p–ISSN: 2723 - 6609 e-ISSN: 2745-5254
Vol. 6, No. 1, January 2025 http://jist.publikasiindonesia.id/

Educational Game for Writing and Introduction of Javanese Script Based on Augmented Reality

Desy Fitriana[1*], Sri Wulandari[2]
Universitas Teknologi Yogyakarta, Indonesia
Email: Desy.5210411014@student.uty.ac.id[1*], sri.wulandari@staff.uty.ac.id[2]

*Correspondence

Keywords: augmented reality; learning media; Javanese script.

ABSTRACT

The use of augmented reality (AR) in the world of education has become a trend and an innovative solution in the digital era. The application of AR or augmented reality in educational software development is an interesting approach to increasing interest in learning. The main goal of this research is to develop an educational game that introduces and teaches the Javanese script to users through interactive and fun experiences with AR technology and develops fine motor skills in students. This application was developed for use by elementary school students in grades 2 to 3 so that children are more familiar with the Javanese script and make it easier for teachers to learn. The methods used include needs analysis, design, development, and evaluation. The results of this research are in the form of an application that presents Javanese characters interestingly and interactively through AR, Puzzles, and writing according to the Javanese characters displayed. The evaluation was carried out by black box testing, which showed that the application worked as expected and was able to attract students' interest in learning.

Introduction

The Javanese script, known as the Hanacaraka Letters, is a valuable cultural heritage that needs to be preserved. However, technological developments have made this script increasingly forgotten, and the reading skills of the Javanese script remain low due to the diverse and difficult-to-understand letterforms. A survey of 35 junior high school students aged 12-15 showed that 91.4% still use books, but 60% find learning with Android games more interesting. With augmented reality (AR) technology, the sound that appears when the camera is pointed at a marker can help students understand how to read the script, increasing their interest in learning the Javanese script. (Heru Kurniawan Ramadani & Walidini Syaihul Huda, 2020).

The Javanese language is still widely used, but the Javanese script is almost extinct because it is considered difficult and the learning method is monotonous, making students less interested. The loss of this script will fade the literary richness and noble values of ancient manuscripts. To preserve it, interesting learning methods, such as Javanese calligraphy, are needed so that the younger generation understands and appreciates cultural heritage. (Vijayati, Rahdini, & Sulaksono, 2024).

Based on the above problem, the author is interested in designing an augmented reality-based Javanese script recognition application. This application aims to make the learning process more interesting and interactive by recognizing markers and displaying 3D animations of Javanese letters. In addition, there are puzzle games to improve students' concentration and learning outcomes. This application is also equipped with voices and a feature to thicken characters to train fine motor skills. It is hoped that this application can increase students' interest and understanding of the Javanese script effectively.

This research is supported by several previous researches, including research conducted by Widya and Mustagfirin, research conducted in 2020 with the title "3D Javanese Script Educational Game with Accelerometer", the creation of this application is not only to apply an accelerometer as a movement control player but also to make an educational game to introduce the Javanese script to elementary school children in an interactive way so that it can increase knowledge elementary school children in getting to know the Javanese script. The method used is the MDLC method (Multimedia Development Life Cycle) and the result obtained from the creation of this application is that the Android-based 3D Javanese Script Educational Game can attract and provide knowledge about the basic Javanese script to elementary school students. (Widya & Mustagfirin, 2020).

The second research that supports this research is a research conducted by Yudhoyono with the title "Educational Games with Android Bias" The game makes players start the game and pass obstacles, collect question marks, and answer questions then implement to Android. The method used is the Waterfall method and the results obtained from this study are that the game can be accessed on Android and increase knowledge about the Javanese script and it is hoped that elementary school children will know more about the Javanese script. (Yudhoyon, Widodo, 2023).

The third research that supports this research is a study conducted by Leny Suryaning Astutik in 2020 with the title "The Influence of Media Puzzle on Javanese Script Learning Outcomes in Elementary Schools" research was conducted to determine the influence of media use Puzzle on the Javanese script learning outcomes of grade III elementary school students. The methods used in this study are One Group Pretest Posttest Design and the result of this study is that there is a very significant influence on the application of puzzle media on the learning outcomes of Javanese script in grade III students of SDN Sukorejo 1 Blitar. (Astutik et al., 2020).

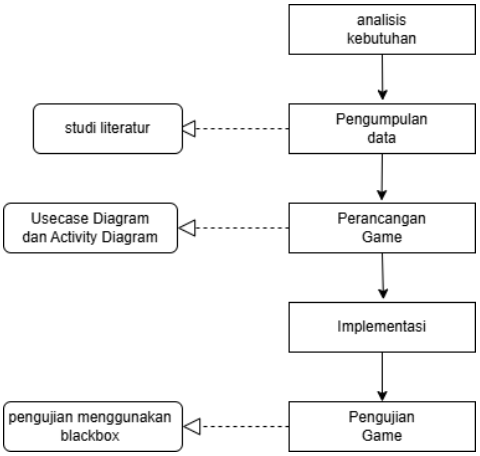
The fourth research that supports this study is a study conducted by Agustian in 2021 with the title "Introduction to Javanese Script and Education with Marker Tracking in Android-Based Augmented Reality", the method used in this study is Block Diagram, the result of this study is that children in the age group of 9-11 years show good interest and ability in learning the Javanese script. 9-year-olds, in particular, easily complete the basic level quizzes with a very satisfactory score, which is between 90 to 100. At the next basic level, they are still able to achieve quite good scores, which are between 70 and 80.

Meanwhile, a 10-year-old has been able to conquer advanced quiz challenges with a score that shows good comprehension, which is between 50 and 70 (Agustian & Badri, 2021).

The fifth research that supports this research is a study conducted by Susilo with the title "Application for Recognition of Javanese Hanacaraka Characters Based on Augmented Reality" in 2021, the method used is the Waterfall In this study, it was found that applications with augmented reality can attract students' interest in learning Javanese script and are very feasible to be used by students to learn Javanese script. (Susilo et al., 2021).

Method

Methodology Waterfall was chosen because it offers structured and sequential stages. The process includes five main steps: requirements analysis, system design, code writing, testing, and implementation. Modeling is done using UML, including use case, activity, class, and sequence diagrams. Each stage is designed to meet the needs and address specific problems. Testing is carried out using the black box testing method to ensure the functionality of the system, while the implementation includes hardware and software specifications. This approach provides a systematic framework for the development of an efficient and accurate assessment information system. (Priyambodo et al., 2022).



Picture 1
Metode waterfall

The initial stage of the research focuses on identifying game needs, both functional and non-functional needs. The results of this functional and non-functional needs analysis will be the basis for the development of the game developed.

The data used in this study is data taken through a literature study, which is a collection of data using books, journals, papers, and other readings according to the topics discussed. In the learning stage, the concept of using the Marker base Augmented Reality method makes 2-dimensional objects into 3-dimensional as a learning medium.

The design of the game will be applied in the developed application. This process results in the design of the game logically and physically. Logical design includes Use

Case and Activity diagrams, while physical design focuses on designing the application interface. In this study, UML is used, namely by using a Use Case diagram to describe the functionality of the game created and the user's interaction with the game or system, while the activity diagram is used to describe the activities of the game or system created (Putri et al., 2023).

The implementation of the interface according to the UI design as well as coding so that the UI is integrated with the application system created and the data displayed. The result of this implementation is a game that has been running and connected with a pre-designed UI. At this stage, the author uses the Unity game editor to create the game. Unity uses Programming languages C-Sharp or C# (Hernanza et al., 2024).

App testing is the most important stage in creating a game. With the guidance on the results of the analysis of game needs and previous game design, to design an interactive interface. This interface design will be a record in the next stage of game development, and to ensure that the designed game runs according to the design.

Augmented reality

Marker-based tracking is a type of Augmented Reality (AR) that utilizes a special 2D image as a marker. These markers have a specific pattern that the device's camera (such as a phone or computer) can recognize so that the device can track the position and orientation of the marker in the real world. This marker is a black-and-white image with a unique pattern. (Apriyani et al., 2016).

Javanese script

Learning the Javanese Legena script in grade 3 elementary school is by the 2013 curriculum. Given the complexity of the Javanese script, the use of interesting learning media is very important to support students' understanding, especially at an early age. (Navita Chari, Rashiyaana Ashree, Bistiana, Setiaweti, & Fatikhatone Nazikhah, 2024).

Educational Games

Educational games are learning tools that are packaged in the form of interesting games. The goal is to provide a fun and educational learning experience for the players. The use of digital educational games is one of the effective strategies to increase student learning motivation. Through intensive interaction with various elements in the game, students can be more enthusiastic to actively participate in the learning process. (Najuah et al., 2022).

Results and Discussion

The early stages of making this game, begin by analyzing the output and input needs that will be used in this game. At this stage, the author conducts a literature study by reading articles and journal journals related to augmented reality and the Javanese script. The author also does the development of previously created applications. The next step is to use Unified Modeling Language (UML) modeling.

The comparison of the development of this application with existing applications is stuck in the writing menu, in addition, students can play Javanese script letter puzzles, and students can practice writing Javanese script whereby writing Javanese script can

train students' fine motor skills. Children are invited to get to know letters and numbers through activities such as imitating writing and doing mazes. The goal is for children to be able to connect graphic symbols with sounds and meanings, this trains eye and hand coordination (Nurbani et al., 2023).

In this script game, students can choose the menu that is scanned to scan the marker, the game button to go to the puzzle game section, the write button to go to the Javanese script writing page, the setting button to adjust the volume of the music and the type of music, there is also an exit menu to exit the application. Figure 2 below is a use-case diagram image.

Modeling UML What is done is to make an Activity Diagram which will be shown in Figure 3. Activity Diagram is used to describe the actor or user and the actions performed by the analysis performed on the Use Case Previous diagram. Users can perform Input By pressing the button on the menu or page displayed, the system will display according to the command given. (Putri et al., 2023).

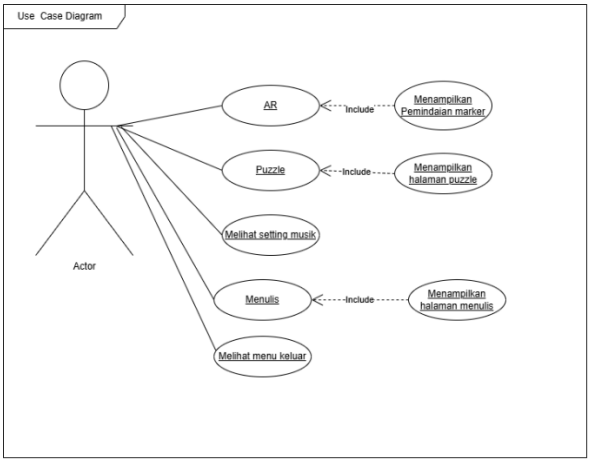


Figure 2
Use Case Diagram

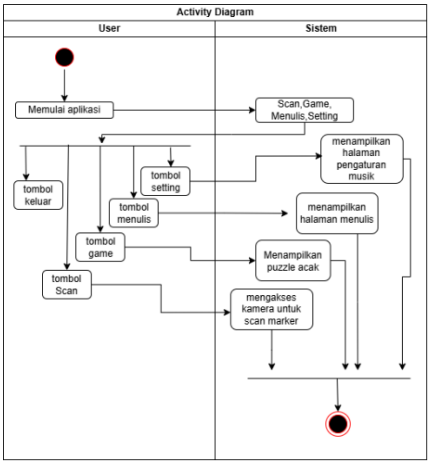


figure 3
Activity Diagram

The Implementation Stage is a stage that transforms the design and analysis to become an educational game for writing and Javanese character recognition based on augmented reality with the Unity application to combine 3-Dimensional animation that has been created using 3-dimensional applications, namely blender, audio, CorelDRAW, and others. There are various buttons on the main menu page, Scan, Games, Writing, and others. Figure 4 is the main menu display that will appear after the *splash screen*. On this main menu page, there will be various buttons such as *Scan*, Game, Writing, Setting, and Exit button, then in picture 5 is the display of Scan on this menu users can scan the existing markers using the Android smartphone camera and then a 3-dimensional animation will appear in addition to that will be provided with a voice button and also a back button to return to the main menu page.

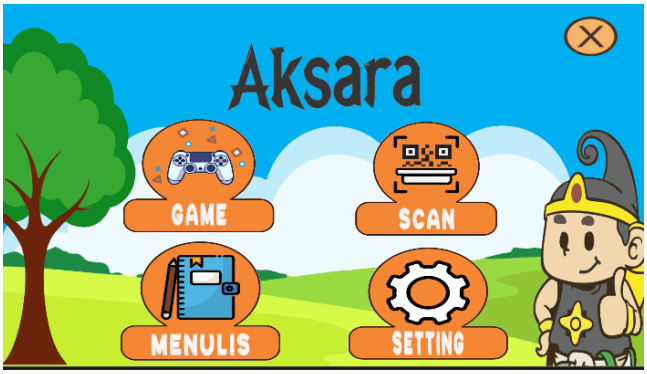


Figure 4
Main Menu Display

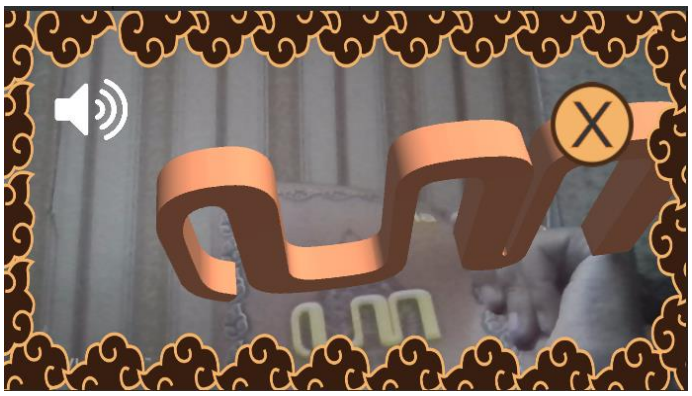
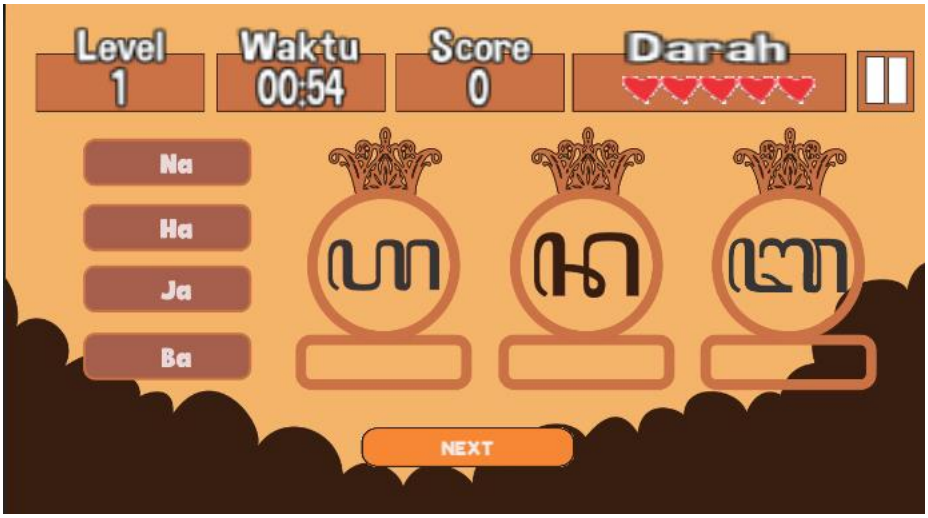


Figure 5
Scan Page View

Figure 6
Writing Page View

Figure 7
Settings Page View



Picture 8
Writing Page View

Figure 6 displays the writing menu on this page, users can write according to the image displayed in this display, and if the user has finished writing, can press the next button to practice writing in other Javanese characters.

Figure 7 is a view of the page Settings So that when the volume is shifted, a sound will appear and the user can adjust the loudness of the sound and whether or not. Figure 8 is a view of the page Puzzle When the user presses the tempo Puzzle which is on the main menu, it will be displayed Puzzle randomly and the user will be asked to pair the Javanese script by reading it if the user places it incorrectly then the answer will return to its place and if the user is correct then the answer will fill in the bottom of the question. After that, the user can press next and advance to the next round.

Table 1

Testing Activities	Test Scenarios	Result
Main Menu Page	Displays the main page containing scans, games, writing, and settings.	Succeed
Menu Scan	Pressing *the Scan* button will display the scan page.	Succeed
Scan Page	Directing the camera to scan and display 3D images.	Succeed
Menu Game	Pressing the game button will bring up the puzzle game page.	Succeed
Puzzle Games Page	Displaying a puzzle *game page* displays Javanese characters and also answers by reading them.	Succeed
Writing Menu	Displays the writing page section where each page is different in Javanese characters so that users can follow the displayed characters.	Succeed
Menu Setting	Displays the sound settings menu including the size of the sound.	Succeed
Exit Menu	The page to exit the application will then the application will close automatically.	Succeed

The test method of the game used is black-box testing. Black-box testing is a software test that requires a functional examination of an application without looking at Source Code which was done to make the application. The results of the test black box

can be seen in table 1. Based on the results of the table, it can be concluded that the application has been running and successful.

Conclusion

The augmented reality application as a medium for learning Javanese script is shown for students in grades 3 to 4 of elementary school. This game is built using the waterfall and through testing black-box. This research, shows that an augmented reality-based Javanese writing and recognition game has been successfully developed. For further development, this application can be packaged more with bright colors, and the writing application can be further developed.

Bibliography

Agustian, M., & Badri, F. (2021). Pengenalan Aksara Jawa dan Edukasi Dengan Marker Tracking Pada Augmented Reality Berbasis Android. *Teknika : Engineering and Sains Journal*, *5*(1), 1–8.

Apriyani, M. E., Huda, M., & Prasetyaningsih, S. (2016). Analisis Penggunaan Marker Tracking Pada Augmented Reality Huruf Hijaiyah. *JURNAL INFOTEL - Informatika Telekomunikasi Elektronika*, *8*(1), 71. https://doi.org/10.20895/infotel.v8i1.54

Astutik, L. S., Suwandayani, B. I., & Agustin, U. L. (2020). Pengaruh Media Puzzle Terhadap Hasil Belajar Aksara Jawa di Sekolah Dasar. *Jurnal Pemikiran Dan Pengembangan Sekolah Dasar (JP2SD)*, *8*(1), 79–87. https://doi.org/10.22219/jp2sd.v8i1.12413

Hernanza, F., -, A., Abdullah, A., Prasetyo, D. Y., & Prasetyo, D. Y. (2024). Rancang Bangun Aplikasi Game Pengenalan Organ Pencernaan Manusia Menggunakan Unity. *Jurnal Informatika Dan Teknik Elektro Terapan*, *12*(1), 365–371. https://doi.org/10.23960/jitet.v12i1.3764

Heru Kurniawan Ramadani, H. K. R., & Walidini Syaihul Huda. (2020). Game Edukasi Aksara Jawa Menggunakan Augmented Reality Berbasis Android. *Explore IT! : Jurnal Keilmuan Dan Aplikasi Teknik Informatika*, *12*(2), 87–92. https://doi.org/10.35891/explorit.v12i2.2281

Najuah, Sidiq, R., & Sinamora, R. S. (2022). Game Edukasi: Strategi dan Evaluasi Belajar Sesuai Abad 21. In *Yayasan Kita Menulis*.

Novita Sari, E., Rossiana Asri, O., Vistiana, J., Setiawaty, R., & Fatikhatun Najikhah, dan. (2024). Pengembangan Media Papan Kartu Aksara Jawa [Pakarja] Guna Meningkatkan Minat Baca Aksara Jawa Legena Pada Siswa. *INOPENDAS: Jurnal Ilmiah Kependidikan*, *7*(1), 20.

Priyambodo, A., Prihati, P., & Nurdianto, K. (2022). Perancangan Sistem Informasi Wisata Kopeng Berbasis Web dengan Metode Waterfall. *Jurnal Cakrawala Informasi*, *2*(1), 59–68. https://doi.org/10.54066/jci.v2i1.176

Putri, E. J., Sutarman, S., & Diwandari, S. (2023). Aplikasi Media Pembelajaran Aksara Jawa untuk Siswa Sekolah Dasar menggunakan Augmented Reality berbasis Android. *Edumatic: Jurnal Pendidikan Informatika*, *7*(2), 376–385. https://doi.org/10.29408/edumatic.v7i2.23201

Susilo, H., Sudargo, & Menarianti, I. (2021). Aplikasi Pengenalan Aksara Jawa " Ha Nacaraka " Berbasis Augmented Reality. *Jurnal Ilmiah*, *2*(2), 41–48.

Widya, A. H., & Mustagfirin, M. (2020). Game Edukasi Aksara Jawa 3D dengan Accelerometer. *Jurnal Informatika Dan Rekayasa Perangkat Lunak*, *2*(2), 146.

https://doi.org/10.36499/jinrpl.v2i2.3579

Wijayanti, R., Rahadini, A. A., & Sulaksono, D. (2024). Media Pembelajaran Kaligrafi Sebagai Upaya Meningkatkan Minat dan Keterampilan Siswa Dalam Menulis Aksara Jawa. *Sabdasastra : Jurnal Pendidikan Bahasa Jawa*, *8*(1), 59. https://doi.org/10.20961/sabpbj.v8i1.74113

Yudhoyon, M. B. A. o, Widodo, D. W., & ... (2023). Rancang Bangun Game Edukasi Belajar Aksara Jawa Berbasis Android. *Prosiding SEMNAS …*, *7*, 568–575.