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Android based learning application for Wudhu and Tayamum using augmented reality technology

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Abstract. Nowadays, wudhu and tayamum are widely found in various media such as books, articles, tutorial videos and internet. Muslims who are new to Islam as children often have difficulty reading books to understand how to learn and practice tayamum, one of the lessons learned in technology development using Augmented Reality based learning. The learning method used in Augmented Reality is the marker method. The marker method step is that the program will read an object from the image marker, the marker uses a downloadable image by clicking the Download Marker button in the main menu, and then it will be displayed as a moving object or an output in the data. This app is implemented for Android-based smartphones, with the help of Blender 3D and Unity 3D software. The results of the questionnaire count conclude that augmented reality learning media applications are easy to use, practical, useful, and effective in supporting children's learning activities as children become more engaged in learning. The attractive interface design makes kids feel comfortable and engaging as they use it and develop their understanding. In addition, this application is also used as an interactive learning medium.

1. Introduction

Before performing worship, Muslims must perform Thaharah or purify first by performing ablution or tayammum. Ablution is the sanctity of holiness that Allah 'Azza wa jalla set to Muslims as a condition before performing the prayer, while tayammum is a substitute for ablution [1] to relieve someone from purification because they cannot use water due to various obstacles. Therefore Muslims must know the procedures for ablution and tayammum according to Islamic law [2].

Currently learning ablution and tayammum procedures can be done with a variety of media, namely from books, articles, video tutorials, and the internet. Muslims who are new to Islam like children often experience difficulties because they have to read and understand the procedures for ablution and tayammum usually in the form of books[3]. Video tutorials are easier to understand than books, but currently, there are rapidly developing learning methods one of which is 3 dimensional to facilitate learning ablution and tayammum procedures we can use Augmented Reality [4][5].

Research conducted by Nur Jazillah [6] in 2015 was entitled "Augmented Reality-Based Learning Application in Wudu Guidelines for Children". The purpose of this study is to find out interactive learning in children to determine the effectiveness of applications. Another goal is to determine the effectiveness of the brute force algorithm so that users can find out the appropriate sequence of ablution movements. The conclusion of this research is the Augmented Reality-Based Learning Application in Wudhu Guidebook for Children can run on mobile devices with the Android operating system with

RAM specifications above 1.5GB, can display objects at a distance of 10cm with 0° angle and sunlight (cloudy). Whereas in the lighting of the light (dark) the object will be displayed at a distance of 15cm at an angle of 0o, increasing student interest in learning to perform ablution, and felt very effective, the application of the algorithm.

In a journal made by Erwin Setiawan [7], UU Syaripudin, Yana Aditya Gerhana in 2016 entitled "Implementation of Augmented Reality Technology in Wudu Guides Based on Android Mobile". The purpose of the journal is to be useful in learning the procedures for ablution movements to be more interesting and enjoyable. The conclusion of this journal is that the ablution augmented reality application has been designed and built on an android mobile device as a learning medium for children in recognizing the procedures for ablution movements in the form of a simulation of ablution motion animation built using the Unity 3D game engine, Vuforia SDK and blender as a tool to create 3D animation models[8]. The marker less augmented reality method can be applied to the ablution augmented reality application in the ablution guidebook as a learning medium for children[9][10].

One method used for Augmented Reality is the marker method[11][12]. The way this marker works is, by the way, the program will read the object from the image marker then a moving object or output that is already present in the data will be displayed[13]. This application was made for the Android OS, the software used to create this application is 3D Blender and Unity 3D. Android is the most recent operating system that is embedded in many high-end smartphones, as well as open-source. Android supports the existence of images, moving animations to beautify the appearance of applications compared to others.

2. Methods

The purpose of this study is the development of interactive learning media ablution and tayammum using Augmented Reality. In making this final project using a research method that is divided into several work processes with the following flow [14] (figure 1).
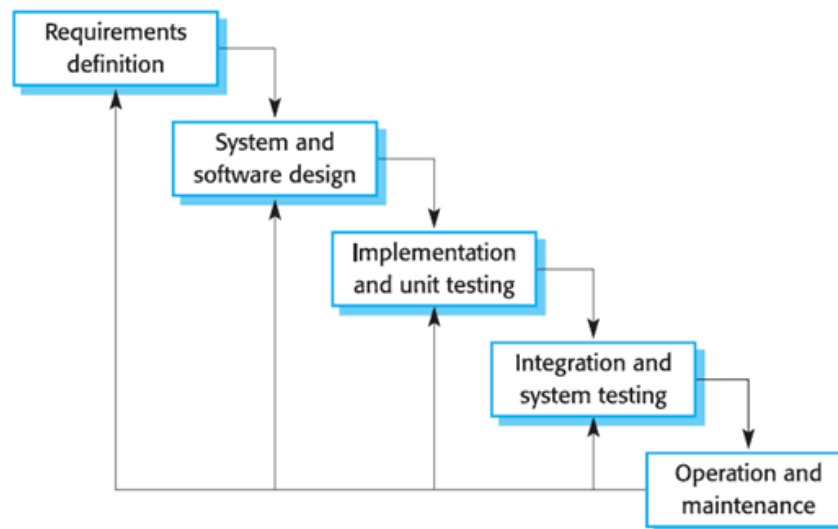

Figure 1. Waterfall method

The first stage in the waterfall method is the requirements stage, which is looking for what is needed by the user and the limits of the software used through interviews. Then the system design is done before coding. The result at this stage is the application display. Next is the implementation phase, at this stage, the programming is done. Then the verification stage is tested on the application. The purpose of application testing is to find out if there are errors in each part of the application. And the last stage is maintenance. This stage is carried out application maintenance or repair if an error is found in the application[15].

3. Experimental Result and Discussion

3.1. Application Making Process

The application of design into programming begins at this stage so that the application can run according to the desired function. The first in making this application is preparation, making Main Menu, making 2D tutorials and making AR Cameras. Then Build the application to the Android APK.

3.2. System View

At this stage will discuss the appearance of applications that have been installed on Android after going through a series of stages of system design.

3.2.1 Initial Display (Splash Screen)

The splash screen display is the earliest display when opening an application or game. When opened the application will display the default splash screen that says made with unity because it uses the Unity 3D application for the application development process. To give an identity to the application, the application is given a splash screen add it by displaying the application logo. This display will appear for 3 seconds and then will go to the loading display on Figure 2.
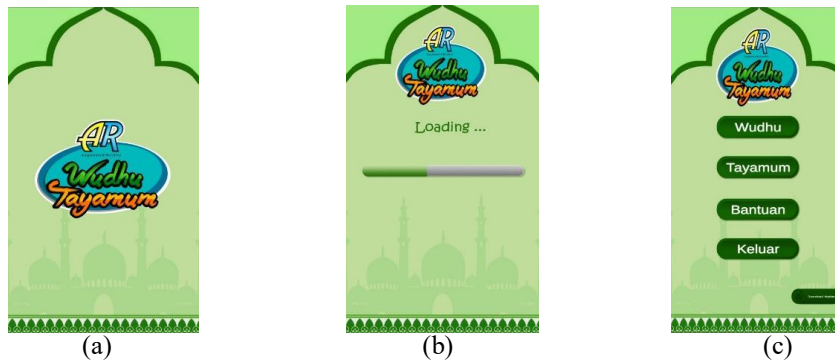

| (a) | (b) | (c) |

Figure 2. Display splash screen, loading and main menu

3.2.2 Main *Menu Display*

This main menu display has 5 buttons namely the ablution button to display the button options again namely procedures for ablution with 2D images, AR Camera button which functions to start the AR Camera and back button to return to the main menu. The tayammum button on the main menu to display the button options again, namely the procedure for 2D images, the AR Camera button which functions to start the AR Camera and the back button to return to the main menu. The help button on the main menu will display help using the application and the exit button on the main menu functions to stop the application. And finally the Download Marker button, the user will be taken to the URL marker on the google drive to download the marker on Figure 3.
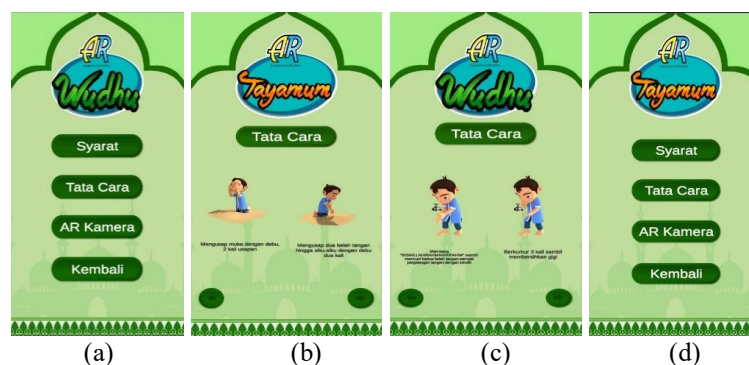

| (a) | (b) | (c) | (d) |

Figure 3. Menu Display Wudu and Tayammum Procedures

3.2.3 AR Camera Display

In the AR camera view Figure 4, there is a back button that functions to return to the main menu. Then the description display and target name will appear if a marker is detected. In addition, there is a sound feature that will come out if the speaker button is pressed. The contents of the description and sound will change according to the markers detectedIn the AR camera view, there is a back button that functions to return to the main menu. Then the description display and target name will appear if a marker is detected. In addition, there is a sound feature that will come out if the speaker button is pressed. The contents of the description and sound will change according to the markers detected.
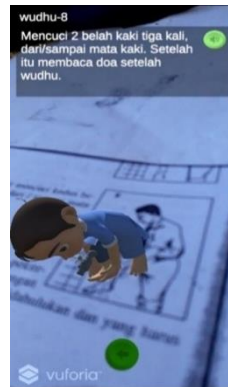

Figure 4. AR Camera Display

3.3. Application Testing

3.3.1. Application Workflow Testing

System workflow testing aims to determine the function of each element in the application whether it is running according to design. So that it will be known functions that run normally or cannot run (error). Functionality testing is done by alpha testing methods. This method is based on Black Box testing which focuses on the functional aspects of the system based on flowcharts at the design stage. The test is divided into several stages with the following results:

Table 1. The results of testing the functionality opening the application

Test cases	Expected Result	Status (pass/fail)
Start the application	Show the Splash Screen menu	Pass
	Show the Loading menu	Pass
	Show the main menu	Pass

Table 2. The results test of functionality

Test cases	Expected Result	Status (pass/fail)
Click wudhu button	Go to wudhu display	Pass
Click procedures button	Go to procedures button	Pass
Click AR Camera button	Go to scene AR Camera with rear camera visuals	Pass
Click back button	Back to main menu	Pass
Start tayammum button	Go to tayammum display	Pass
Click procedures button	Go to tayammum procedures display	Pass
Click AR Camera button	Go to scene AR camera with rear camera visuals	Pass
Click back button	Back to main menu	Pass
Click help button	Go to help display	Pass
Click exit button	The application has stopped	Pass

Table 3. AR Camera functional test results

Test cases	Expected Result	Status (pass/fail)
1. Aim the camera to marker	1. The system captures markers to match the target image database (marker) in the Vuforia database.	Pass
	2. The system displays 3D objects according to markers and immediately starts the animation.	Pass
2. Click back button	1. The system displays the target name, description text, and plays explanatory audio	Pass
	2. Back to main menu	Pass

3.3.2. Questionnaire

This application was tested on users, the Al-Qur'an Education Park lecturers and students of Al-Ikhlas TPA. The results of the trial are summarized in a questionnaire that the author has shared with 10 teachers (Table 4).

Table 4. Results of User Questionnaire

No.	Questionnaire Statement	Frequency of Answers				
		SD	D	N	A	SA
1	This application is easy to use	1		1	3	5
2	This application is practical to use	1	1		3	6
3	This application is effectively for learning media of wudhu and tayammum	1		1	3	5
4	The design of interface is attractive and interactive			1	3	6
5	This application is user friendly				3	7
6	This application is as needed for the students of Al-Qur'an Education Park				2	3	5
	Total number of Frequency of Answers	**3**	**1**	**5**	**18**	**34**

Explanation:

Rating scale

SA	Strongly Agree (5)
A	Agree (4)
N	Neutral (3)
D	Disagree (2)
SD	Strongly Disagree (1)

From the test results above, it can be concluded that the average respondent chose the SA (Strongly Agree) answer on each question. This means that respondents agree on the use of this augmented reality application as teaching media. Because this augmented reality application is very effective in supporting teaching and learning activities.

4. Conclusions

The use of Augmented Reality as a learning aid for ablution and tayammum procedures for children with the development of augmented reality applications that can be used on Android smart phones. This application requires markers, these markers using images can be downloaded by clicking the Download Marker button on the main menu. With this application, children can be more developed by seeing hearing and feeling what they are learning with the help of AR, and children become more enthusiastic in learning. From the calculation results of the questionnaire, it can be concluded that the augmented reality learning media application is very easy to use, practical, useful, and effective in supporting learning activities. Besides this application is also appropriate to be used as an interactive learning media for children. An attractive interface design makes children as users feel happy and interested when using it.

Reference

[1]   S. Ayyub, Hasan, *Fikih Ibadah*. Jakarta: Pustaka Al-Kausar, 2002.

[2]   H. B. Syekh H. Abdul Halim, *Tafsir Al-Ahkam*. Jakarta: Kencana, 2006.

[3]   M. Rifa'i, *Risalah Tuntunan Shalat Lengkap*. Semarang: CV. Toha Putra, 2011.

[4]   M. Billinghurst, A. Clark, and G. Lee, "A survey of augmented reality," *Found. Trends Human-Computer Interact.*, vol. 8, no. 2–3, pp. 73–272, 2014.

[5]   S. Elvrilla, "Augmented Reality Panduan Belajar Sholat Berdasarkan Buku Teks Belajar Sholat Menggunakan Android," *Jakarta*, 2012.

[6]   Nurnajmi, "APLIKASI PEMBELAJARAN BERBASIS AUGMENTED REALITY PADA BUKU PANDUAN WUDHU UNTUK ANAK HALAMAN JUDUL Oleh : NUR JAZILAH," *Buku Pandu. Wudhu*, p. 11, 2015.

[7]   E. Setiawan, U. Syaripudin, and Y. A. Gerhana, "Implementasi Teknologi Augmented Reality pada Buku Panduan Wudhu Berbasis Mobile Android," *J. Online Inform.*, vol. 1, no. 1, p. 28, 2016.

[8]   Fidelis Josaphat Soekahar, "Open Source 3D Animation," ‏הנוטע עלון‎, vol. 66, pp. 37–39, 2004.

[9]   R. Indriani, B. Sugiarto, and A. Purwanto, "Pembuatan Augmented Reality Tentang Pengenalan Hewan Untuk Anak Usia Dini Berbasis Android Menggunakan Metode Image Tracking Vuforia," *Semin. Nas. Teknol. Inf. dan Multimed.*, pp. 73–78, 2016.

[10]   M. B. Franciska, M. B. Setyawan, and I. A. Zulkarnain, "Rancang Bangun Media Pembelajaran Bahasa Inggris Berbasis Android Menggunakan Teknologi Augmented Reality Untuk Sekolah Dasar (Studi Kasus Mi Ma'Arif Patihan Kidul)," *Komputek*, vol. 2, no. 2, p. 48, 2018.

[11]   M. N. Jannah and F. N. Hakim, "Rancang Bangun Aplikasi Huruf Hijaiyah Berbasis Android (Studi Kasus : Taman Baca Al Quran Raziev Reinezhwa Banjarmasin Kalimantan Selatan)," *J. Teknol. Inf. dan Komun.*, vol. 6, no. 2, pp. 53–59, 2015.

[12]   A. Pramono and M. D. Setiawan, "Pemanfaatan Augmented Reality Sebagai Media Pembelajaran Pengenalan Buah-Buahan," *INTENSIF J. Ilm. Penelit. dan Penerapan Teknol. Sist. Inf.*, vol. 3, no. 1, p. 54, 2019.

[13]   Y. Rizki, "Markerless Augmented Reality Pada Perangkat Android," *J. Tek. Elektro*, vol. 4, no. August, pp. 1–10, 2012.

[14]   G. W. Sasmito, "Penerapan Metode Waterfall Pada Desain Sistem Informasi Geografis Industri Kabupaten Tegal," *J. Inform. Pengemb. IT*, vol. 2, no. 1, pp. 6–12, 2017.

[15]   Wahana Komputer, *Membangun Aplikasi Mobile Cross Platform dengan Phonegap*. Gramedia, 2014.