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WATER AS INSPIRATION OF AUGMENTED REALITY CORAL SPONGES: INFORMATION AND EDUCATIONAL MEDIA

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Abstract
"Toya", the Sanskrit for water, has an excellent value for the survival of living things in the world. Around 71% of the earth's surface is covered by water, whereas the oceans hold about 96.5% of all water. The sea is currently affected by contamination from waste or garbage such as plastic, metal, glass, wood, paper, rubber, clothing, and textiles. The lack of public awareness of maintaining environmental cleanliness contributes to trash accumulation in the ocean, which also impacts marine ecosystems. One part of the marine ecosystems affected by marine trash is coral sponges through the implementation of augmented reality (AR) based science technology by creating applications that can be used as a medium of information about coral sponges in the form of three-dimensional (3D) objects, as well as a tangible layout of providing education about the diversity of marine ecosystems, especially the types of coral sponges. The data in this study were collected through direct observation, using the MDLC (Multimedia Development Life Cycle) method to create coral sponges augmented reality applications. Based on the application of the MDLC method to the coral sponges augmented reality application, the augmented reality coral sponges application can be realized and run on android mobile devices with excellent performance. This application has succeeded in bringing up various types of coral sponges in the form of three-dimensional (3D) objects as a form of information and educational media to the users about the importance of keeping the environment clean from marine trash to maintain the sustainability of the marine ecosystem for a better future.

Keywords: Augmented reality, multimedia development life cycle, coral sponges, marine ecosystem

INTRODUCTION

The role of water is very important for the survival of humans, animals, and plants on earth. In Sanskrit, water is referred to as "Toya", it is recorded that about 71% of the earth's surface is covered by water, and the oceans hold about 96.5% of all water on earth. The total volume of water in the world remains constant, what changes is its quality and availability. Water is constantly being recycled, like a system known as the water or hydrologic cycle [1].

Water itself has the property of filling spaces and flowing from a high place to a lower place, from upstream to downstream. Water quality is influenced by the quality of water supply originating from the catchment area while the quality of water supply from the catchment area is closely related to the human activities around it [2]. Characterized by the increase of domestic, agricultural, and industrial activities that will affect and have an impact on water quality conditions. The variety of human activities is one of the determining factors in the availability of clean water to be used to meet daily needs.

Currently, the lack of awareness of the importance of keeping the surrounding environment clean is one of many causes to water contamination, both in rivers and in the ocean.

The ocean is considered a landfill for human life, but that fact is ignored by humans because the ocean has a large volume of water. There is an ecosystem of life in the ocean that must be preserved which can maintain a balance and one of human needs. Sustainability of ocean

water if polluted by substances generated by human waste continuously with large volumes in high concentrations, can cause damage to the balance of the ocean, damage to the balance of the ocean can have an impact on the preservation of nature and global impacts will occur in the future [3]. Based on data obtained from the Indonesian Plastic Industry Association (INAPLAS) and the Central Statistics Agency (BPS), plastic waste in Indonesia annually reaches 64 million tons/year. A total of 3.2 million tons are plastic waste that is dumped into the ocean [4]. Plastic waste that gets into the body of water will unravel into micro and nano plastic particles which are notoriously dangerous because they can be accidentally eaten by fish or have a negative impact on other marine biota such as marine corals, especially coral sponges. Coral sponges are unique because they have a porous or perforated texture with various pore sizes in each coral sponge. The waste generated by humans makes coral sponges also affected by pollution, because the pores in coral sponges do not function optimally.

These problems can be overcome through community action in the form of concern for the surrounding environment from waste pollution, especially plastic waste. The world of technology that is growing rapidly provides a new breakthrough for educating and providing a detailed understanding of certain topics that can be packaged in the form of an application that can generate three-dimensional (3D) objects. This technology is better known as AR (Augmented Reality). AR can be interpreted as a merging between real objects and virtual three-dimensional objects in a real environment and runs interactively in real time [5]. Through this application the user can find out in detail about the shape of coral sponges in 3D, the application also provides explanations in the form of additional information regarding the types of coral sponges. The existence of this application is expected to contribute as a tangible manifestation of concern for the surrounding environment, as well as a form of renewal for information media and educational media that are packaged in an attractive way, application users can find out about the importance of keeping the environment clean from marine waste to maintain the sustainability of marine biota ecosystems especially coral sponges' species to maintain its existence in the future.

RESEARCH METHOD

MDLC (Multimedia Development Life Cycle) has six stages of multimedia development, namely, Concept, Design, Material Collecting, Assembly, Testing, and Distribution. These six stages do not have to be sequential in practice, these stages can exchange positions, although the Concept stage remains the main one in the process [6].

Figure 1. Multimedia Development Life Cycle
[Source: Development Team]

1. Concept
At the concept stage, the researcher conducts a 5W + 1H analysis to be able to arrange and develop the processes carried out in realizing the application.

2. Design
At the design stage, the researcher makes the application menu structure and makes an overview of the application. The AR application workflow process starts from the user who has installed the application on an Android mobile device, followed by the process of scanning markers on books that have markers to bring up the three- dimensional (3D) coral sponges objects.

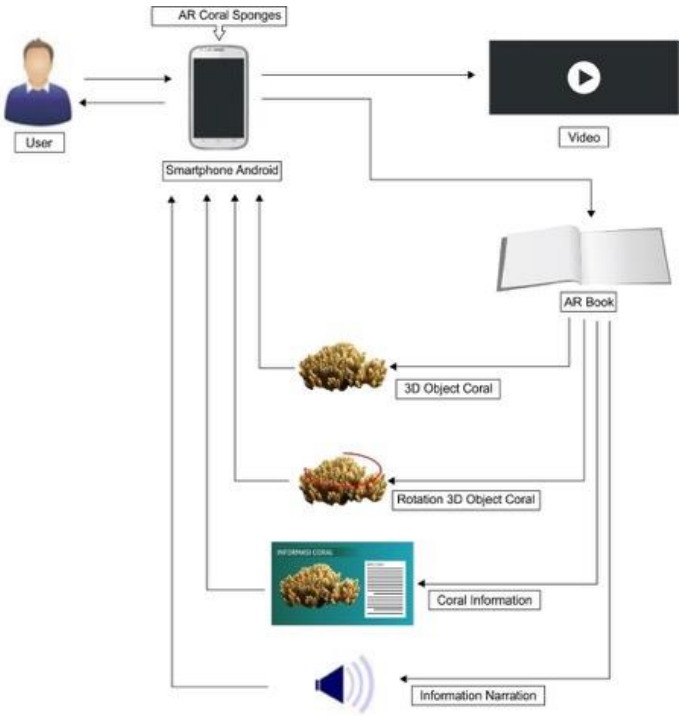

Figure 2. Application Design
[Source: Development Team]

3. Material Collecting
At the material collecting stage, the researcher collects the materials needed to make an application. The materials include pictures/photos of the types of coral sponges, video recordings about coral sponges, and literature of source books regarding detailed information about coral sponges.

Figure 3. Coral Sponge Marker
[Source: Suhardono 2008 [7]

4. Assembly
At the assembly stage, the researchers made a comprehensive application including three-dimensional (3D) coral sponges' objects, application user interface design, and managing menu navigation for application. To support this, researchers use software including Blender 3D as software for creating three-dimensional (3D) objects, Vuforia SDK as marker image processing software, Unity3D as overall application processing software, Adobe Illustrator as interface design processing software, and Adobe Photoshop as image processing software for the application.

5. Testing
In the testing phase, the researcher tested the application to users directly and gave several questions in the form of questionnaires to users who had used the application thoroughly from start to finish, including in the process of creating three-dimensional (3D) objects of coral sponges. The target users for distributing the questionnaire are at least 30 users with different age categories, in order to get maximum results in testing the usefulness of this coral sponges AR application.

6. Distribution
In the distribution stage, researchers distribute applications and AR books through online channels using tools from Google, namely Google Drive which can be accessed via a link. Users can easily access the link and download applications and AR books for free without being charged any fees.

DISCUSSION

1. Application Design
Application design is a functional requirement in making coral sponges augmented reality applications through an overview of the application, including its performance flow, use case diagrams, and sequence diagrams.

2. Application Menu Structure

Figure 4 describes the menu structure of the coral sponges augmented reality application, there is one main menu and four supporting menus in the application. The main menu is the "Scan Marker" menu, and four other supporting menus, namely the "About" menu, "How to use" menu, "Video Application" menu, and the "Exit" menu from application.

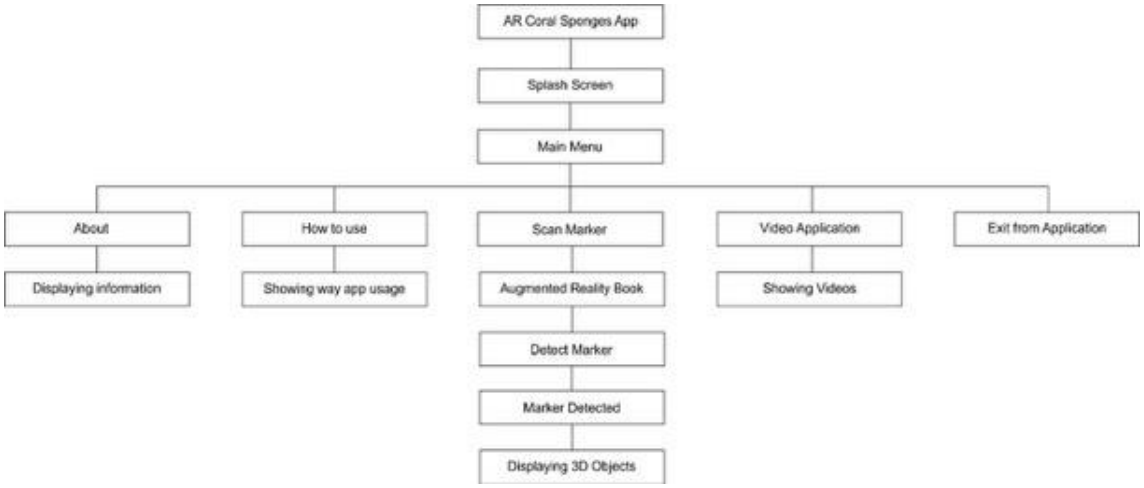

Figure 4. Application Menu Structure
[Source: Development Team]

3. Use Case Diagram

Use case diagrams are set according to how the process of running the application that is built, as well as the process that can be carried out by users to interact with the application. Details about use case diagram can be seen in Figure 5.

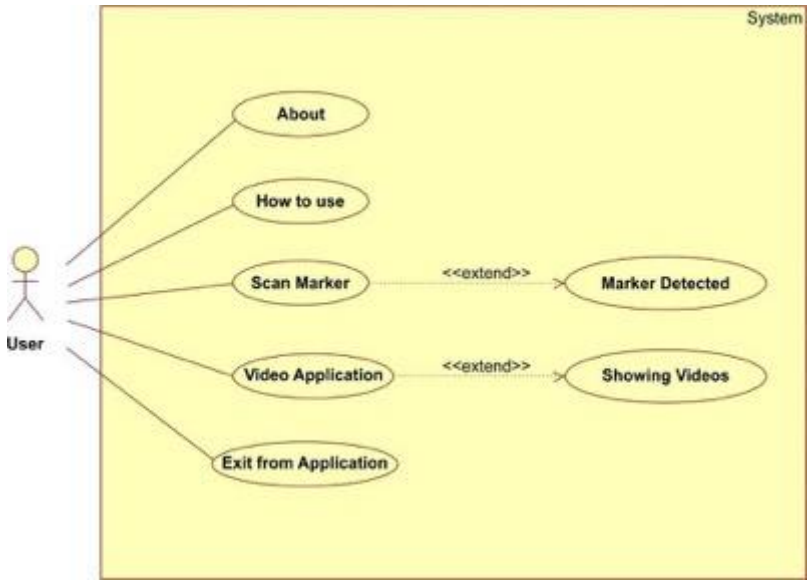

Figure 5. Use Case Diagram
[Source: Development Team]

4. Sequence Diagram

Sequence Diagram is a graphical application flow that describes how objects interact with each other when performing an operation from a use case. Sequence diagrams describe

the pattern of interaction between objects arranged in a chronological order, and through this diagram shows the objects involved in the interaction and the flow of messages sent. Details about the sequence diagram can be seen in Figure 6.

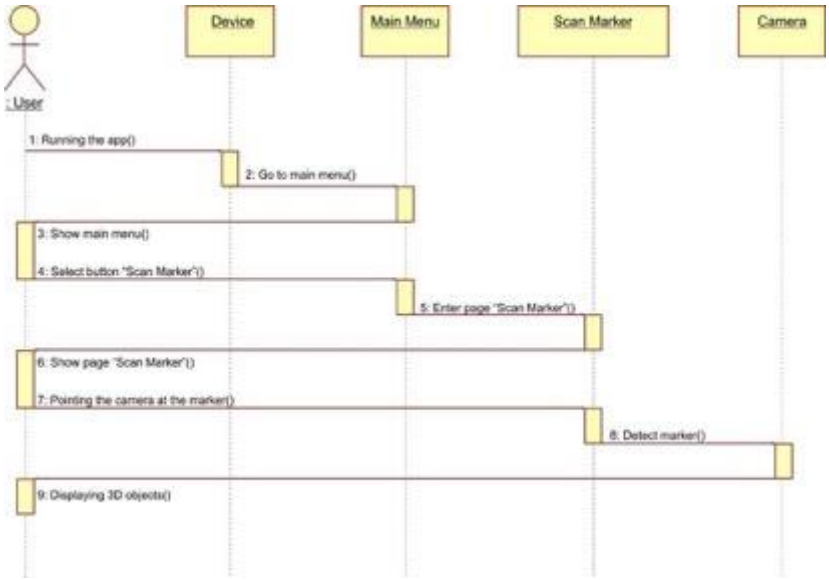

Figure 6. Sequence Diagram
[Source: Development Team]

5. Implementation

The main menu page is the starting page of the coral sponges augmented reality application, on that page users can interact directly with the application by pressing the menu button that is available on the application. Details regarding the main menu page can be seen in Figure 7.

Figure 7. Application Implementation
[Source: Development Team]

There is a Scan Marker menu button as the main menu in the application, when the button is pressed, it will prompt to access the device's camera feature. The connectivity between the device camera and the AR Book (a book containing markers) can bring up three-

dimensional (3D) coral sponges objects directly on the smart phone device screen. One of the markers used to create three-dimensional (3D) objects can be seen in Figure 8.

Figure 8. Amphimedon sp. Coral Marker
[Source: Development Team]

The application automatically runs the program after the scanning process on the marker, the application then shows three-dimensional object of the Amphimedon sp type through the device's screen, details can be seen in Figure 9.

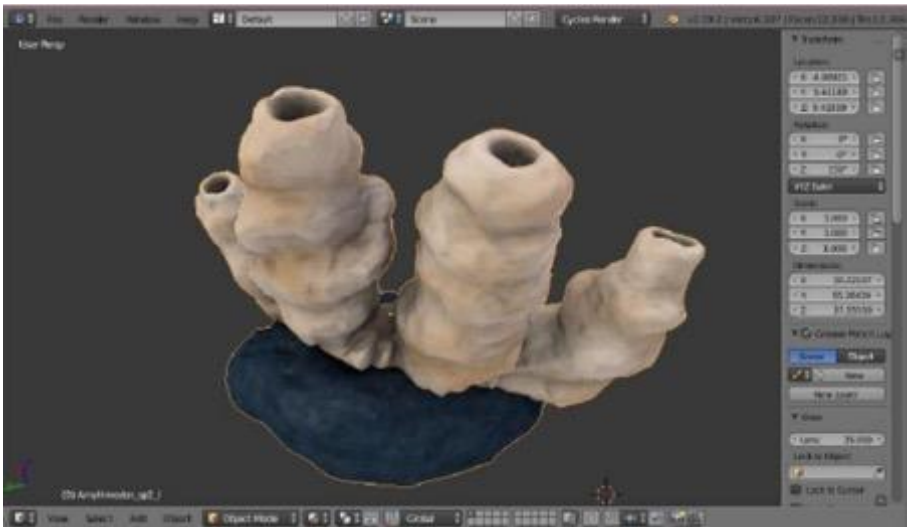

Figure 9. Three-dimensional object of Amphimedon sp Coral
[Source: Development Team]

There are several videos available in the application about the beauty of marine life, especially coral sponges. In the video, there are various types of coral sponges that have beautiful colors and interesting shapes.

Figure 10. Coral Sponges Videos
[Source: Development Team]

6. Application Test

The test method used is a questionnaire test consisting of 10 questions with 3 different categories, such as application design, content, and utilization, involving 50 respondents. Users in this case as respondents have downloaded and installed the coral sponges augmented reality application before filling out the questionnaire. Based on all the results of testing the questionnaire with 50 respondents, the results are as follows:

a) The design category received a total of 100 very good ratings, 45 good ratings, 5 adequate ratings, and 0 very poor ratings, with a total average of 4.62 and percentage of 92.4% achieving very good rating.
b) The content category received a total of 110 very good ratings, 81 good ratings, 8 adequate ratings, and 0 very poor ratings, with a total average of 4.5 and percentage of 90 % achieving very good rating.
c) The utilization category received a total of 91 very good ratings, 36 good ratings, 7 adequate ratings, and 0 very poor ratings, with a total average of 4.6 and percentage of 92 % achieving very good rating.

CONCLUSION

Based on the results of the research conducted, it can be concluded that the application of coral sponges augmented reality is as follows:

1. Coral sponges became the object of research as a form of real action in introducing and educating users through renewed media by implementing augmented reality technology, displaying 22 three-dimensional (3D) coral sponge objects.
2. This research has succeeded in realizing an augmented reality application complete with AR Book, it can be accessed and operated anywhere and anytime.
3. In the test results using the questionnaire method, user responses were very enthusiastic about the coral sponges augmented reality application due to the novelty of the media used as an introduction and education medium related to coral sponges.
4. Based on all questionnaire result collected from 50 respondents using 10 questions with 3 categories, the result is as follows:

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REFERENCES

[1] Nick Gray. "Water Technology", 3rd Edition, CRC Press, London, 2017.
[2] Dyah Agustiningsih, Setia Budi Sasongko, Sudarno. "Analisis Kualitas Air Dan Strategi Pengendalian Pencemaran Air Sungai Blukar Kabupaten Kendal", JurnalPRESIPITASI. Vol. 9 No. 2 ISSN 1907-187X, 2012.
[3] R.W. Ningsih. "Dampak Pencemaran Air Laut Akibat Sampah Terhadap Kelestarian Laut Di Indonesia", Jurnal Universitas Muhammadiyah Yogyakarta,2018.
[4] R. Rarasati, T. Pradekso. "Pengaruh Terpaan Berita Satwa Laut yang Mati Akibat Sampah Plastik dan Kampanye Zero Waste terhadap Perilaku Pengurangan Penggunaan Kantong Plastik", Universitas Diponogoro, 2019
[5] I.K.T.A. Stanaya, I.N. Sukajaya, I.G.A. Gunadi. "Analisis Efek Pencahayaan Pada Performa Augmented Reality Book Coral Sponges Menggunakan Metode Marker-Based Tracking". Jurnal Ilmu Komputer Indonesia (JIKI) Vol. 4, No. 2. ISSN 2615-2711, 2019
[6] R. Arpriansah, Y. Fernando, dan J. Fakhrurozi. "Menggunakan metode MDLC untuk anak usia dini", Jurnal Teknologi dan Sistem Informasi (JTSI), Vol. 2 No. 2p.88, 2021.
[7] Suharsono. "Jenis-Jenis Karang Di Indonesia", LIPI Press – Jakarta. ISBN: 978-979-799-229-3, 2008