

Visualization of Animal Introduction based on Augmented Reality for Toddlers

Husni Walad

University of Technology Yogyakarta - Indonesia

Irma Handayani

University of Technology Yogyakarta - Indonesia

ABSTRACT

Toddlers are one of the human age periods that follow infancy, spanning from two to five years old, or often calculated in months, ranging from 24 to 60 months [1]. This age range is also referred to as the preschool age. During this time, toddlers require easily understandable and engaging learning tools for exploring their surroundings, such as the introduction of animals they may have never encountered before [2]. Traditional learning materials, such as animal pictures on posters or in books, may not always captivate the interest of toddlers [2]. However, with the advent of Augmented Reality technology, it can be harnessed as a learning medium for toddlers [3]. An application is developed using Unity 3D software with the Vuforia SDK library, Blender for creating animations, and 3D objects that can be downloaded from "Sketchfab" and "SketchUp"[4]. This application aims to simplify the learning process for toddlers as they discover various animals.

General Terms

Waterfall Method

Keywords

Augmented Reality, Smartphone, SDK Vuforia, Software, Animals.

1. INTRODUCTION

Toddlers, or children under five years old, refer to those aged 1-3 years (toddlers) and preschool children (3-5 years). During the toddler stage, children are still fully dependent on parents for essential activities such as bathing, toileting, eating, adapting to the environment, and learning [5].

Animals are organisms classified in the Animalia kingdom in the scientific classification system. They are multicellular living beings with the ability to move independently, breathe, consume food, and reproduce [6]. Animals come in various shapes, sizes, and behaviors, and they can be found in diverse habitats worldwide. Examples of animals include mammals, birds, reptiles, amphibians, fish, and insects [7].

To introduce basic knowledge about animals to toddlers, tools such as picture books, animal picture posters, nature observation, and visits to the zoo can be used [8]. However, many toddlers may show less interest in 2D methods or pictures despite the availability of zoos. Additionally, zoos may not feature a complete range of animals, and parents may not have the time to take their children to the zoo.

Addressing the mentioned issues, this research develops an Android-based Augmented Reality (AR) application. It can display various animals in the form of 3D objects and games. This application is expected to assist children in honing their skills in learning animal recognition [9]. The presence of Augmented Reality technology makes it easier for toddlers to become interested in familiar and unfamiliar animals [10].

Toddlers will enjoy using Augmented Reality technology because it allows them to interact easily and better understand animal recognition [11].

In the development of the Android-based Augmented Reality application, Unity 3D software with the Vuforia SDK library is used, animations and 3D objects are created using Blender, and markers are created using Photoshop.

2. RESEARCH METHOD

The Waterfall method is used for this approach, emphasizing systematic and sequential stages. Figure 1 illustrates the development model stages using Waterfall: Analysis, Design, Coding, Testing, Implementation, Maintenance

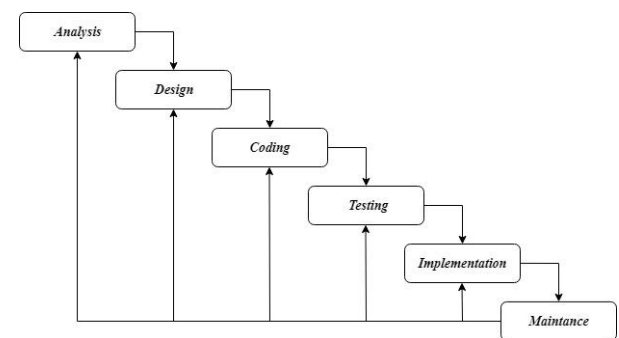


Fig 1 : Waterfall Method

In the Analysis stage, which serves as the foundation for creating the AR application, the focus is on understanding the learning needs of toddlers regarding animal recognition.

In the subsequent stage, the application structure is outlined, as depicted in Figure 2. It is explained that users can access the Augmented Reality Animal Recognition application. Users have the option to access a user guide for the application. Additionally, users can scan object markers to display 3D objects. Furthermore, users can engage in gameplay during their leisure time.

3. RESULT & DISCUSSION

3.1 Assumption

The development of this augmented reality application is planned to ensure optimal functionality. With the enhancement of this augmented reality application, users will find it easier to acquire knowledge and learn about animal recognition.

3.2 Hypothesis

This hypothesis is grounded in assumptions obtained and substantiated during the research phase. As a result, the research hypothesis is formulated as follows: "The presentation of animal introductions through Augmented Reality is effective for toddlers."

3.3 Feature

The system analysis in this research involves the assessment and testing of the developed Augmented Reality application, aimed at facilitating mothers and toddlers in learning about animals. The flow of system application usage can be illustrated in the diagram below.

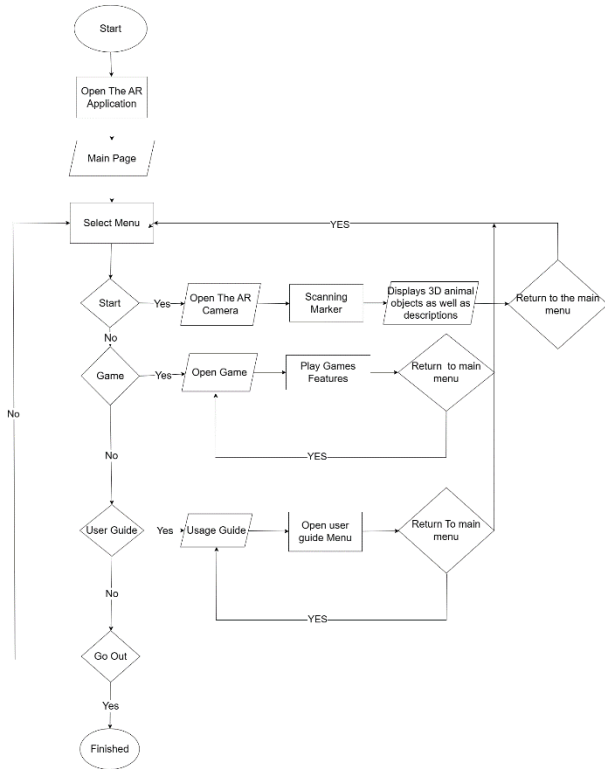


Fig 3 : Flowchart

3.4 Application Development

3.4.1 Marker Creation

Marker creation is usually an illustration of black and white squares with a bold black border and a white background. The computer will recognize the position and orientation of the marker, creating a virtual 3D world with the origin at point (0,0,0) and three axes - X, Y, and Z. Marker-Based Tracking has been developed since the 1980s and in the early 1990s started to be developed for Augmented Reality use. Marker creation utilizes tools like Vuforia, as shown in Figure 4 below.

Target Name	Type	Rating	Status	Date Modified
ulamarker	Image	★★★★★	Active	Jan 05, 2023 19:17
blumarker	Image	★★★★★	Active	Jan 05, 2023 19:17
stegamarker	Image	★★★★★	Active	Jan 05, 2023 19:17
capamarker	Image	★★★★★	Active	Jan 05, 2023 19:16
prigamarker	Image	★★★★★	Active	Jan 05, 2023 19:16
pausamarker	Image	★★★★★	Active	Jan 05, 2023 19:16
mantamarker	Image	★★★★★	Active	Jan 05, 2023 19:16
macamarker	Image	★★★★★	Active	Jan 05, 2023 19:15
kambamarker	Image	★★★★★	Active	Jan 05, 2023 19:15
kuraz	Image	★★★★★	Active	Jan 05, 2023 19:11

Fig 4 : Create Marker In Vuforia

3.4.2 Developing an AR Application

In this research, the researcher utilized Unity 3D software to develop Augmented Reality and design the user interface (UI).

The creation of the user interface can be observed in Figure 5 and Figure 6.



Fig 5 : Create Main Menu Pages



Fig 6 : Create Hyperlink

Creating Game Pages and Crafting Game Elements. As shown in Figure 7 and Figure 8 below

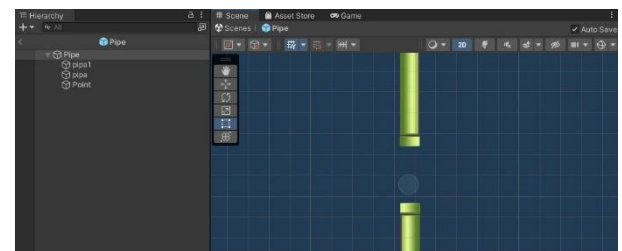


Fig 7 : Create game Menu



Fig 8 : Create Animation Game

3.4.3 Interface Implementation

Implementation of User Interface (UI) refers to the process of applying the designed UI into the actual application or software. This involves converting the designed elements, layout, and interactions into functional components within the application. The implemented user interface is demonstrated as follows:



Fig 9 : Splashscreen Menu

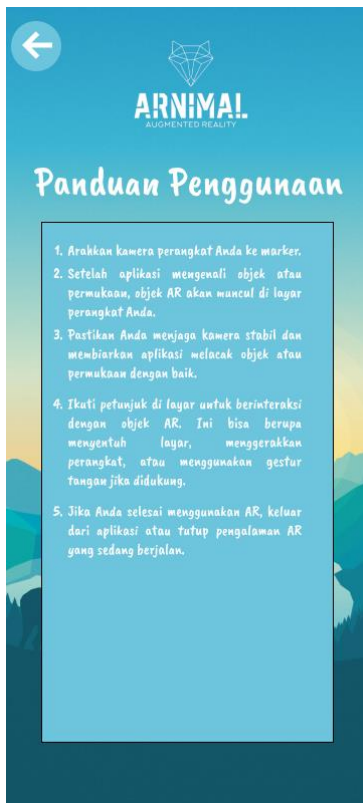


Fig 11 : User Guide Page



Fig 11 : Game Page

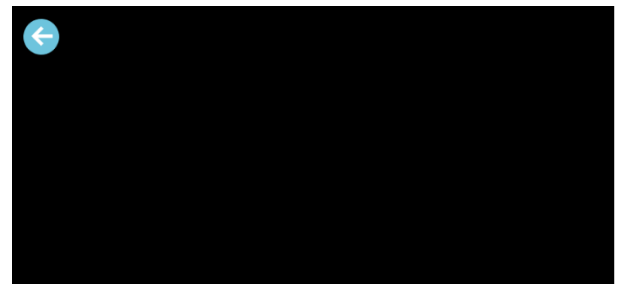


Fig 12 : AR Camera

4. TESTING

4.1 Application Testing

In this research, the AR application will be tested using the "blackbox" testing method. The testing cases will encompass the evaluation of the functionality and features available in the application. In addition to assessing the functionality and features of the application.

Table 1. Testing on Each Device

No	Types of Devices	Types of Android Devices	Installation Process	Running the Application Process
1	Xperia XZ	Android Oreo	Success	Success
2	Xiomi Redmi 6A	Android Oreo	Success	Success
3	Xiomi Redmi 7	Android Pie	Success	Success

Table 2. Testing application and features

No	Input	Proses	Output	Test Results
1	Click Start Menu	Entering the Camera AR	Displaying the Camera AR	Success
2	Click Game Menu	Entering the Feature Game	Displaying the Game Menu	Success
3	Click User Guide Menu	Entering the User Guide Menu	Displaying User guide Menu	Success
4	Click Exit	Exit to The Application	Exit application	Success
5	Click button play in Object 3D	Start plating animal sounds	Play animal sounds	Success

5. CONCLUSION

The design of this Augmented Reality (AR) application is intended to be accessible to all Android users, especially mothers with toddlers. The purpose of this application is to facilitate mothers in learning about animals in their surroundings or animals that may not be readily available nearby.

With this application, the learning process becomes more effective and efficient, aiding mothers with toddlers in animal recognition. The goal is to provide a tool that enhances the learning experience and helps mothers teach their young children about various animals.

6. SUGGESTION

This research report has produced a prototype product that outlines the application's framework. However, it does not yet represent a perfect product. Therefore, the list for further development is indicated below.

1. Addition of features within the game.
2. Addition of Markerless 3D Menu objects.
3. Addition of a Marker Download page.
4. Transforming game features into 3D.

7. REFERENCES

- [1] AUGMENTED REALITY (AR) MENGGUNAKAN UNITY 3D DAN VUPORIA SDK. In Jurnal Ilmiah ILMU KOMPUTER Universitas Udayana (Vol. 9, Issue 1).
- [2] Calvin, L., Gusti, I., & Suryantara, N. (n.d.). Aplikasi Mengenal Hewan Purbakala Berbasis Augmented Reality dengan Metode Multi Marker Application to Know Ancient Animals Based on Augmented Reality with Multi Marker Method. *Cogito Smart Journal* |, 8(1).
- [3] Irfansyah, J. (n.d.). Media Pembelajaran Pengenalan Hewan Untuk Siswa Sekolah Dasar Menggunakan Augmented Reality Berbasis Android.
- [4] Ismu Rahayu, M., Doni Waluya, I., Bandung, S., & Tinggi Manajemen dan Informatika Komputer Bandung, S. (2022). AUGMENTED REALITY (AR) SEBAGAI MEDIA PEMBELAJARAN PERKENALAN HEWAN PURBAKALA DINOSAURUS. In *Jurnal Teknologi Informasi dan Komunikasi* (Vol. 11, Issue 1).
- [5] jurnal_umb,+Journal+manager,+9.+Gunawan+137-148. (n.d.).
- [6] Made, I., & Wijaya, P. P. (2022). APLIKASI AUGMENTED REALITY PENGENALAN HEWAN BERBASIS ANDROID MENGGUNAKAN LIBRARY VUFORIA. *Jurnal Sistem Informasi Dan Informatika (Simika) P-ISSN*, 5, 2622–6901.
- [7] Nuriana, N. (n.d.). PENGENALAN HEWAN MENGGUNAKAN AUGMENTED REALITY SEBAGAI MEDIA PEMBELAJARAN.
- [8] Riskiono, S. D., Susanto, T., & Kristianto, K. (2020). Augmented reality sebagai Media Pembelajaran Hewan Purbakala. *Krea-TIF*, 8(1), 8. <https://doi.org/10.32832/kreatif.v8i1.3369>
- [9] Sanderzon Makapedua, C., Wonggo, D., Komansilan, T., Pendidikan, J., Informasi, T., Komunikasi, D., & Teknik, F. (2021). PENGEMBANGAN MEDIA PEMBELAJARAN PENGENALAN HEWAN BERBASIS AUGMENTED REALITY UNTUK ANAK USIA DINI. In *Jurnal Pendidikan Teknologi Informasi dan Komunikasi* (Vol. 1, Issue 4).
- [10] Wibowo, V. R., Eka Putri, K., & Amirul Mukmin, B. (2022). Pengembangan Media Pembelajaran Berbasis Augmented Reality pada Materi Penggolongan Hewan Kelas V Sekolah Dasar. *PTK: Jurnal Tindakan Kelas*, 3(1), 58–69. <https://doi.org/10.53624/ptk.v3i1.119>.
- [11] Zid, E., Syifa, N., Mustagfirin, D., & Tengah, J. M. (n.d.). Prosiding Seminar Nasional Sains dan Teknologi AUGMENTED REALITY SEBAGAI MEDIA EDUKASI PENGENALAN HEWAN BERDASARKAN JENIS MAKANANNYA.