QCYD 15-2-2 Exp Jan 2020	2	Good	Installed
17	Self ignithing light	QDL 2 - 26	2	Good	Installed
18	Line throwing appliance	Huahai-JH7-230-91 Exp: Jul 2019	4	Good	Installed
19	Line throwing projectile	-	-	-	-
20	Red hand flare	Good Brother HHY60 – 150000 Exp: Spt 2019	6	Good	Navigation Deck
21	Red rocket parachute	Good Brother HGS40 – 30000 Exp: Jul 2020	8	Good	Navigation Deck

22	Bouyant smoke signal	Good Brother CCY3 – 2 Exp: Jun 2020	2	Good	Navigation Deck
23	First aid kit	-	-	-	-
24	Safety helmets	-	10	Good	Bosun Store
25	Safety harness	-	3	Good	Bosun Store
26	Plastic chipping googles	-	9	Good	Bosun Store
27	Dust Mask	-	11	Good	Bosun Store
28	Safety belt & hooks	Hidoken	7	Good	Bosun Store
29	Oxygen detector	-	-	-	-
30	Gas detector	-	1	Good	CO Cabin
31	Breathing apparatus	Haizhou, Exp: Oct 2019	4	Good	1 ND, 1 ECR, 2 Safety Store
32	Emergency VHF no.1	ICOM IC-GM1600E	1	Good	Navigation Deck
33	Emergency VHF no.2	ICOM IC-GM1600E	1	Good	Navigation Deck
34	Emergency VHF no.3	ICOM IC-GM1600E	1	Good	Navigation Deck
35	EEBD	Exp: Oct 2019	9	Good	Instaled

Table 4.1 Inventory List

4.3 3D Modeling

The 3D models are drawn in Blender which is a free and open source 3D computer graphics software used for creating 3D models, visual effects, 3D interactive application, etc. The model is finalized to be as close as the actual object. After the final 3D rendered, the model then added to the Unity which is also a free and open source cross-platform game engine software. The independent objects that has been made in Blender such as the ship decks an Safety equipment are put together.

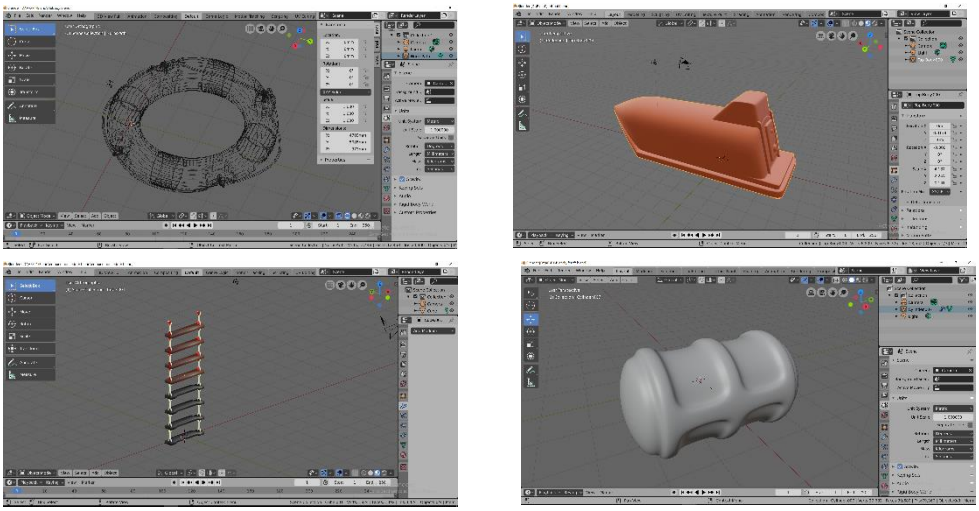


Figure 4.16 3D Object Modeling

4.4 Augmented Reality Android Development

The supporting tools used in developing the application are Vuforia SDK as the additional script to be used as the augmented reality plugin. This plugin is used to make the 3D model can be transforming into an interactive augmented reality model. Android SDK, it includes sample projects with source code, development tools, an emulator, and required libraries to build Android applications. The last tool is the main software that provides comprehensive facilities for software development. There are many options can be used as the main software, such as Android Studio, Microsoft Visual Studio, Eclipse, etc. In this research, Android Studio have become the main software development of the application. These tools can simplify the work of augmented reality Android application development because all of the components already integrate one another.

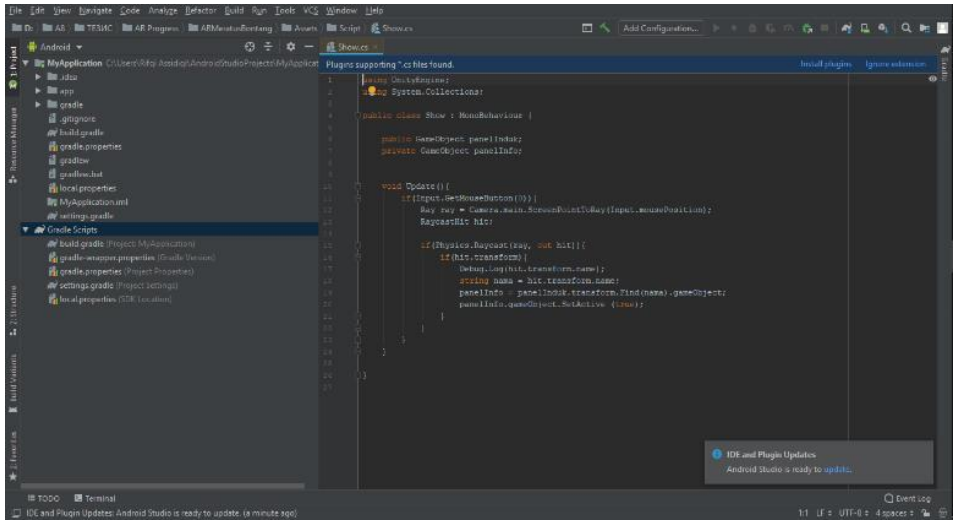
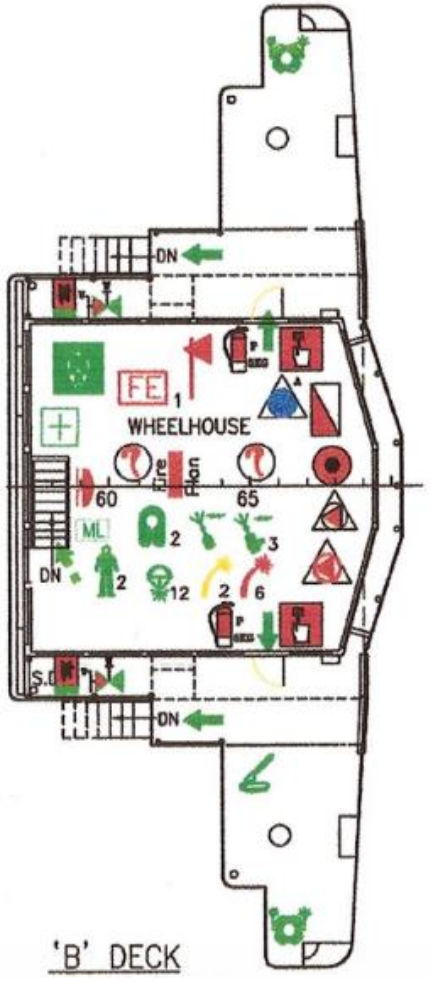
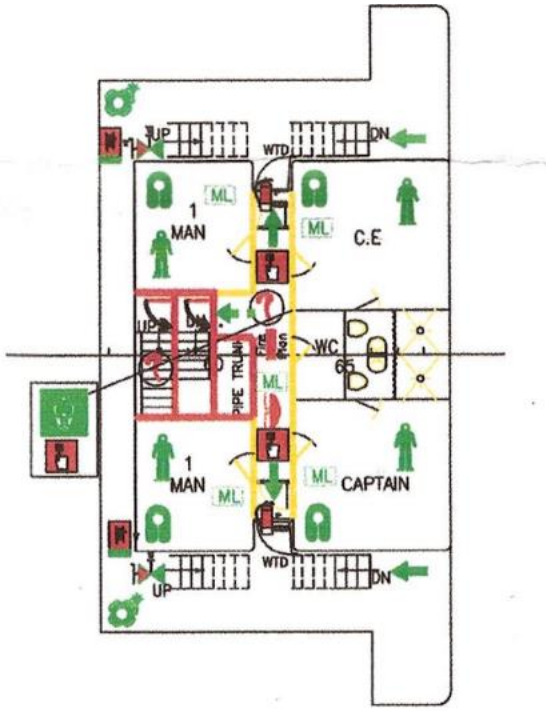


Figure 4. 17 Android Studio User Interface

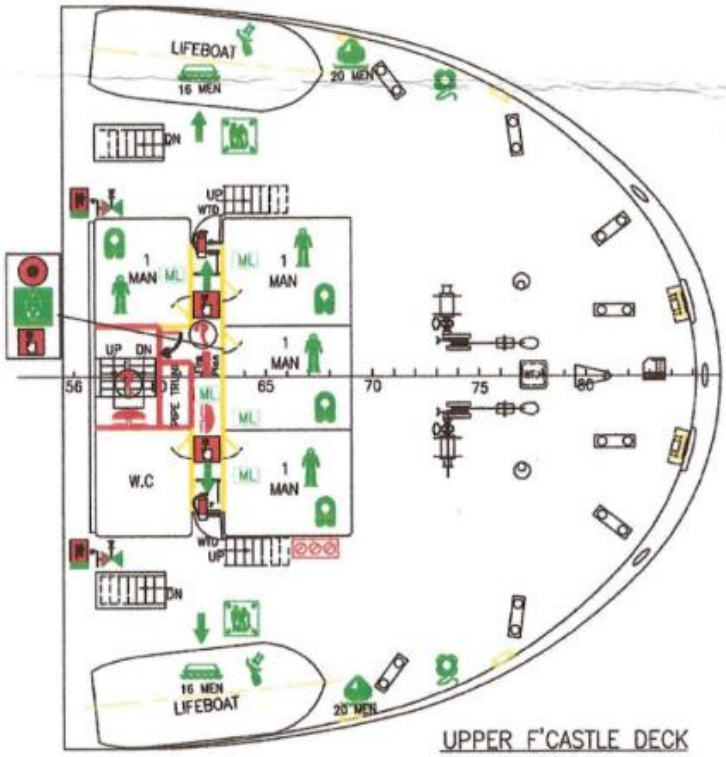
4.4.1 Marker Design

Marker is a unique identifier to be used as an image target of the application. It will visualize the 3D objects in Augmented Reality mode when the camera on smartphone detect the correct information on the marker. Marker to be used in this application obtained from the Safety plan containing five decks of ship. Markers that have been designed are then uploaded to the Vuforia database. This is necessary to be done so that the marker will be listed as a valid target image.





'A' DECK



UPPER F'CASTLE DECK

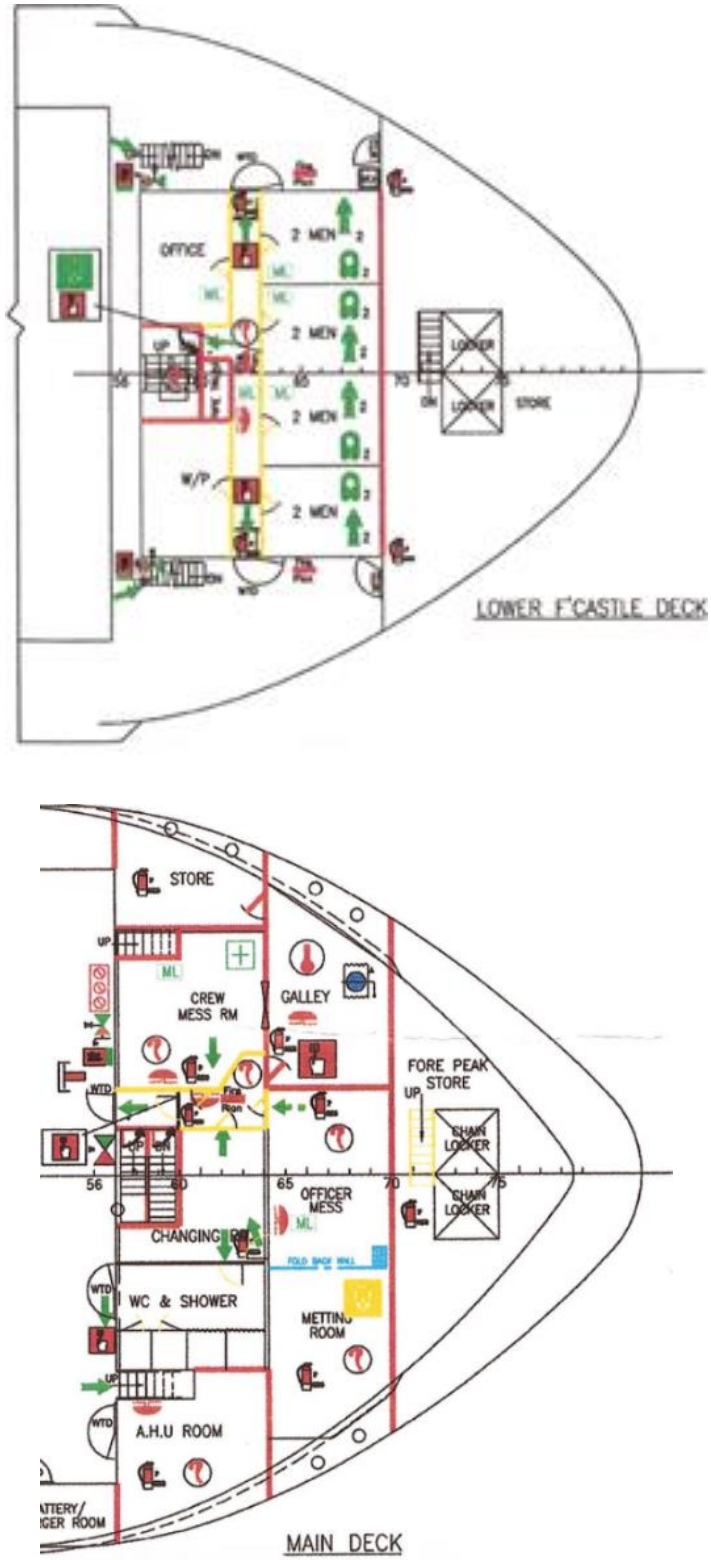


figure 4.18 Marker from Safety Plan

4.5 Application User Interface

User Interface (UI) is a communication mechanism between user with the system. The purpose of the user interface is to communicate to users the features available so that the system can be understood and can be operated easily.

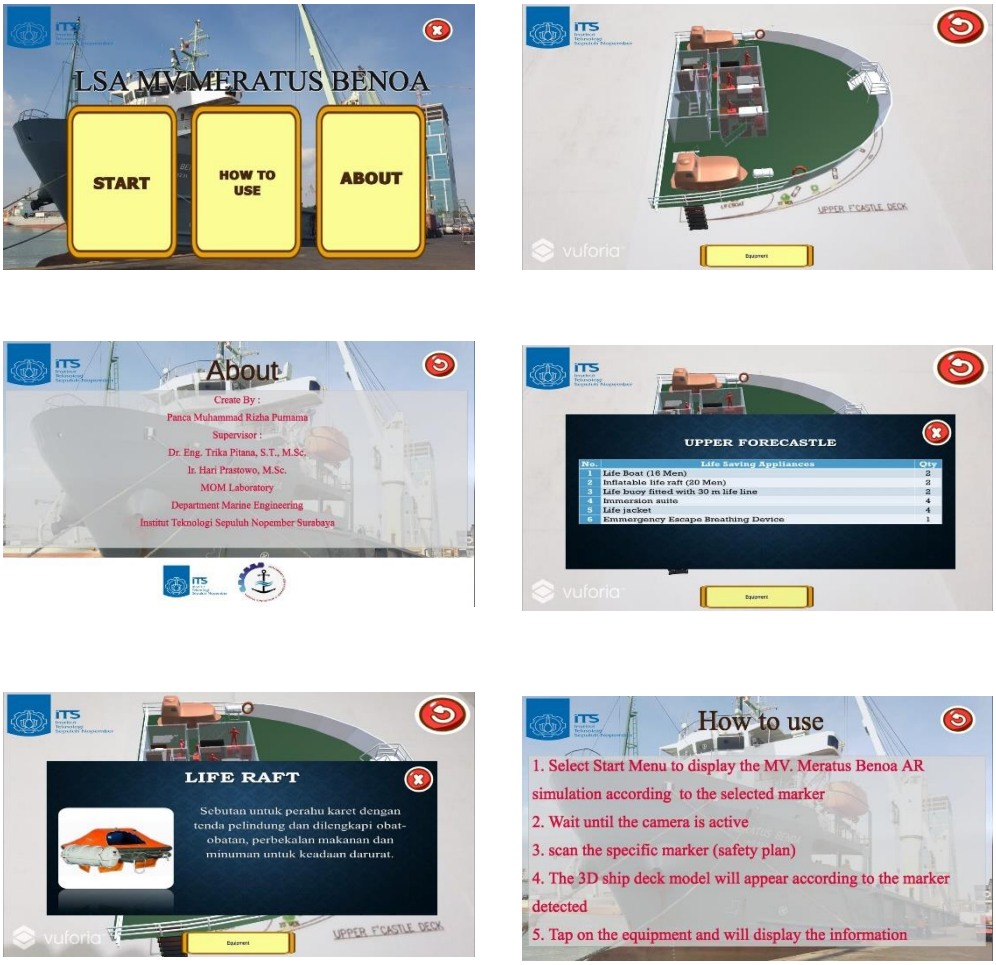


Figure 4. 19 Application User Interface

In figure 4.19, the main menu UI of the application consist of three main features, which are START, HOW TO USE, and ABOUT. Start menu is the main feature of the application, it will open the camera feature on the smartphone so that the user can capture the marker to be visualized. How to use is a feature that can display user guide to use the application. And the about menu is to show the developer information.

4.6 Analyze Phase

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name :

Profession :

No.	Question	Score
1	Does the application look attractive ?	
2	Does the application easy to operate?	
3	Is the marker be detected properly ?	
4	Does it help learning about life saving appliances ?	
5	Does it increase interest in learning ?	
6	What is your phone type ?	

http://bit.ly/questionerlsa

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Regian Ganang

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	7
2	Does the application easy to operate?	8
3	Is the marker be detected properly ?	9
4	Does it help learning about life saving appliances ?	9
5	Does it increase interest in learning ?	9
		42
6	What is your phone type ? Samsung Galaxy S8	

$*\left(\frac{42}{50}\right) \times 100 = 84$

http://bit.ly/questionerlsa

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Brillyan Dimas

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	9
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	10
4	Does it help learning about life saving appliances ?	9
5	Does it increase interest in learning ?	10
		47
6	What is your phone type ? Samsung Galaxy note 8	

$*\left(\frac{47}{50}\right) \times 100 = 94$

http://bit.ly/questionerlsa

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Bagus Fyandika

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	8
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	8
4	Does it help learning about life saving appliances ?	8
5	Does it increase interest in learning ?	10
		43
6	What is your phone type ? Xiaomi 4X	

$*\left(\frac{43}{50}\right) \times 100 = 86$

http://bit.ly/questionerlsa

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Bagas Bimantoro

Profession : Post Graduate

No.	Question	Score
1	Does the application look attractive ?	8
2	Does the application easy to operate?	10
3	Is the marker be detected properly ?	7
4	Does it help learning about life saving appliances ?	9
5	Does it increase interest in learning ?	10
		44
6	What is your phone type ? Sony Xperia Xz	

$*\left(\frac{44}{50}\right) \times 100 = 88$

http://bit.ly/questionerlsa

Assessment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Farhan Mahdy

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	9
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	8
4	Does it help learning about life saving appliances ?	10
5	Does it increase interest in learning ?	10
		46
6	What is your phone type ? Redmi 4A	

$*\left(\frac{46}{50}\right) \times 100 = 92$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Donny Endra Prasta

Profession : Post Graduate

No.	Question	Score
1	Does the application look attractive ?	9
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	8
4	Does it help learning about life saving appliances ?	8
5	Does it increase interest in learning ?	10
		44
6	What is your phone type ? OPPO F15	

$*\left(\frac{44}{50}\right) \times 100 = 88$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Madina

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	9
2	Does the application easy to operate?	8
3	Is the marker be detected properly ?	10
4	Does it help learning about life saving appliances ?	10
5	Does it increase interest in learning ?	10
		47
6	What is your phone type ? Samsung A30	

$*\left(\frac{47}{50}\right) \times 100 = 94$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Ade Ratih

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	10
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	9
4	Does it help learning about life saving appliances ?	10
5	Does it increase interest in learning ?	10
		48
6	What is your phone type ? Redmi note 8	

$*\left(\frac{48}{50}\right) \times 100 = 96$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Gusti Ngurah Putu Wibhu

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	10
2	Does the application easy to operate?	9
3	Is the marker be detected properly ?	9
4	Does it help learning about life saving appliances ?	10
5	Does it increase interest in learning ?	10
		48
6	What is your phone type ? Samsung S6	

$*\left(\frac{48}{50}\right) \times 100 = 96$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Syafira rosyada

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	10
2	Does the application easy to operate?	10
3	Is the marker be detected properly ?	10
4	Does it help learning about life saving appliances ?	9
5	Does it increase interest in learning ?	10
		49
6	What is your phone type ? Xiaomi A6	

$*\left(\frac{49}{50}\right) \times 100 = 98$

http://bit.ly/questionerlsa

Assesment form Augmented Reality Android-Based For Safety Plan Arrangement

Name : Dzilfia Qurrotul'aini

Profession : Student

No.	Question	Score
1	Does the application look attractive ?	10
2	Does the application easy to operate?	10
3	Is the marker be detected properly ?	10
4	Does it help learning about life saving appliances ?	10
5	Does it increase interest in learning ?	10
		50
6	What is your phone type ? Samsung S7	

$*\left(\frac{50}{50}\right) \times 100 = 100$

http://bit.ly/questionerlsa

The aspects tested include functionality, accuracy, menu and button features, etc. The test results can be seen in table 4.2.

Table 4. 2 Test Device Result

No.	Testing Component	Test Device Result		
		Xiaomi A6	**OPPO F15**	**Xperia Xz**
1	Run the Application	✓	✓	✓
2	Open "Start" Menu	✓	✓	✓
3	Open "How to Use" Menu	✓	✓	✓
4	Open "About" Menu	✓	✓	✓
5	Scan Markers	✓	✓	✓
6	Zoom and Rotate 3D Model	✓	✓	✓
7	Open Fire-Fighting Equipment Pop-Up	✓	✓	✓
8	Open Equipment Information List	✓	✓	✓

Based on table 4.2, all devices passed the test in every testing component. It supports different operating system version, screen resolution, and RAM availability of the device. The main feature of the application which is the augmented reality model also can visualize the 4 different decks of ship smoothly without any error or bugs found.

In the testing period, the application was also tested on several Marine Engineering Department students as the user. There are some suggestions obtained from the users for the application that will be shown in chapter five.

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CHAPTER V

CONCLUSION AND SUGGESTION

5.1 Conclusion

Based on the result, the conclusions of this research are:

1. Augmented Reality (AR) application can visualize the Safety plan 3D models of MV. Meratus Benoa on four decks.
2. Every life saving appliances can be displayed alongside the information and the location of the object.
3. Utilizing AR is possible to be used as educational media to get precise information relating to the locations, object, and quantity.

5.2 Suggestions

Suggestions of the thesis are:

1. The application has been able to visualize the safety plan 3D model in an attractive form. But the application only visualizes the superstructure of a ship, not in a complete form of ship building including its engine room, cargo space, and other areas.
2. Pinch to zoom function could be tricky if the user wants to enlarge and zoom out the model. Because when it touches the life saving appliances in the same time, the pop-up information will appear accidentally.
3. This application uses the marker-based method that requires a specific target object to be recognized in the application in order to display the 3D model of ship. This can be an aspect that needs attention in terms of the flexibility in using the application.
4. The application is an early development of augmented reality application to be applied in a ship model. There are many improvements that can be done by adding many features to the further development.

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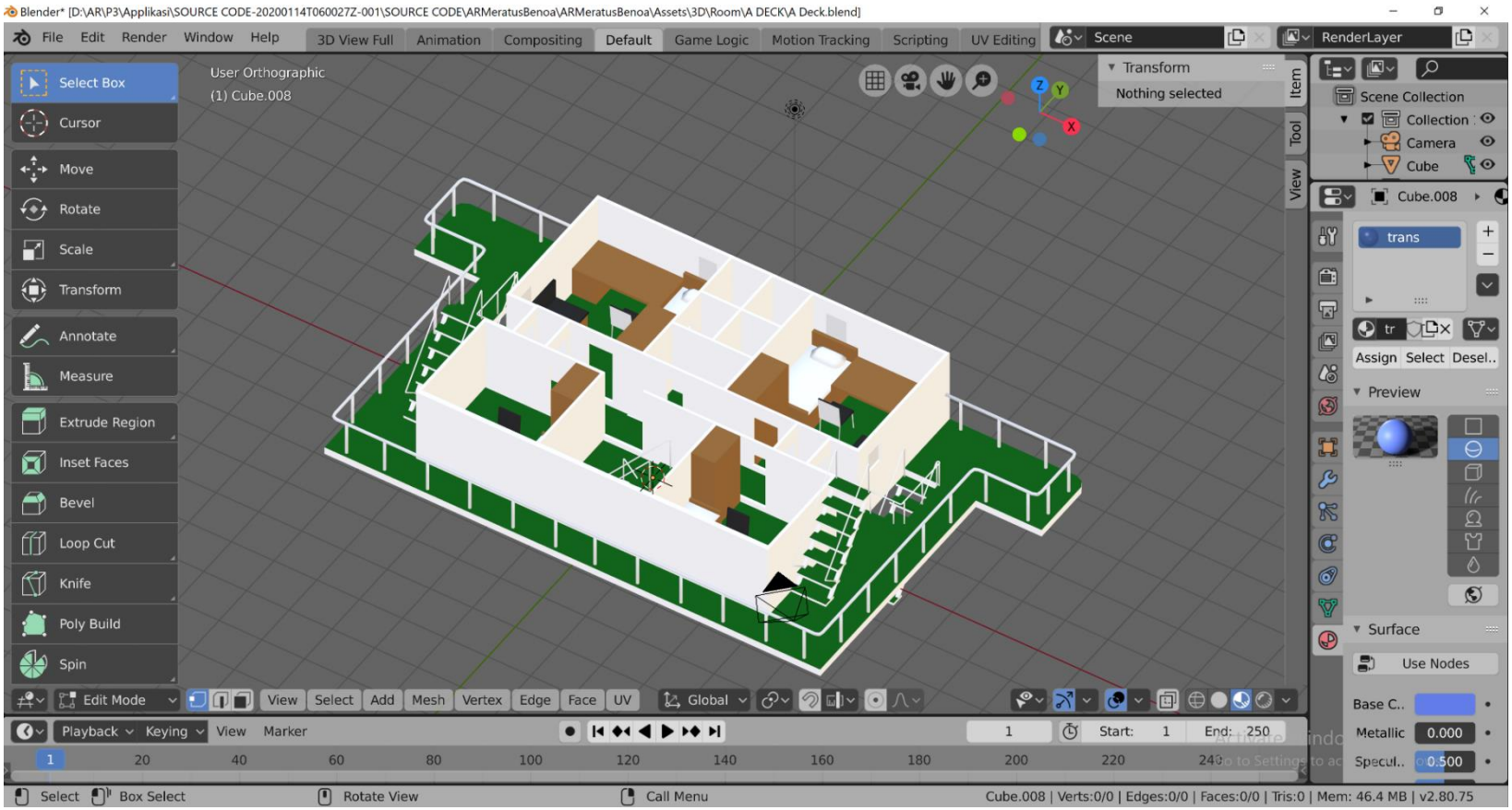

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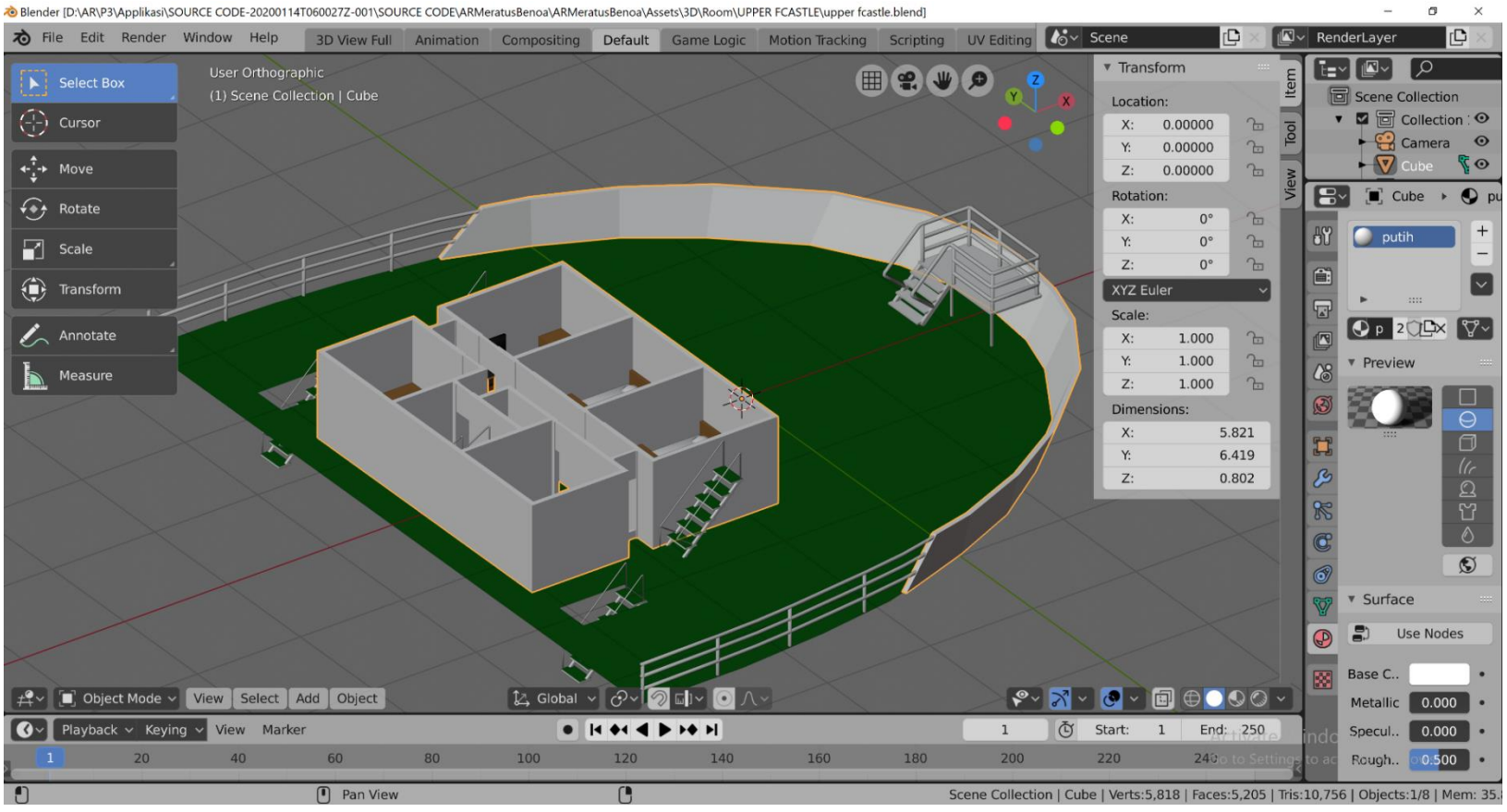

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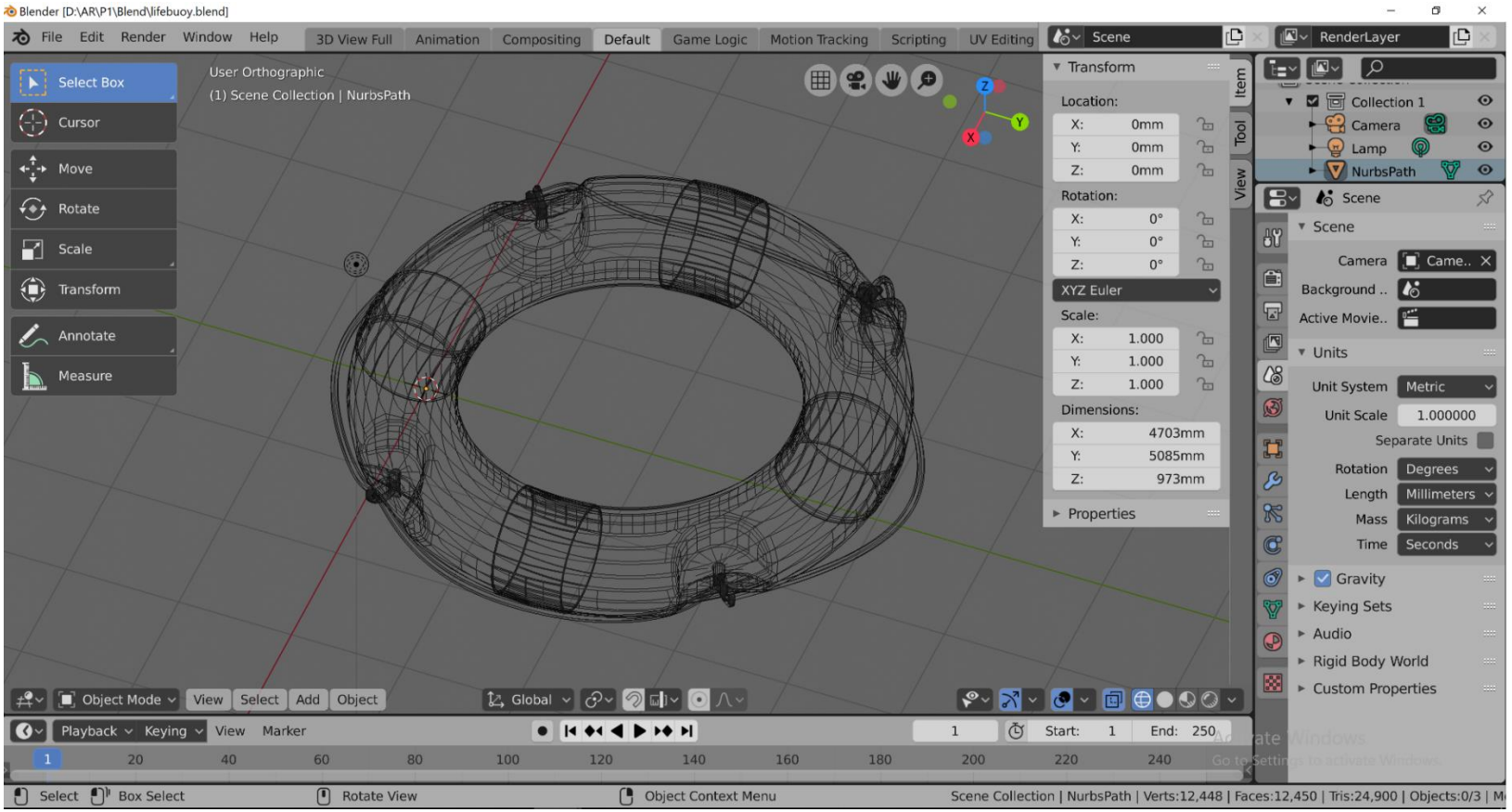

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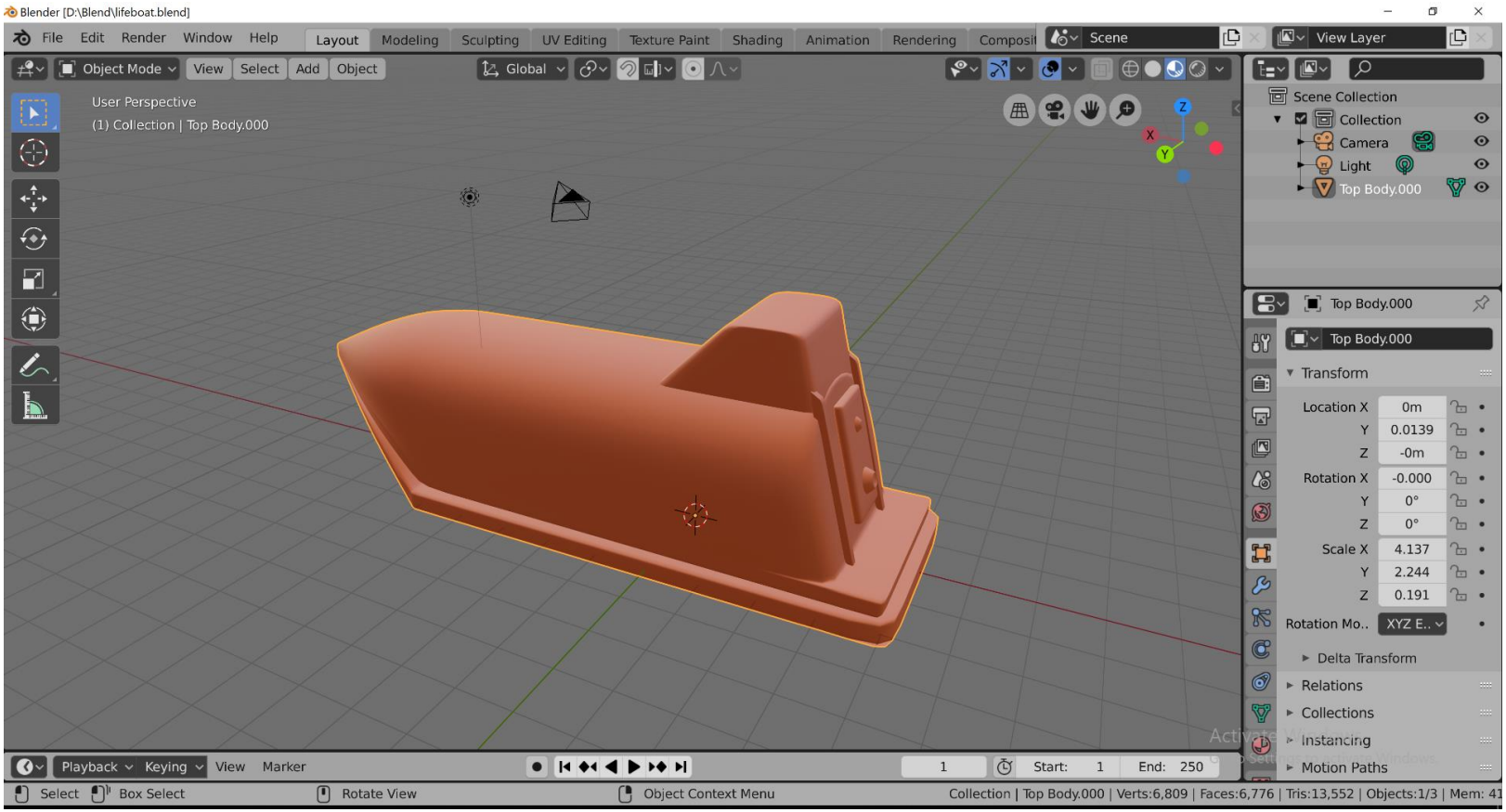

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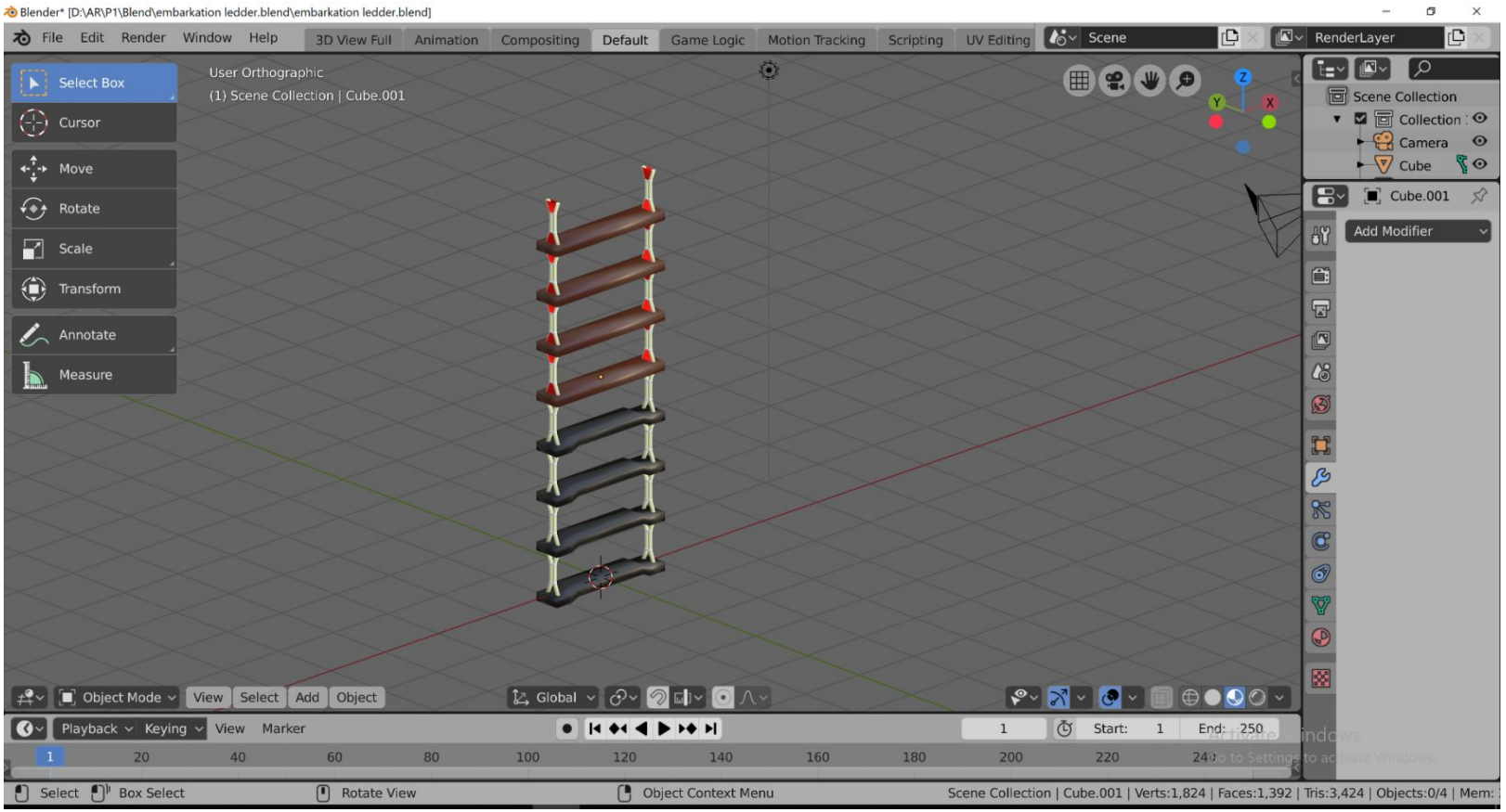

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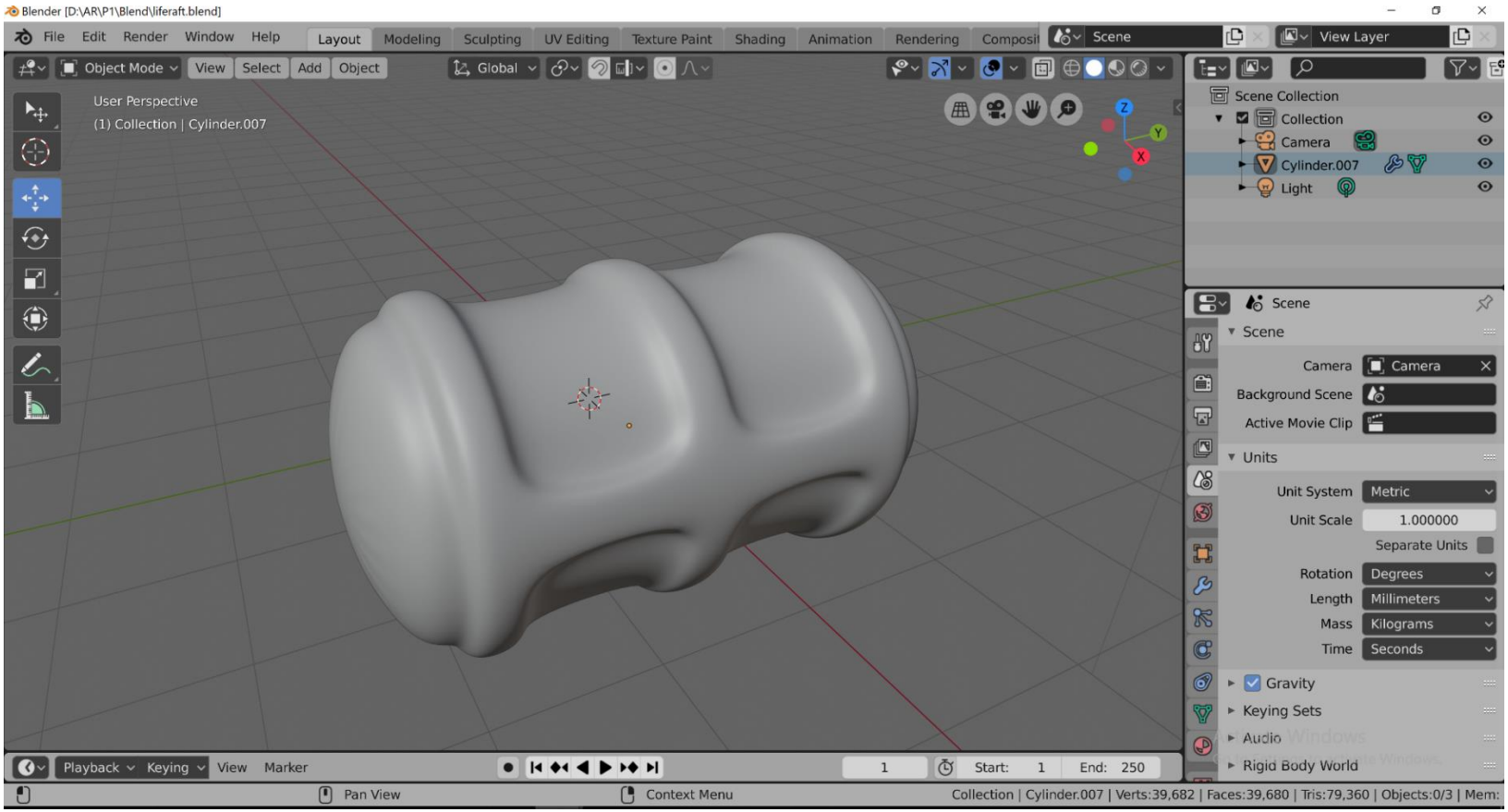

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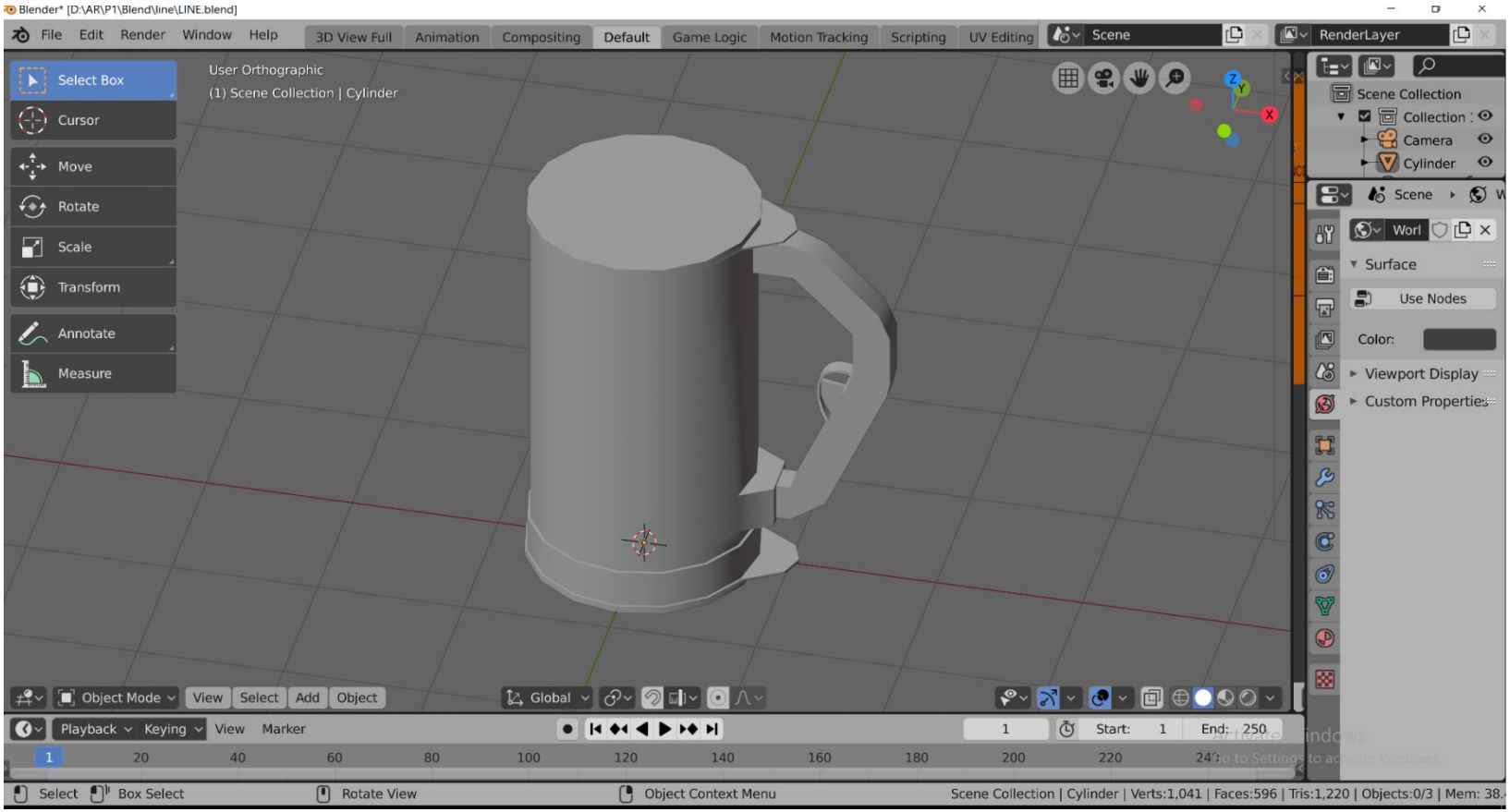

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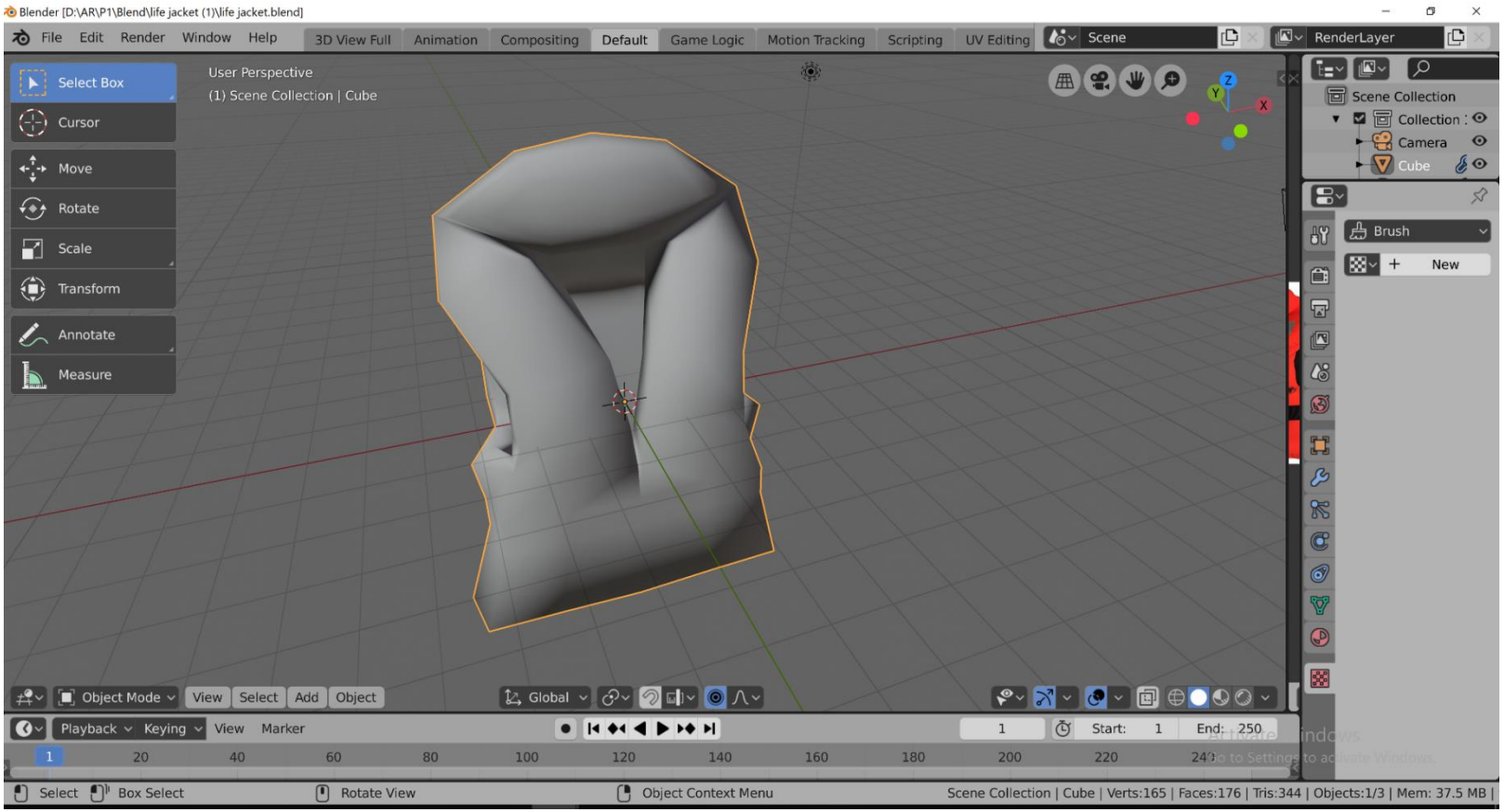

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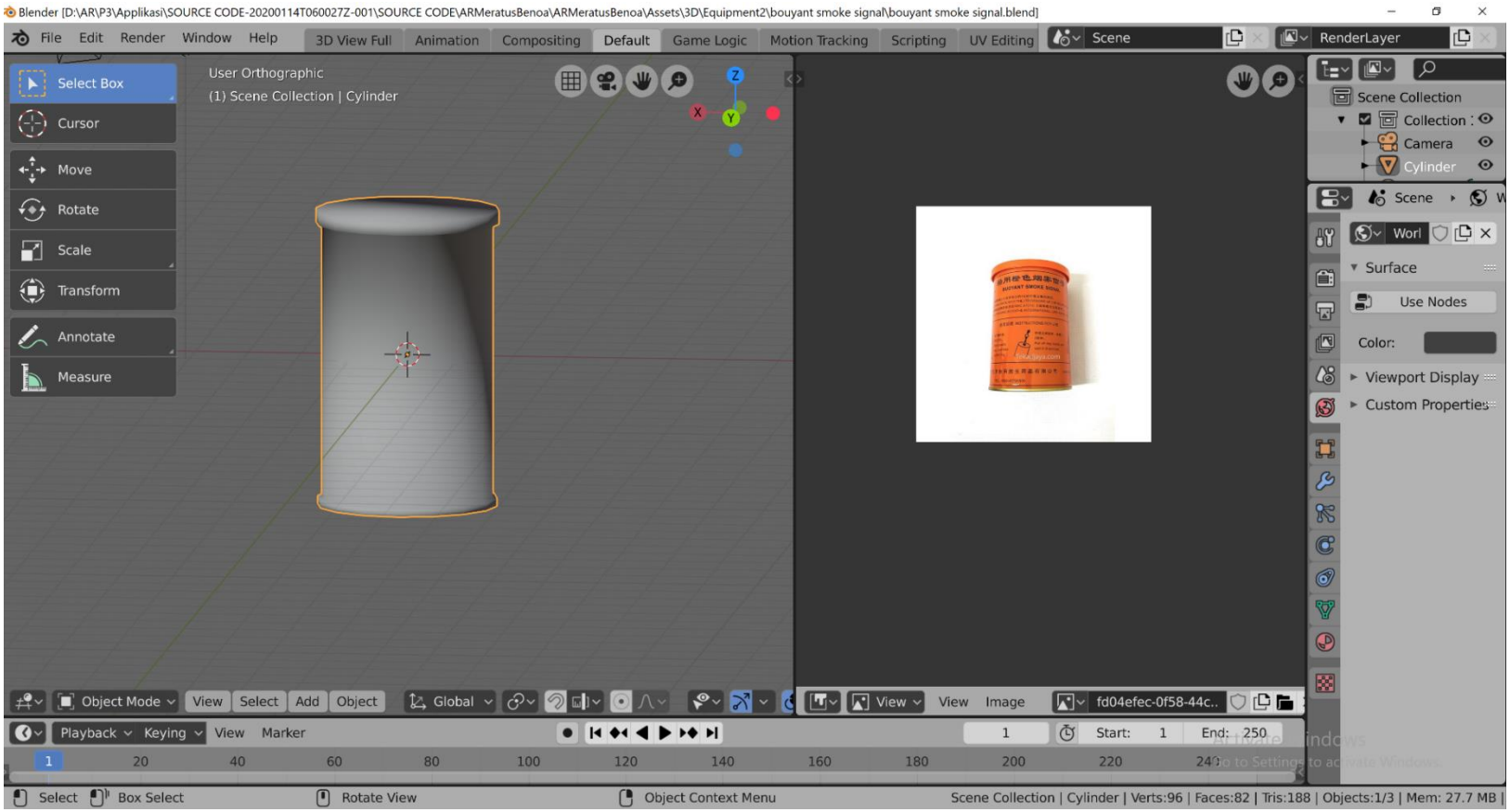

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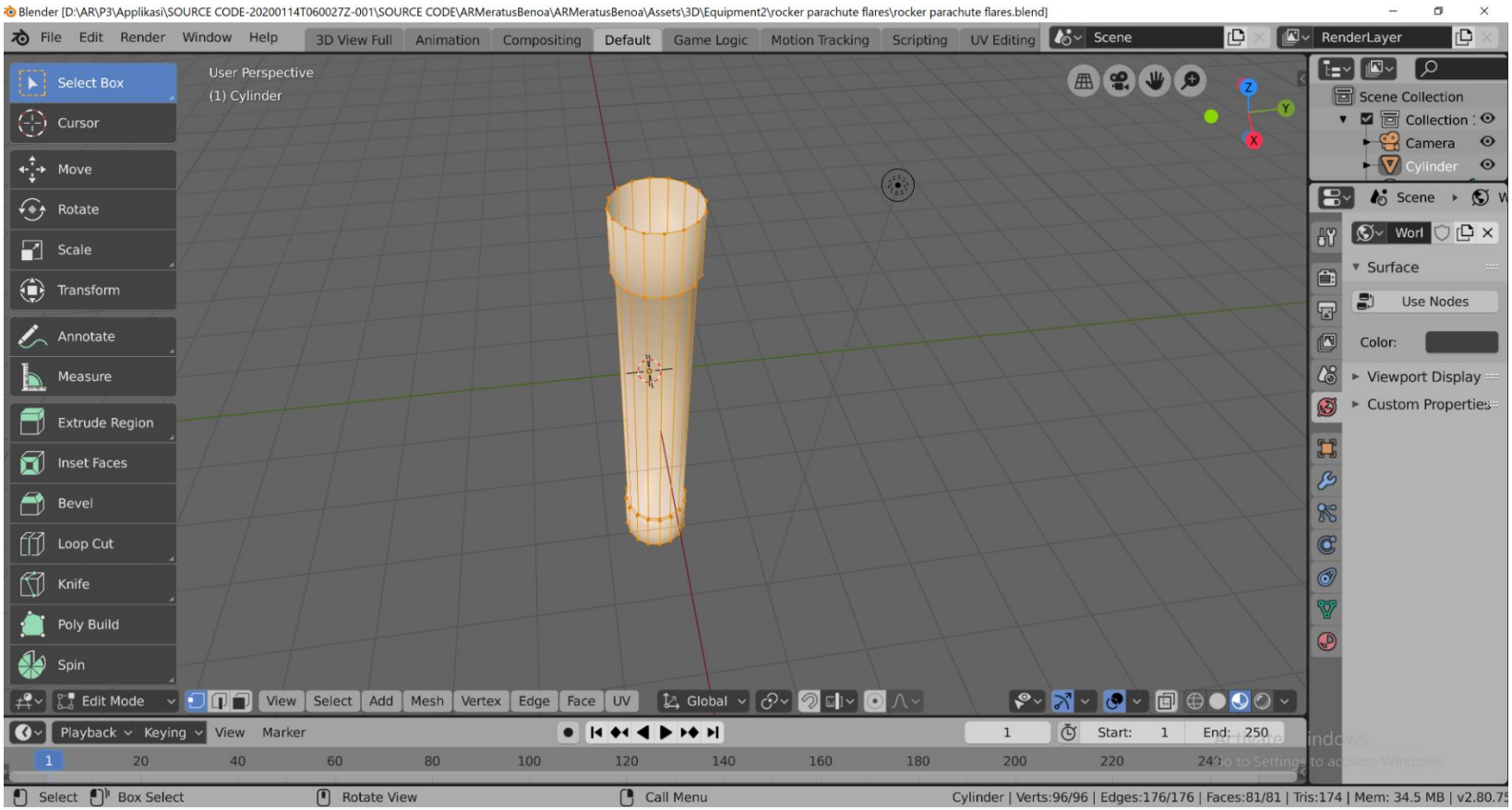

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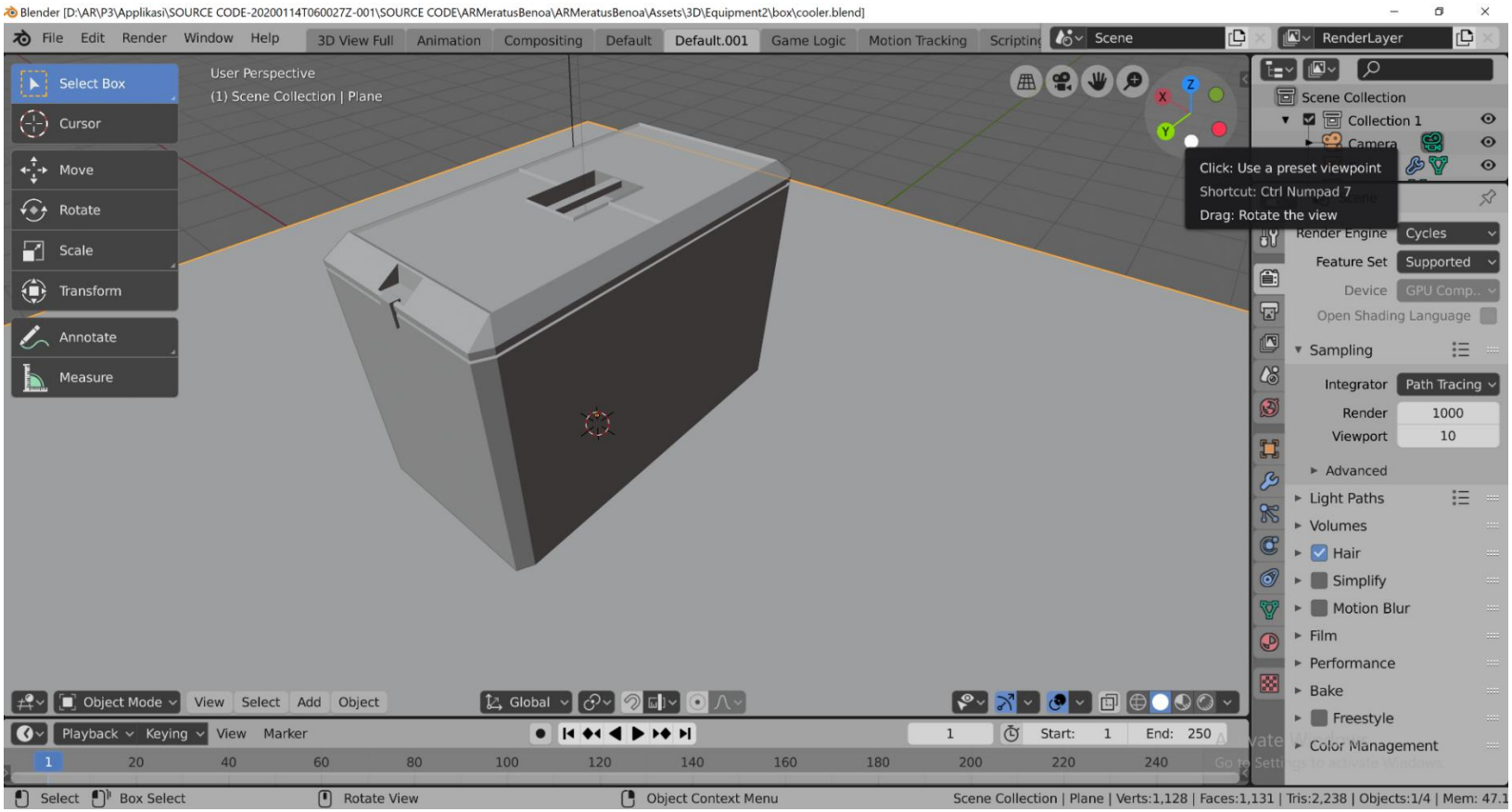

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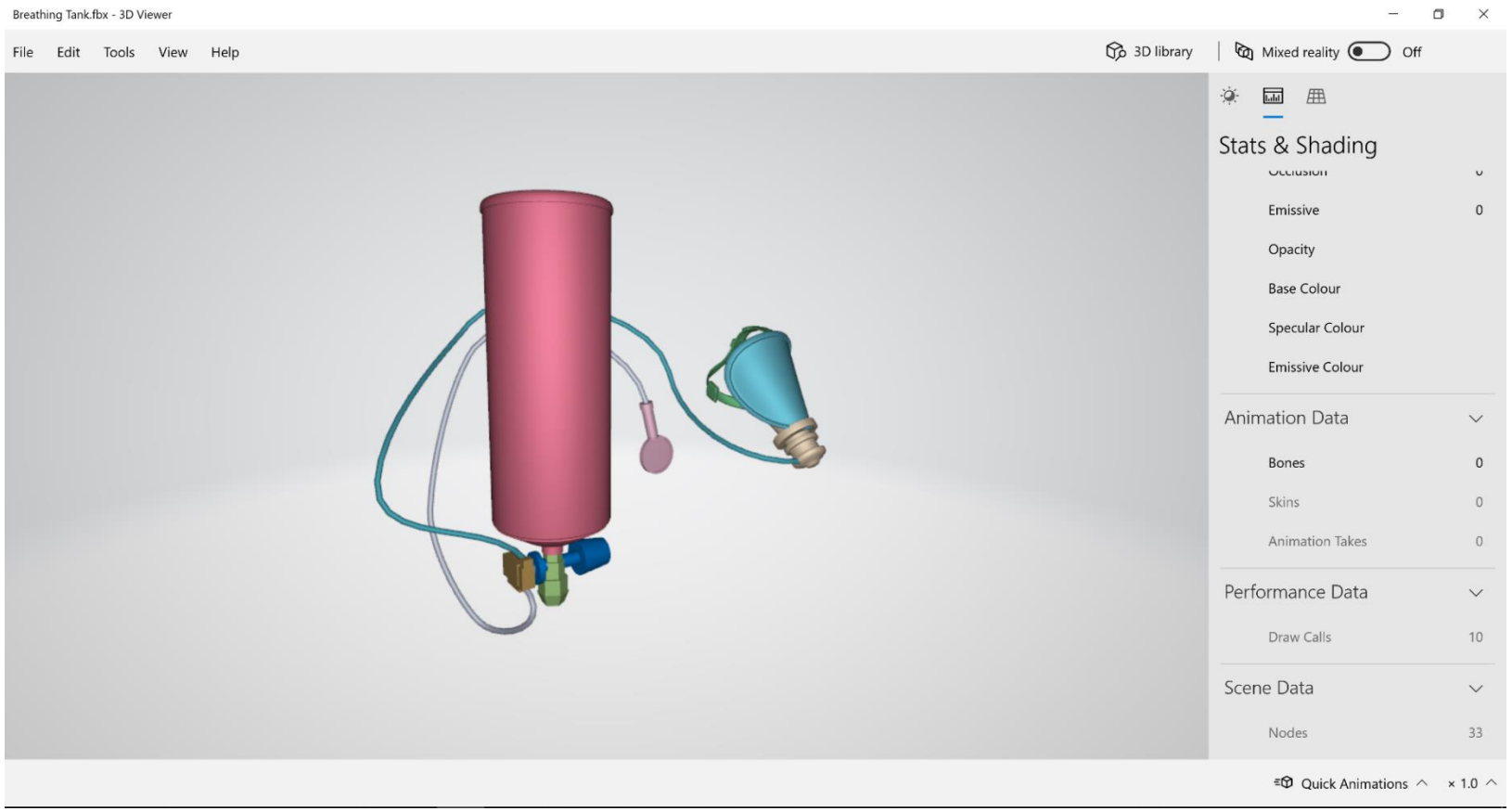

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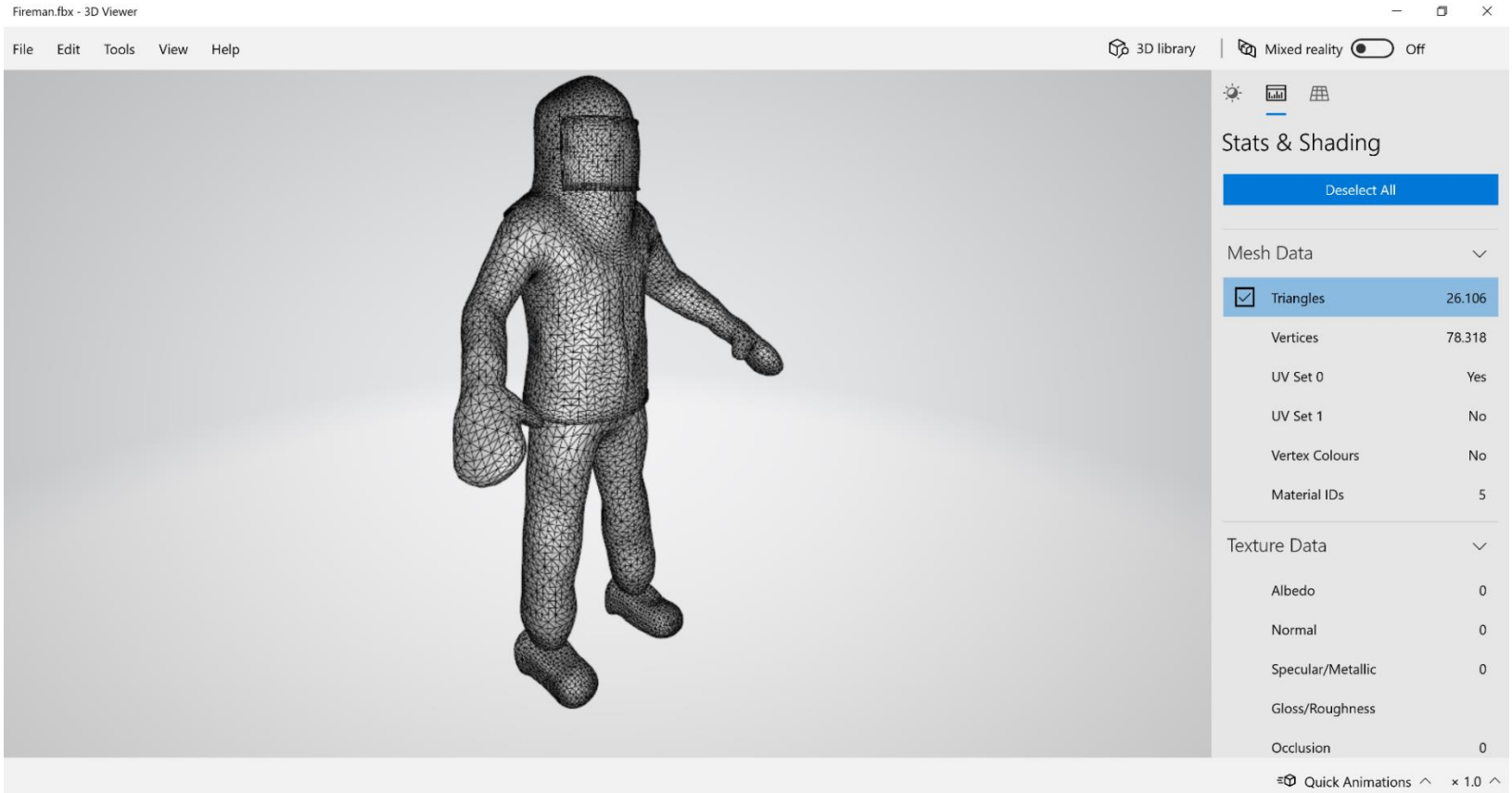
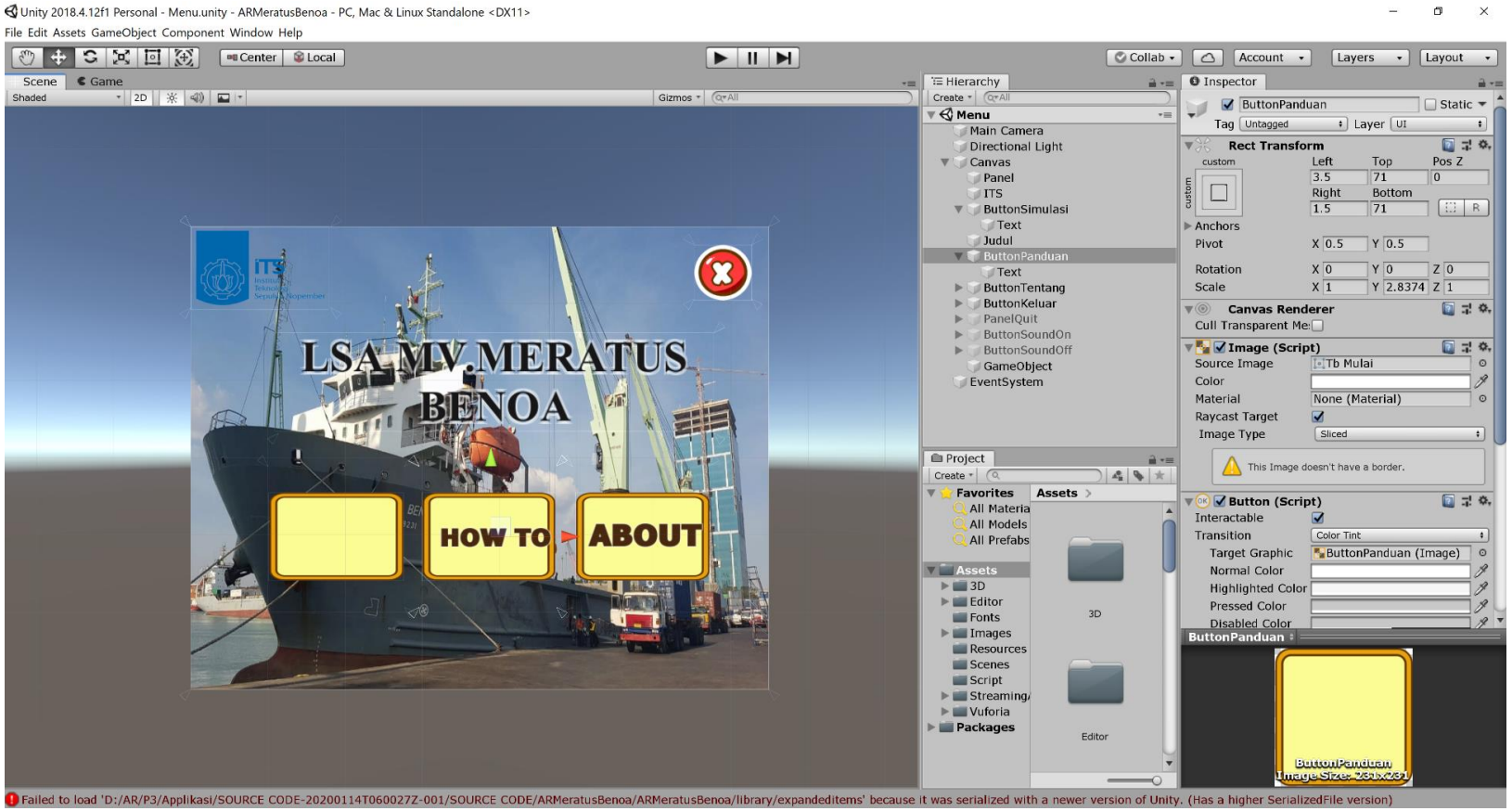


3D VIEWER APPLICATION FOR DESIGNING 3D OBJECT MODEL

UNITY APPLICATION FOR CREATING AUGMENTED REALITY APPLICATION



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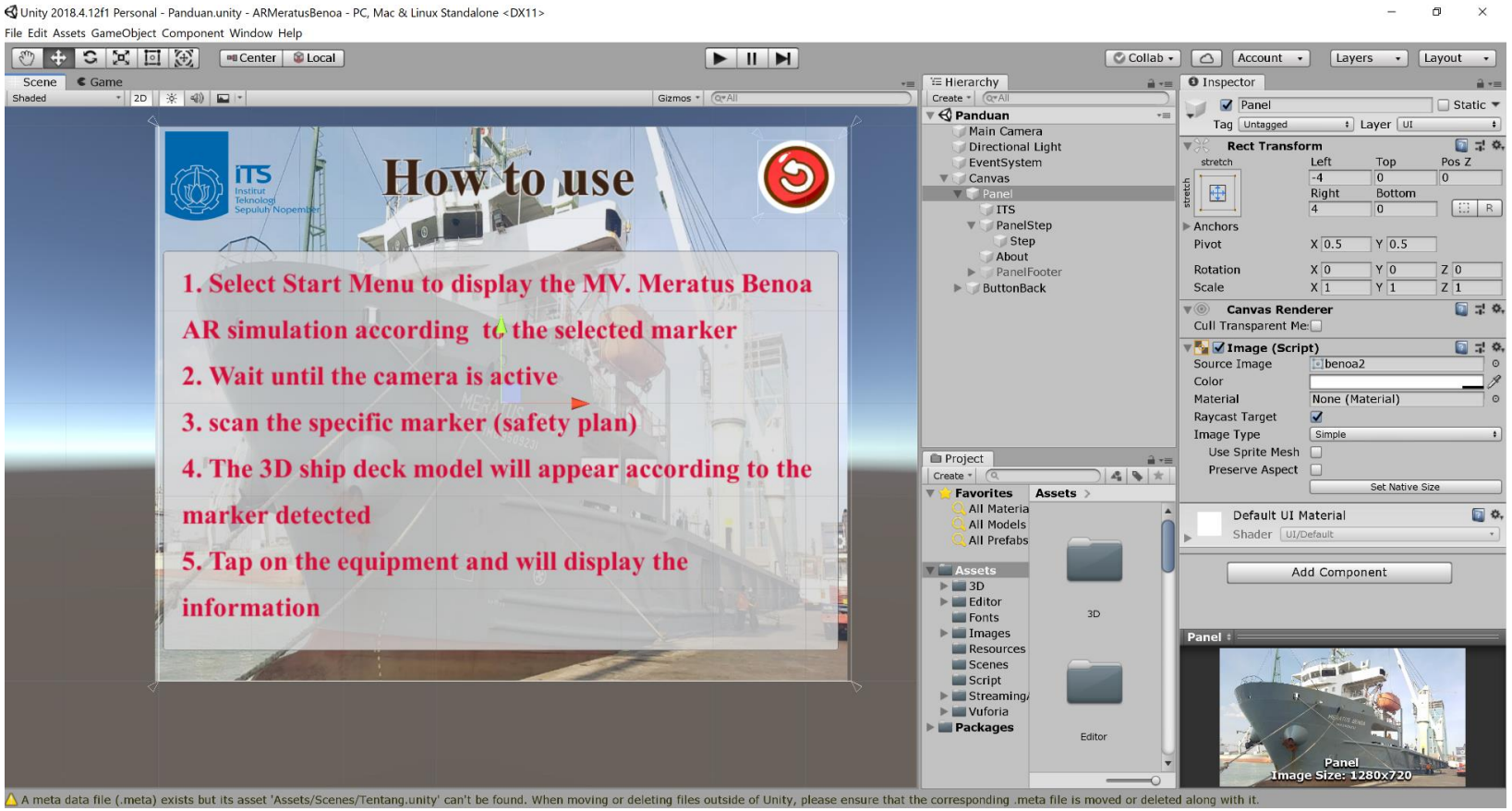

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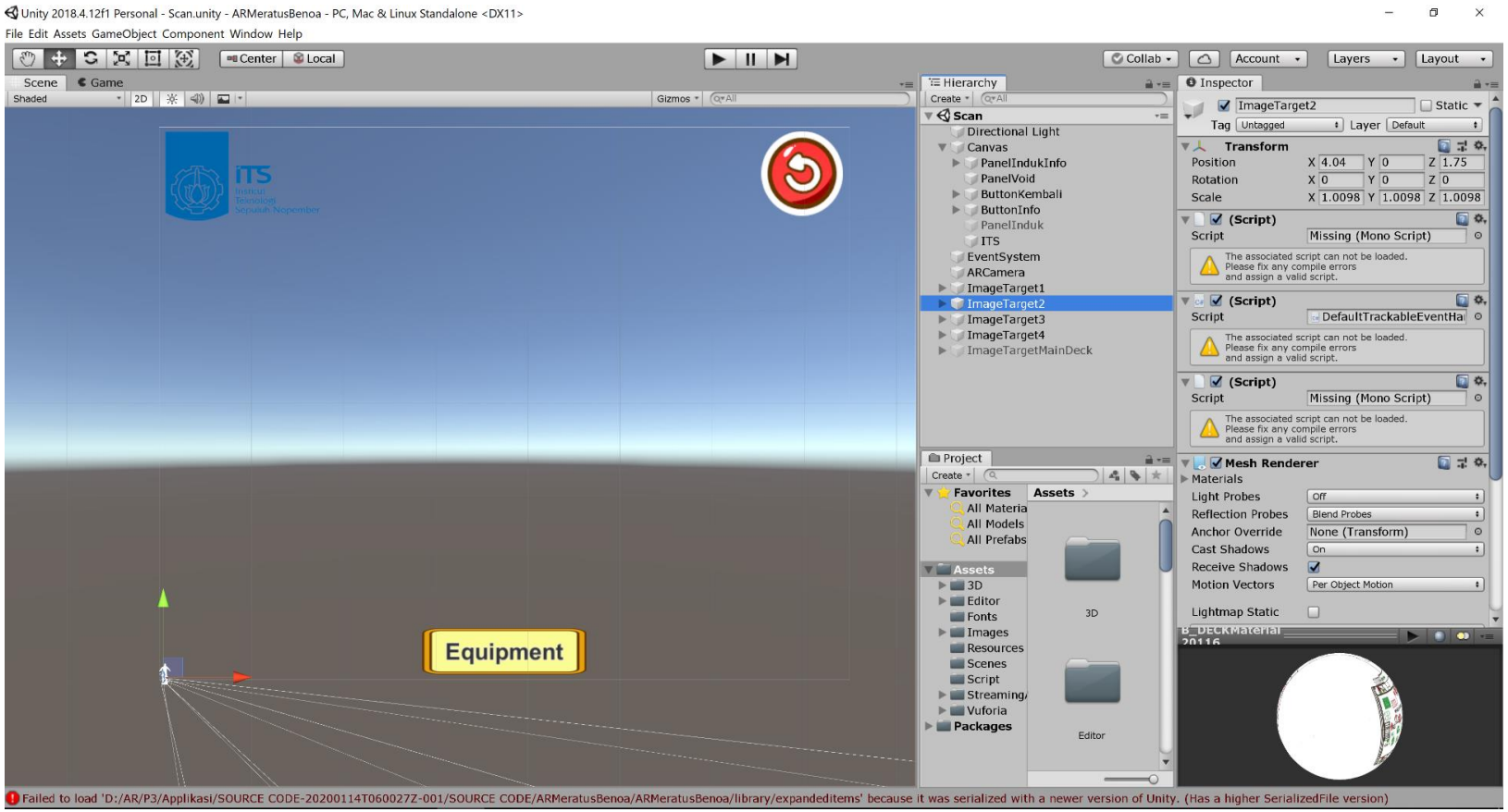
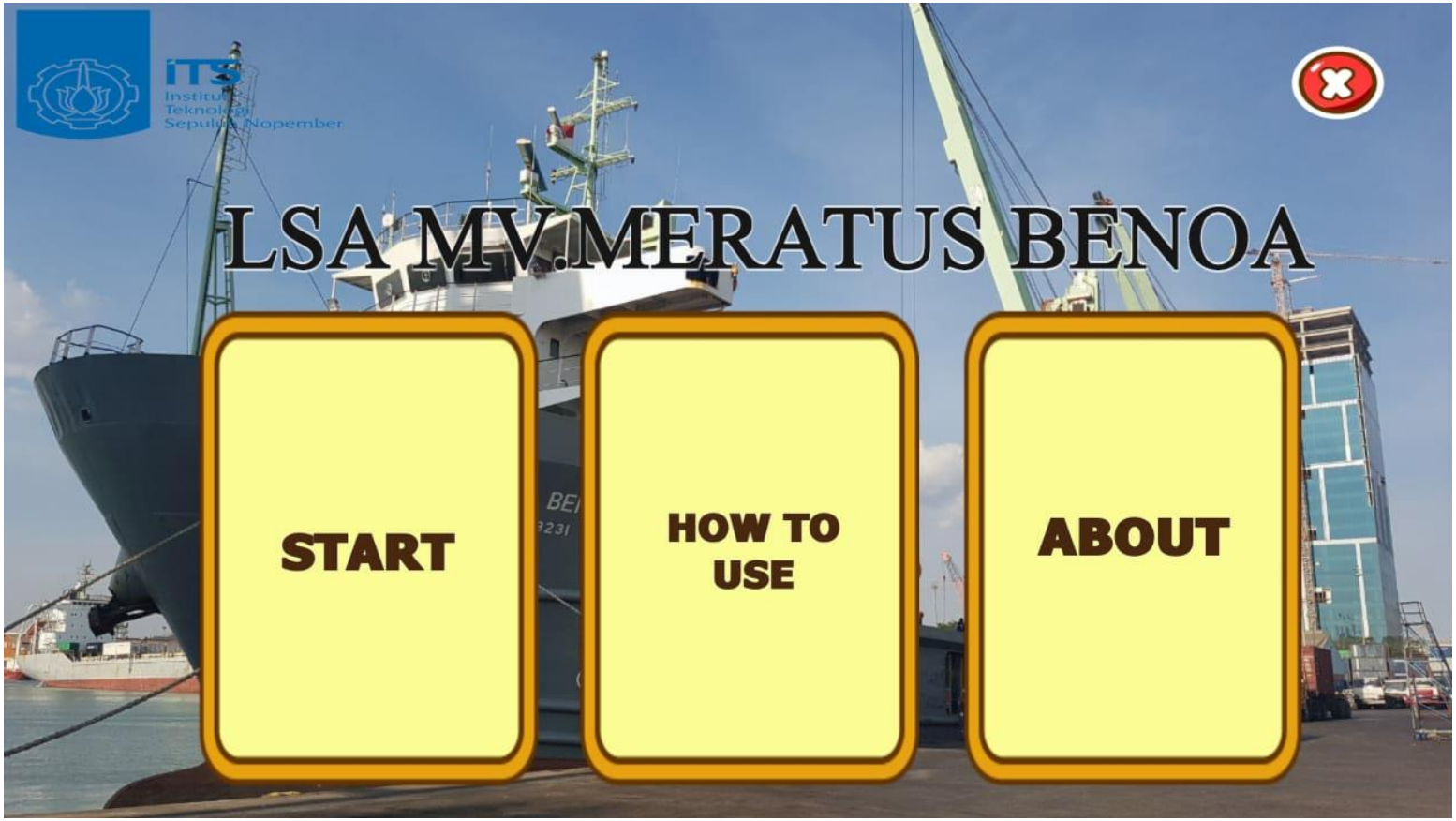


AUGMENTED REALITY APPLICATION USER INTERFACE



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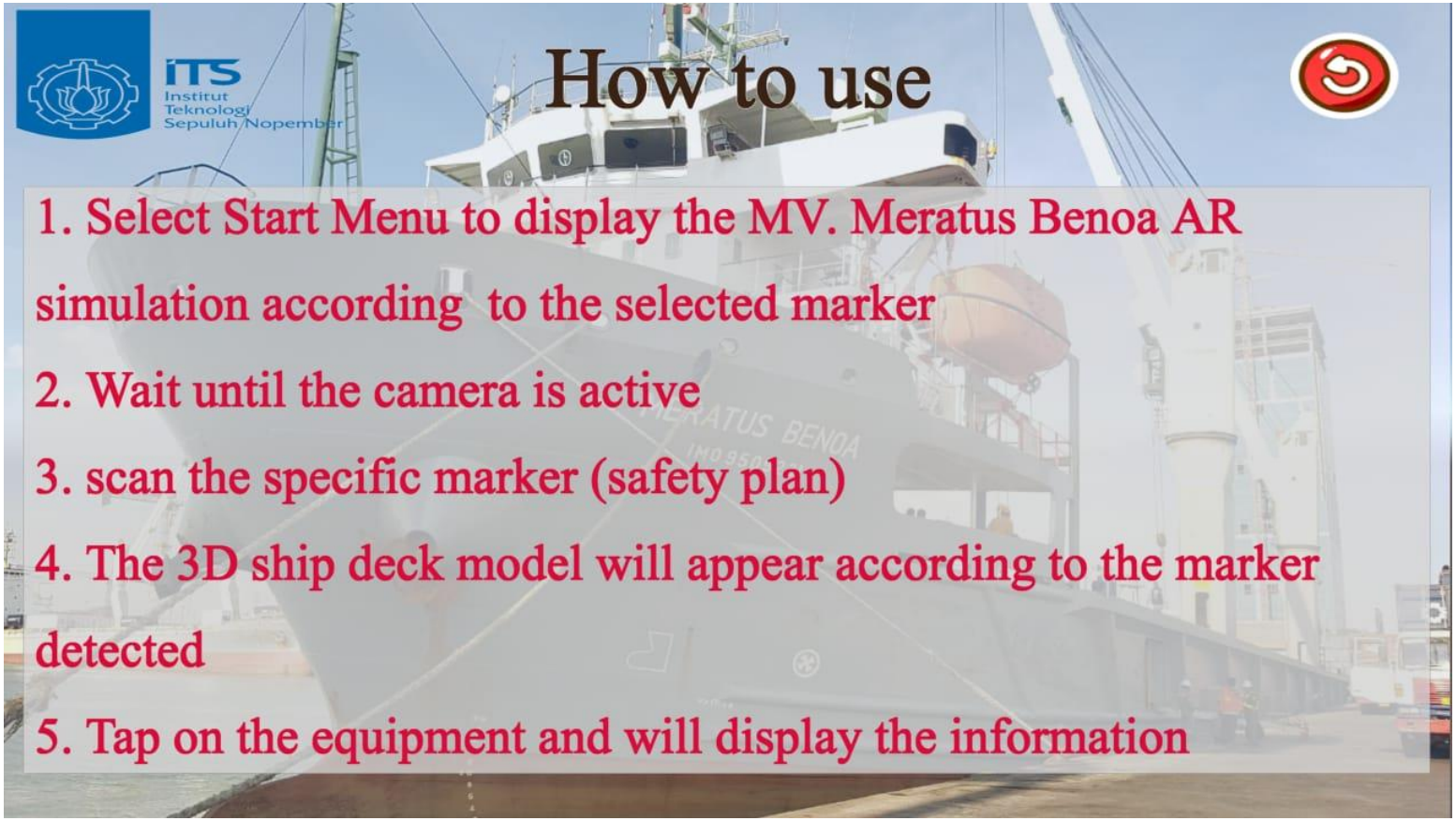
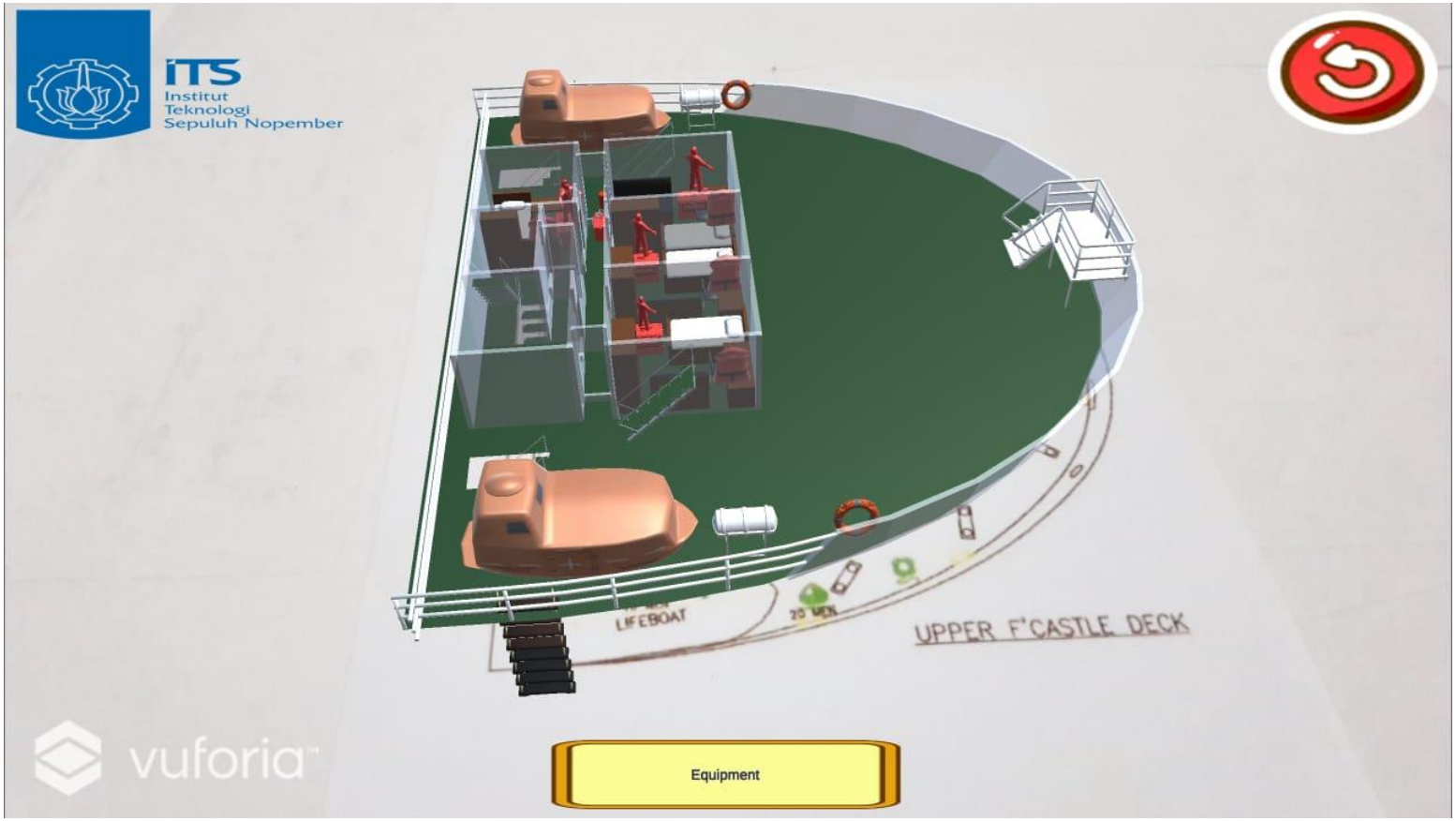


AUGMENTED REALITY APPLICATION USER INTERFACE



AUGMENTED REALITY APPLICATION USER INTERFACE

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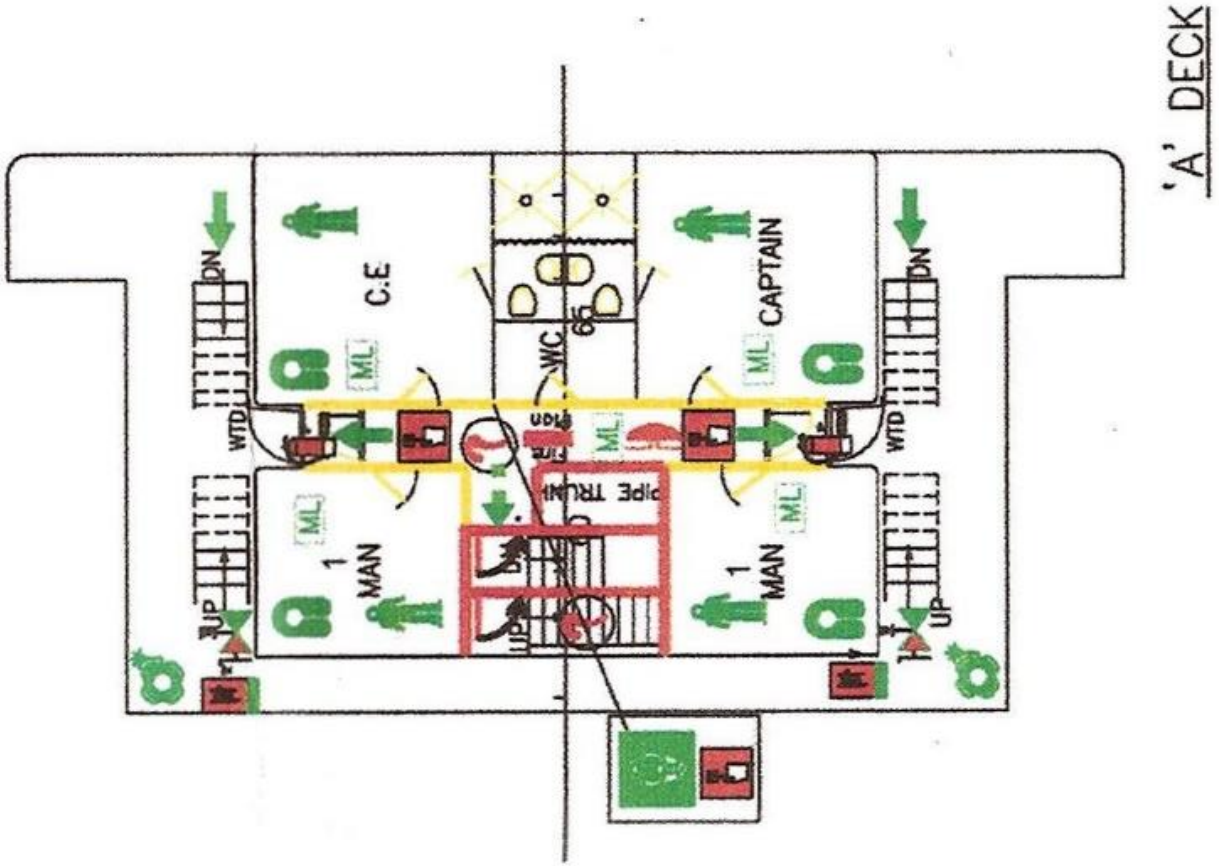
MARKER OF AUGMENTED REALITY APPLICATION



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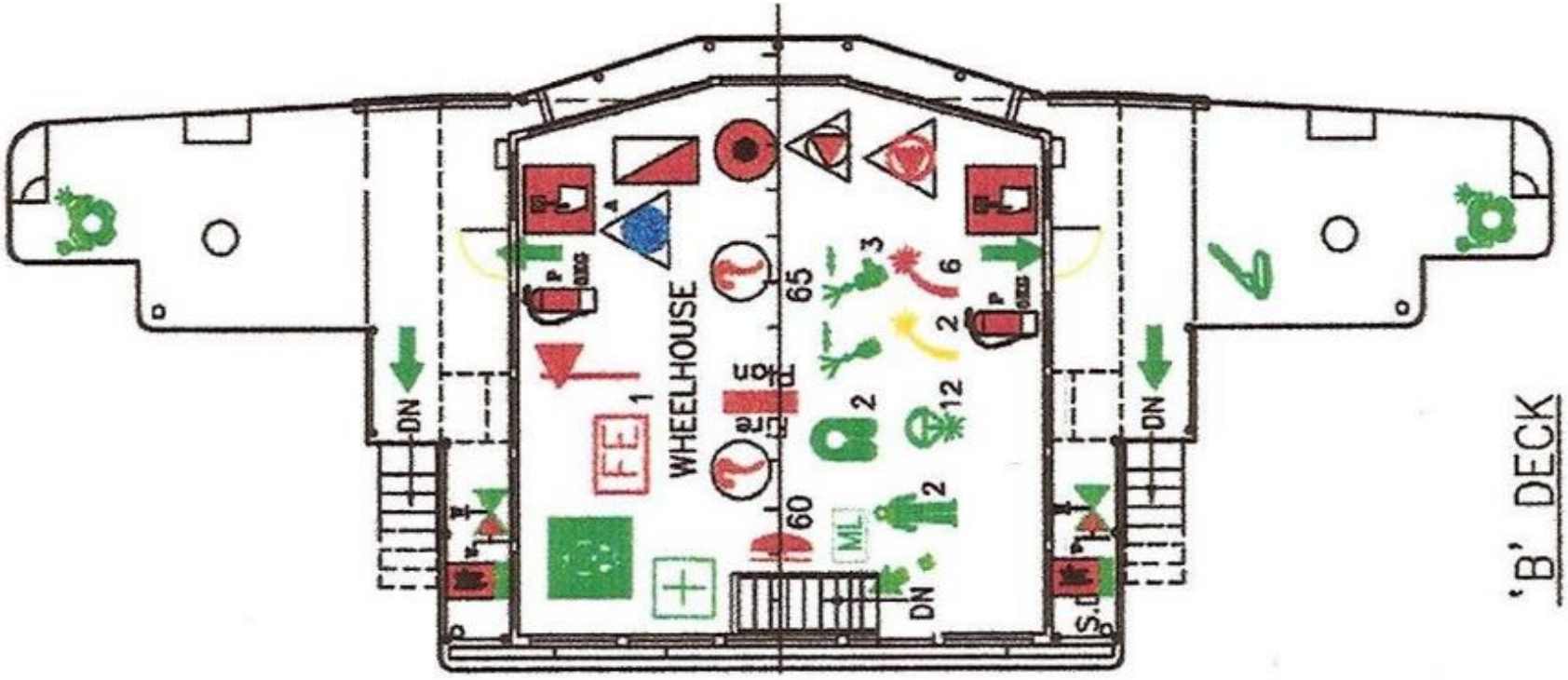

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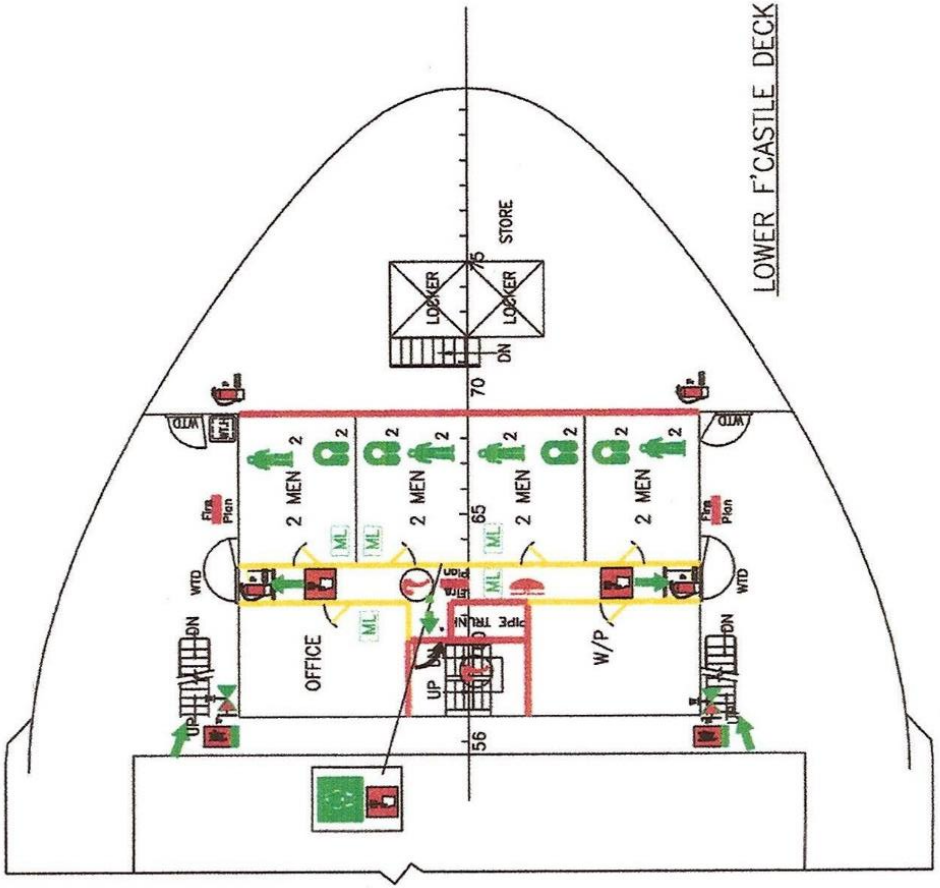

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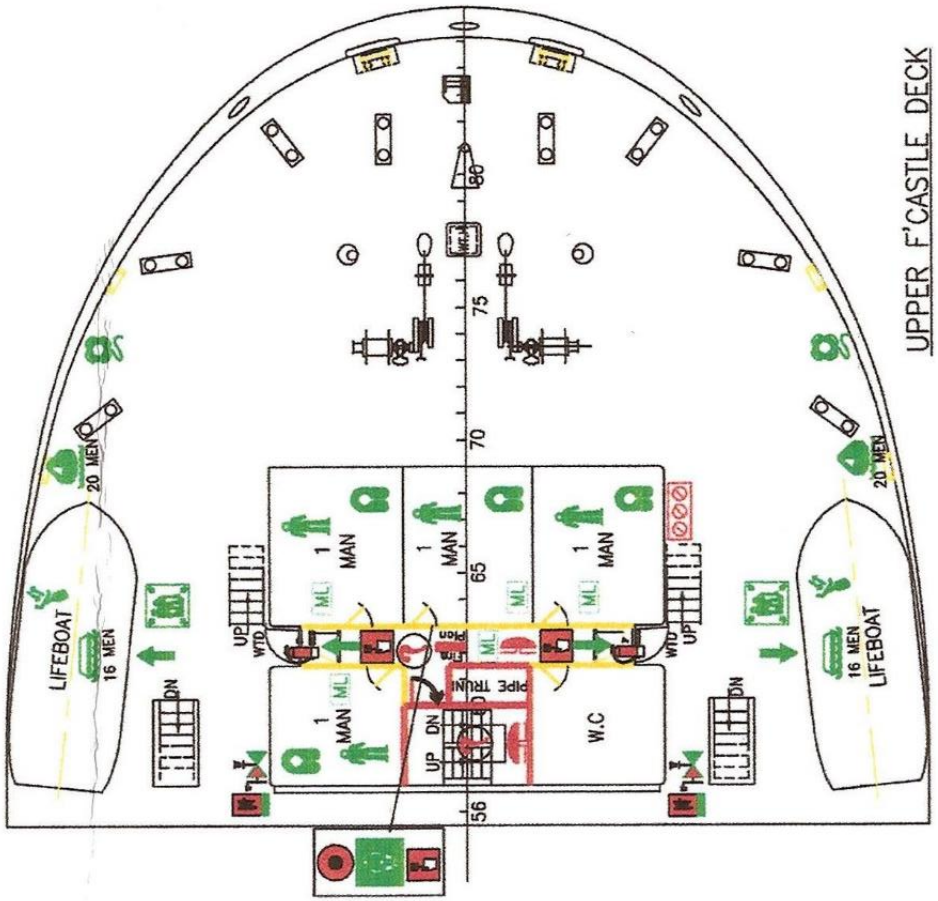


POSTER

DEVELOPMENT OF AUGMENTED REALITY ANDROID-BASED APPLICATION FOR SAFETY PLAN ARRANGEMENT

Panca Muhammad Rizha Purnama
email : rizhapanca@gmail.com

Supervisor:
Dr. Eng. Trika Pitana S.T., M.Sc.
Ir. Hari Prastowo M.Sc.

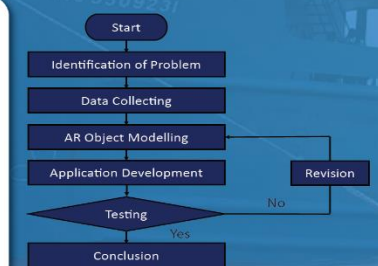
Augmented reality is an interaction technology that can combine 2-dimensional or 3-dimensional virtual objects to be added to the real environment and combine them so that they can create mixed realities and project them into real time. This technology based on android application is applied to facilitate education media and inspection for LSA on board.

Keywords: Augmented Reality, Android Application, Educational Media, Safety Plan Arrangement.

SCOPE & LIMITATION

IMO	: 9509231
Name	: Meratus Benoa
Vessel Type	: Container Ship
Gross Tonage	: 3662 T
Build	: 2010
Flag	: Indonesia
Home Port	: Surabaya
Ship Owner	: PT. Meratus Line

METHODOLOGY



CONCLUSION

SCAN HERE FOR THE APP

Augmented Reality (AR) application can visualize the Safety Plan Arrangement 3D models of MV. Meratus Benoa on four decks.

Each life saving appliances can be displayed alongside the information and the location of the object.

Utilizing AR is possible to be used as educational and inspection media to get precise information relating to the locations, object, and quantity.

AUTHOR BIOGRAPHY

The author's name is Panca Muhammad Rizha Purnama, born on 14th March 1996 in Tuban, Indonesia. Author is the youngest child from 5 siblings. Author is derived from a family with father named Sutomo and mother named Siti Poerwaningsih. The author was raised in the Tuban citiy. The author had formal studies at SD Negeri Latsari II Tuban (2002-2008), SMP Negeri 1 Tuban (2008-2011), and SMA Negeri 1 Tuban (2011-2014). In 2015, the author went to Surabaya in order to continue the study at Department of Marine Engineering (Double Degree Program with Hochschule Wismar), Faculty of Marine Engineering, Institut Teknologi Sepuluh Nopember Surabaya specialized in Marine Operation and Maintenance. During the study period, the author did activities in campus and out campus organizations, e.g., CAMPUSPEDIA, KELAS INSPIRASI, RUMAH ROTAN, BEM FTK ITS, Himpunan Mahasiswa Teknik Sistem Perkapalan FTK ITS, and also as a member of MOM Laboratory of Marine Engineering. The author also has work experiences in two companies as engineering student intern e.g., PT. Yasa Wahana Tirta Samudera (2017) and PT. Samudera Indonesia Ship Management(2018). For further discussion and suggestion regarding to this research, the author can be reached through email stated as below.

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rizhapanca@gmail.com

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