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Computer Hardware Teaching Media Application Based On 3d Augmented Reality with Android Operating System

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ABSTRACT

The background of this study is the advance of game technology especially *Augmented Reality* that triggers the researcher to combine it with education science in order to make   applicable teaching media application. The purpose of this study is to make teaching media application of 3D hardware introduction that can be applied in vocational schools and colleges. The application is built by using *Augmented Reality* technology, 3D Max and Android operating system. This application   is also developed based on Multimedia Development Life Cycle (MDLC) and using software Autodesk 3ds Max 8, Android SDK, Vuforia SDK 5-0-10 and Unity 5.2.4f. The result of the application examination shows: (1) This study has succeeded in making 3D computer hardware introduction application using Android-base *augmented reality* with Multimedia Development Life Cycle(MDLC), (2) This application needs adequate light in order to detect *marker* and display 3D object, (3) The marker detection distance and the displayed object is around 5-45 cm, (4) The color of *marker* does not affect the marker being used, (5) This application can only detect when the marker picture is in proportional scale (6) This application can run well on different kinds of android smartphone.

Keywords: — Augmented Reality, Marker, 3D Hardware.

I.   INTRODUCTION

Game and animation technology advance, this due to the need of 3D world which demands good quality to build a more real *virtual world* in daily life, in entertainment world, medical, military training, robotic engineering and even education world. To increase students' grade and interest, a more interactive and applicable teaching media is needed. *Augmented Reality* is technology which combines abstract object of two or three dimensions into a three dimensional reality then projects the abstract objects in a real time. Unlike abstract reality that fully substitutes reality; Augmented Reality only adds or completes the reality. Augmented Reality technology would be a more interactive teaching media if it is combined with Android Smartphone technology so that it can be used anytime and anywhere.

II.   RESEARCH METHODOLOGY

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A. 3D

3 Dimension (3D) is appearance of picture or object that can be seen from some angles or object which has volume of thickness. If it is seen from coordinate, 3D has three axis namely axis X, axis Y and axis Z. The examples of 3D objects are cube, block, triangular pyramid etc. [1]

B. Hardware

Hardware is tool in a computer system that can be seen/feel physically [2]

C. Augmented Reality (AR)

According to Azuma in Riyanto and Singgih   Augmented Reality (AR) is technology which combines abstract object of two dimensions and three dimensions into reality then projects the abstract objects real time. [3]

D. Marker

Marker is a simple symbol shaped black box and is used as pointer/marker. This pointer/marker functions to present three dimensional objects that is read using webcam. [4]

E. Android

According to Hermawan S.   Android is an operating system that is developed for Linux-base mobile devices. [5] While according to Safaat Android is an operating system for *mobile* software based on Linux that includes operating system, *middleware* and application.[6]

F. Multimedia Development Life Cycle (MDLC)

According to Sutopo, A. H, in Riyanto and Singgih Multimedia Development Life Cycle consists of six stages; *Concept, Design, Material Collecting, Assembly, Testing, and Distribution.*[7]

G. Autodesk 3ds Max

3ds Max is software specialized in three dimension design or to make 3 dimension animations. [8]

H. Methodology

This research uses system development methodology which aims to increase and to make effective the existing system. The steps taken in this new system is by doing data-need analysis, data collecting, designing by using MDLC design, implementing the design into 3d Object Design, User Interface, input design, output design and implementation into Augmented Reality with Android operating system.

I. 3D Object Design

1) *Input device: scanner, joystick, touchpad, keyboard, mouse*
2) *Process device : VGA card (video graphic array), motherboard, ram (random access memory), processor*
3) *Output device : projector, speaker, printer, LCD*
4) *Storage device : hardisk, CD/DVD, floppy disk, flash disk*

J. User Interface Design

User interface is part where communication between user and system happens in order to make user in ease in understanding and using the system.

K. MDLC Model

The method used to solve problem in this research is Multimedia Development Lifecycle (MDLC).
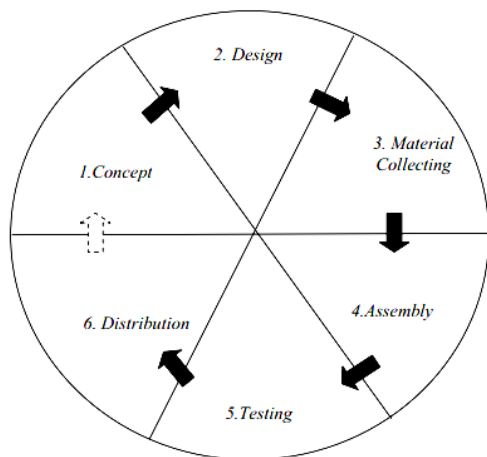
Picture 1: *Development Life Cycle* (MDLC)

III. RESULT AND DISCUSSION

A. Teaching Media Application

Picture 2: the appearance of User Interface

Start menu used by user to operate this application such as: *how to play, what is AR (Augmented Reality), get marker, about,* and *exit* button *and* also *learn* and *play.*

B. System Testing Result

Black-Box Testing Technique is used to find out the testing result. The input and the output are tested. Different inputs are given to find out if the system gives expected result.

TABLE 1
RESULT ON TESTING OF LIGHTING

No	Light Source	remark
1	Daylight in open space	detected
2	Daylight in room of Education of Computer and Information Technology Study Program	detected
3	At night with light from lamp	detected
4	At night with moon light	Not detected

TABLE 2
RESULT ON TESTING OF MARKER DETECTION RANGE

No	Marker	Marker Detection Range (Cm)						
		5	10	20	30	35	45	>50
1	*Mouse*	√	√	√	√	√	√	-
2	*Keyboard*	√	√	√	√	√	√	-
3	*Touchpad*	√	√	√	√	√	√	-
4	*Processor*	√	√	√	√	√	√	-
5	*RAM (Random*	√	√	√	√	√	√	-

No									
	access Memory)								
6	*Motherboard*	√	√	√	√	√	√	-	
7	*VGA Card (Video Graphic Array)*	√	√	√	√	√	√	-	
8	*Power Supply*	√	√	√	√	√	√	-	
9	*Casing Unit*	√	√	√	√	√	√	-	
10	*Lcd Monitor*	√	√	√	√	√	√	-	
11	*Speaker*	√	√	√	√	√	√	-	
12	*Printer*	√	√	√	√	√	√	-	
13	*HarDisk*	√	√	√	√	√	√	-	
14	*Floppy Disk*	√	√	√	√	√	√	-	
15	*CD/DVD*	√	√	√	√	√	√	-	
16	*FlashDisk*	√	√	√	√	√	√	-	

TABLE 3
RESULT ON TESTING OF MARKER'S COLOR

No	Color	Detection
1	Colored/normal	detected
2	Grayscale	detected
3	Black & white	detected

TABLE 4
RESULT ON TESTING OF MARKER SCALE

No	Scale	Detection
1	Proportional	detected
2	Not proportional	Not detected

TABLE5
RESULT ON TESTING WITH DIFFERENT ANDROID SMARTPHONE

No	Brand	Specification	remark
1	Samsung Galaxy Tab 3 OS : 4.4.2 (Kit Kat)	CPU : Intel Atom Z2560, Dual-core 1.5 GHz Rear Camera : 5 MP	run
2	Asus Zenfone 2 OS : 5.0 (Lollipop)	CPU : Intel Atom Z3580 Quad-core 2.3 GHz Rear Camera : 13 MP	run
3	Acer Liquid Z220 OS : 5.0 (Lollipop)	CPU : Qualcomm Snapdragon 200, Dual-core 1.2 GHz Rear Camera : 5 MP	run

IV. CONCLUSION

This research has succeeded in making 3D computer hardware introduction application using Android-base *augmented reality* with Multimedia Development Life Cycle (MDLC). In the testing stage on lighting it can be concluded that this application needs adequate light in order to detect *marker* and display 3D object. In the stage of testing on marker detection range it can be concluded that this application can detect marker and display object in 5 cm - 45 cm, In the stage of testing of marker's color it can be concluded that marker's color does not affect the marker being used. In the stage of testing of marker scale it can be concluded that this application can only detect marker when the picture is in proportional marker. In the stage of testing with different kind of android smart phones it can be concluded that this application can run well with different kinds of android smart phones.

REFERENCES

[1]   Madcoms, 2005. *Membuat Desain Animasi 3D dengan Autocad 2010 dan 3D Studio MAX 6.* Yogyakarta : C.V Andi Offset.

[2]   Sutantan, Edhy, 2005.*Pengantar Teknologi Informasi*. Yoyakarta: Graha Ilmu

[3]   Jumaidi, Riko dan Timoty. 2012. *Rancang Bangun Katalog Rumah Pada Perumahan Berbasis Augmented Reality Menggunakan Banyak Marker Pada Satu Waktu*. STMIK MDP.

[4]   Riyanto dan Singgih S.R, 2015. *Pemanfaatan Augmented Realitypada Media Pembelajaran Interaktif Peredaran Planet*. STMIK AMIKOM Purwokerto.

[5]   Hermawan, Stepanus.2011. *Mudah Membuat Aplikasi Android*. Yogyakarta : C.V Andi Offset.

[6]   Safaat, Nazruddin. 2012.*Pemtogramaan Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android*. Bandung : Informatika.

[7]   Prahara, Aditya Yoga dan Hariguna Taqwa. 2010. *Rancang Bangun Game Pertempuran Lakon Wayang Sebagai Sarana Pengenalan Tokoh Pewayangan Indonesia*. STMIK Amikom Purwokereto.

[8]   Pranowo, Galih. 2010. *3D Studio Max 2010 Dasar dan Aplikasi*. Yogyakarta : C.V Andi Offset.

[9]   Nugraha, S.I dkk. 2010. *Pemanfaatan Augmented Reality Untuk Pembelajaran Pengenalan Alat Musik Piano*. Program Studi Sistem Komputer, Fakultas Teknik, Universitas Diponegoro.

[10] Sudarto, Ferry dkk.2014. *Executive Information System (Eis) Dalam Bidang Penjualandengan Metode Swot Pada Karinda Cafe Dan Resto*. STMIK AMIKOM Yogyakarta.