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Educational Media Introducing Computer Devices Based on Augmented Reality for Elementary Schools

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Abstract

Early mastery of technology is a crucial step in preparing young generations to face the challenges of the digital era. Therefore, introducing computer devices to elementary school students is essential. This study aims to develop an educational media based on Augmented Reality (AR) as an interactive learning tool for introducing computer devices to elementary school students. This educational media is designed to facilitate a more engaging and immersive learning process by visualizing computer devices in three dimensions and allowing students to interact with virtual objects. Through the use of AR, students can learn about computer components such as monitors, keyboards, mice, and CPUs in a more interactive and enjoyable way. Trials conducted in several elementary schools students indicate that the use of this media improves students' understanding of computer device concepts compared to conventional teaching methods. Therefore, this AR-based educational media is expected to serve as an innovative alternative in information technology education at the elementary school level.

Keywords: *Augmented Reality, Computer Devices, Media Learning*

1. Introduction

The development of information and communication technology (ICT) has brought significant changes to various aspects of life, including in the field of education. One technology that is developing rapidly and has great potential to be applied in the world of education is Augmented Reality (AR). AR enables integration between real environments and virtual elements that can be interacted with in real-time, resulting in a more interactive and engaging learning experience [1]. In the teaching and learning process in schools, the role of learning media cannot be separated from one another. Media acts as an intermediary in the educational process to increase understanding and as a tool to help educators disseminate knowledge and material. Today's increasingly advanced technological developments certainly have an impact on various areas of human life. Technological developments also contribute to the development of learning media.

Understanding computer devices is one of the basic competencies that is important for students, especially in the field of information and communication technology. However, material regarding computer devices is often presented conventionally through textbooks and lectures, which tend to be less interesting and difficult for students to understand. This is partly due to limited components which make it difficult for teachers to explain the form and function of computer hardware. In addition, the many forms of hardware components make it difficult for students to remember the shape and function of each component. As a result, students' learning motivation decreases and their understanding of the material becomes less than optimal. Therefore, with technological advances, AR-based learning media offers innovative solutions to overcome this challenge. AR allows students to view and interact directly with 3D models of various computer devices, such as monitors, keyboards, printers, and mouse. This not only makes learning more interesting, but also helps students understand the function and workings of each component better.

2. Theoritical Basis

2.1. Multimedia

According to the book Multimedia: Developer's Guide written by Perry P, multimedia is the integration of several components such as text, audio, video, animation and images. This multimedia will be managed through software on the computer and there will be interaction between the media and the user. However, in general, according to Rosch in the Holy Book of Computers and Multimedia, it can be said to be Multimedia if there is a combination of at least three elements. These three elements are, sound, images and text [2].

2.2. Augmented Reality

Augmented Reality (AR) is a technology that combines computer-generated digital content with the real world in real-time. In other words, AR allows users to see 2D or 3D virtual objects projected on top of the real world. Users can experience immersive interactions with additional information embedded in the surrounding environment. As time goes by, AR has become increasingly integrated into everyday life, often through applications on smartphones. In contrast to Virtual Reality (VR) which completely replaces the real world with a digital environment [3].

2.3. Marker Based Tracking

This type of AR method is also known as image recognition. Marker Based Tracking requires a special visual object and a camera to scan it. These visual objects can take various forms, from QR codes to special symbols. This AR device calculates the position and orientation of the marker to display the appropriate digital content. In this way, the marker will display a digital animation that can be seen by the user.

2.4. Media Learning

Media Learning are all forms of tools or materials used in the learning process to help students understand and master the subject matter. This media can be in the form of physical objects, technology, or a combination of both designed with the aim of communicating information more effectively and facilitating understanding and retention of learning concepts [4].

3. Analysis and Design

3.1. Problem Analysis

Based on initial observations and literature review, several main problems identified in teaching introduction to computer devices in elementary schools are:

1. Traditional learning methods such as lectures and the use of textbooks are less effective in attracting students' attention. Students tend to get bored quickly and are less interested in material presented in a monotonous manner.
2. Learning to introduce computer devices requires good visualization so that students can understand the form and function of each component. Conventional methods are often unable to provide interactive and interesting visualizations.
3. The low level of student interest in learning about computer equipment introduction material is caused by a lack of innovative and interesting approaches in the learning process.

3.2. System Analysis

System analysis is carried out after problems are discovered. System analysis is used to describe what will be done to solve a problem found, thereby creating a solution to the problem. In addition, system analysis is carried out to identify appropriate methods and approaches to solve detected problems. From the explanation of the problem analysis, designing an augmented reality application using the marker based tracking method is considered to be able to increase students' interest in introducing school devices.

3.2.1. Hardware and Software Materials

Hardware is the physical part of a computer whose function is to accommodate or support the implementation of software. The materials used in this research include:

Table 1: Hardware Materials

Devices	Function
Laptop	Laptops are used as the main hardware used during application design. Use a laptop that can run Blender 3D, Unity 3D, Visual Studio
Mouse	A mouse is needed as an additional device used as a tool in application design
Smartphone	Smartphones, used when designing a production application, smartphones function as a medium for testing the design whether it goes as desired or not as well as for carrying out marker designs

Software is a program or part of a computer that is visible but does not have a physical form and acts as a bridge between the user and the hardware so that it can display instructions or commands issued by the user in its implementation. The Software materials used in this research include:

Table 2: Software Materials

Software	Function
Windows 11	The operating system used by the laptop in application design.
Blender 3D	Application for creating 3D objects which will later be projected on AR.
Unity 3D	AR application designing application where all assets are collected in the application.

Canva	A design application where all 2-dimensional assets, be it UI or markers, are worked on in this application.
Visual Studio	This is a text editor application which will later be used as a place for program code to be created. The program code is created using the C# programming language.

3.3. Use case Diagram

Use case diagrams are a type of UML (Unified Modeling Language) diagram that describes the function, scope and user interaction with the system. Use case diagrams visualize interactions between users (actors) and systems (use cases), as well as what actions actors can take on use cases in detail. For example, in the process of developing websites, mobile applications, or other systems, use case diagrams have an important role. Because, this diagram is able to identify user needs, clarify system requirements, and design website functionality [5]. A use case diagram is an implementation model of the information system that will be created. Use cases work by describing typical interactions between system users and their own systems through stories about how the system is used. As a first step in designing an application, a use case diagram is first created which can be seen in the following image.

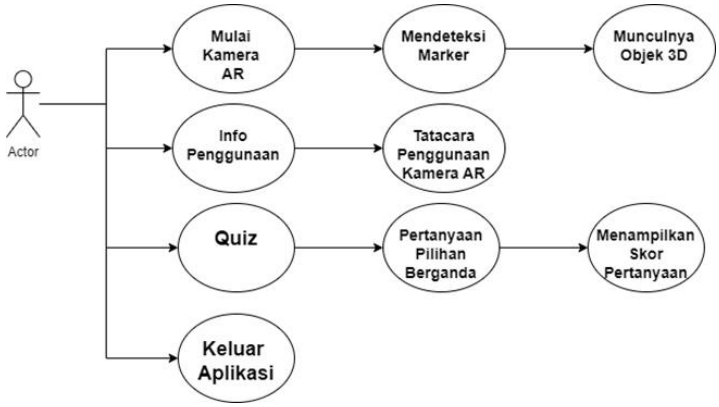


Fig. 1: Application's Use Case Diagram

3.4. Activity Diagram

Activity Diagrams are a variation of the Unified Modeling Language (UML) which can describe dynamic aspects in a system. In general, activity diagrams are an advanced version of flowcharts that display the flow of the system creation process. An activity diagram is a diagram that presents a sequence of activities in a system and forms a flow or flow of data. The visual form of this activity diagram is usually displayed vertically for modeling business processes [6]. This Activity Diagram is designed to understand system processes and actions carried out by users when using the application. It contains certain shape elements connected by arrows. The arrows then point to the sequence of activities performed from start to finish.

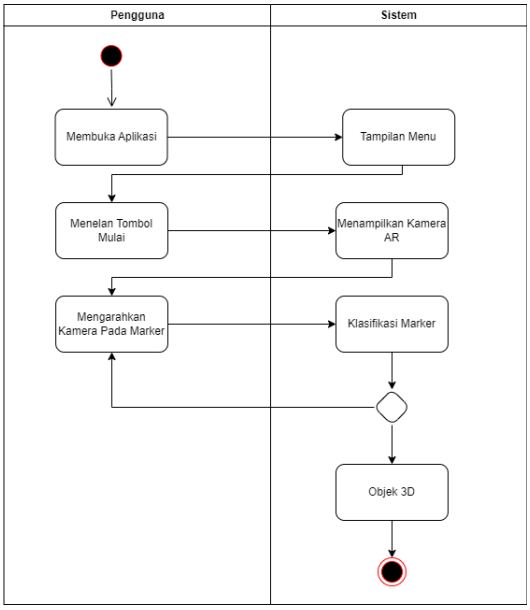


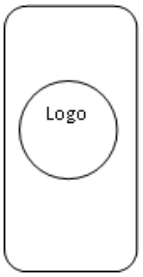
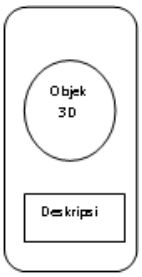
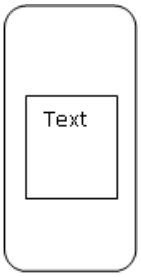
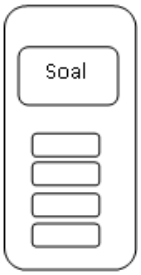
Fig. 2: Application's Activity Diagram

3.5. Storyboard

Storyboards are used to help developers in preparing the application design step by step. Having a storyboard will make it easier to determine the right position and can be used to clarify the menu in the application being built. Storyboards are created by providing

information or explanations of commands in the application, this is intended so that the relationship between each menu in the application is more systematic and when an error occurs it will be immediately known and can be corrected [7].

Table 3: Storyboard

Scenario	View	Description
Scene 1		Displays the unity logo splash screen for 3 seconds
Scene 2		The menu display in the application is as follows. 1. Start Camera 2. Info 3. Quiz 4. Exit button
Scene 3		The AR camera start view will change when a marker is detected. This display will display a rotating 3D object which will display a marker, a description box that explains the meaning of the 3D object, a box for the name of the 3D object.
Scene 4		The info display for using the augmented reality camera contains procedures for using the AR camera
Scene 5		The quiz display contains question sections and answer options.

4. Implementation

At this stage the results of the designed application are displayed. This is used to check whether the application is running as expected. Several views are available in the application including.

1. Main menu
   This is the first screen of the application screen, and this screen contains menu buttons that take you to different pages

Fig. 3: Main Menu

2. AR Camera View
   AR is projected onto this display. When the camera fires and detects a marker, it projects a 3D object, followed by a description and name of the displayed object.

Fig. 4: AR Camera View When Detecting Markers

3. Info Page View
   This page contains text that explains to users how to use AR. This view only displays text and a button to return to the menu page.

Fig. 5: Usage Information Display

4. Quiz View

Apart from AR, this application also has games that increase user interaction with the application. This game takes the form of a multiple choice quiz with questions related to the theme.

Fig. 6: Quiz View

There is another display when taking a quiz, namely the display when answering questions, when you answer the question correctly you will make a "yeee" sound and a pop up or notification will appear that the answer is correct which will appear for 3 seconds.

Fig. 7: Right Answer

On the other hand, when the answer chosen is wrong it will make a "booo" sound and a notification or pop up will appear saying that the answer chosen is wrong and will appear for 3 seconds.

Fig. 8: Wrong Answer

5. Conclusion

After a series of research and application design, research conclusions can be drawn from the following findings:

1. Media Learning for computing devices based on Augmented Reality (AR) using AR technology to enable students to interact with 3D model computing devices, visualize components in detail, and understand their functions can be developed using an innovative approach enabling a deeper understanding of.
2. AR-based learning media has been proven to increase students' understanding of computing devices. AR allows students to study material interactively, making it easier to understand concepts that are difficult to understand using conventional methods..

References

[1] M. A. Saifulloh, "Penerapan Media Augmented Reality (Ar) Pada Proses Pembelajaran Bidang Teknik," *J. JKPTB*, vol. 6, no. 2, pp. 10–17, 2020.

[2] R. A. Mawardi, "Apa Itu Multimedia? Ini Pengertian, Elemen, dan Jenisnya," detik.com. Accessed: Jul. 19, 2024. [Online]. Available: https://www.detik.com/edu/detikpedia/d-6142968/apa-itu-multimedia-ini-pengertian-elemen-dan-jenisnya

[3] R. P. Sari, "Apa itu Augmented Reality ? Pengertian, Jenis dan Contohnya," cloudcomputing. Accessed: Jul. 24, 2024. [Online]. Available: https://www.cloudcomputing.id/pengetahuan-dasar/apa-augmented-reality

[4] A. Dwi, "Media Pembelajaran dan Jenis-Jenisnya," FKIP UMSU. Accessed: Jul. 19, 2024. [Online]. Available: https://fkip.umsu.ac.id/media-pembelajaran-dan-jenis-jenisnya/

[5] M. Ariffud, "Use Case Diagram: Pengertian, Contoh, Simbol, Cara Membuatnya," niagahoster. Accessed: Jul. 24, 2024. [Online]. Available: https://www.niagahoster.co.id/blog/use-case-diagram-adalah/

[6] L. Bisma, "Activity Diagram: Pengertian, Tujuan, dan Cara Membuatnya," myedusolve. Accessed: Jul. 24, 2024. [Online]. Available: https://myedusolve.com/id/blog/activity-diagram-pengertian-tujuan-dan-cara-membuatnya

[7] R. Y. Ariyana, Erma Susanti, and Prita Haryani, "Rancangan Storyboard Aplikasi Pengenalan Isen-Isen Batik Berbasis Multimedia Interaktif," *INSOLOGI J. Sains dan Teknol.*, vol. 1, no. 3, pp. 321–331, 2022, doi: 10.55123/insologi.v1i3.375.