UTILIZATION OF AUGMENTED REALITY TECHNOLOGY MUSIC INSTRUMENT AND TRADITIONAL DANCE IN WEST JAVA AS INTRODUCTION TO ART AND CULTURE (CASE STUDY SAUNG ANGKLUNG UDJO)

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ABSTRACT

Art is everything created humans that contains elements of beauty and able to evoke feelings of others. Art has several branches, including the art of music and dance. In every region in Indonesia, events about arts and culture will be organized and coordinated by the Department of Tourism and Culture. One of their main functions is to introduce the local culture to the people. For a distinctive arts of West Java itself is set by the Department of Tourism and Culture of West Java. Based on interviews with Mr. Rowehandy as section head of the traditional art of Tourism and Culture of West Java, the introduction of West Java arts and culture to people still use the conventional method of the performing arts in some places. This study aimed to introduce the art of dance and musical instruments to the community of west Java by using Augmented Reality technology. Augmented Reality is interactive technology that is capable of projecting the virtual objects into real objects in real time. The output of this research is Android applications. Testing applications to the general public will be conducted at Saung Angklung Udjo. Visitors are asked to test the application by pointing the camera of the smartphone towards the marker that has been provided and then the application will display 3D objects together with sound and animation in accordance with the motion picture directed marker.

Key Word : Art, Department of Tourism and Culture, Augmented Reality, Android, Saung Angklung Udjo

1. INTRODUCTION

Art is everything created by humans that contains elements of beauty and able to evoke feelings of others. Art has several branches, including the art of music and dance. Indonesia as an archipelagic country is a nation which very rich in cultural diversity and art. Each region has a variety of different art that makes a unique and characteristic of each region in Indonesia. One is the typical art Sundanese originating from West Java province.

In every region of the regions in Indonesia official events on the arts will be organized and coordinated by the Department of Tourism and Culture. One of their main functions is to introduce the unique artistry while preserving their area to the wider community. For a typical art Sundanese itself regulated by the Department of Tourism and Culture of West Java Province.

Based on interviews with Mr. Rowehandy, S.Sn ,. MM as section head of the traditional art of Tourism and Culture of West Java Province. Culture and Tourism Department of West Java Province had a special agenda for introduce Sundanese culture to the people, as an example of the festival organizing arts (music, dance, theater, etc.) on a scheduled basis. But nowadays, Department of Tourism and Culture of West Java province only use technology for data collection or documentation of the results of their art show has been held. Documenting here include: data collection type of the arts in West Java, cultural etc. So its needed an another innovation to introduce the art of dance and musical instruments from West Java to the people by using Augmented Reality technology.

2. RESEARCH CONTENT

2.1 Research Method

In making this software, using the paradigm of the waterfall software, which includes several processes :

a. The definition of needs

   The entire software requirements must be obtained in this phase, including the expected utility software users and software limitations. In this study, there are two methods of data retrieval is a literature study and observation.

b. System design and software

   This stage is done before coding. This stage aims to provide an overview of what should be done and how it looks. This stage helps to specify the hardware and system requirements as well as defining the overall system architecture.

c. Implementation and testing unit

In this stage we do programming. Process to making software is split into small modules which will be incorporated in the next phase. In this stage also conducted checks on modules made, whether it meets the desired function or not.

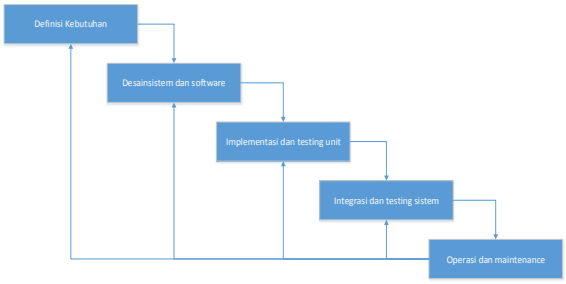
d. Integration and system testing

At this stage, the incorporation of modules that have been made and testing is performed to determine whether the software is made in accordance with the design and still has an error or not.

e. Operation and *maintenance*

This is the latest stage in the waterfall model. Software that has been executed and performed maintenance. Maintenance included in correcting errors that are not found in the previous step. Improve the implementation of the system unit and improvement of system services as new needs.

For more details waterfall model can be seen in the following figure:



Picture 1. Waterfall Model according Ian Sommerville

2.2 Art

Art is often interpreted with several meaning, and have a many meaning from several opinion.Originally the word "art" is an adjective that corresponds to the word "soft" in the sense as beautiful, thin, small, and so on. The art is then formed into a noun "art", but affix is removed. As a noun "art" get the sense of what is commonly known in the art such as music, art, tan, literary arts, visual arts and others. Definition commonly used in the art of deciphering them is beauty, expressions, feelings, imagination, intuition, expression and so forth. Various means are not by chance, but starting from the history of human civilization, which was then collected and be the reference society [1].

In general terms contained in the word art comes from art, which has a broad meaning, which is a result of human activity beautiful individually or in groups, high-quality in the concept and manufacture in producing something beautiful, something that carries aesthetic, a special skill in appearance. Thus there is an absolute need in the art is the expertise, skill, dexterity and skill. In addition to the description of a beautiful, beautiful self, which means beautiful, good, true, important, valuable and precious. Art is a kind of human work that can be found anywhere, so there is a variety of definitions. And a broad understanding then directed to the application of a skill to produce something beautiful, and evokes a sense of aesthetic tastes and trends.

2.2.1 Music

The term of music comes from the word Mousal from the Greek, the nine goddesses who mastered the art, pure arts and artistic knowledge.

Music is an art form whose medium is sound and silence. Common elements of music pitch: height of tone (which organize melody and harmony), rhythm (associated concepts tempo, meter, and articulation), dynamics, and the sonic qualities of timbre and texture. The word comes from the Greek (mousike; "art of the Muses") [2].

Another opinion states that music is a series of tones and speech as well as in ideals. Music was also due to the human voice or a musical instrument, while Parasita, gives the explanation of music is one of the human culture that is born of feeling and expression results in the form of greeting. Furthermore, according to Aristotle, quoted by Heni Nurhaeni, music has the ability to reconcile the hearts were depressed, have recreational therapy and foster patriotism.

Music is a series of tones that express thoughts, feelings, and expression of a person in certain situations, eg sad, happy, depressed, disappointed, and so forth. The tone sequence can be either a melody or can also be accompanied with a poem or a series of words that also contain literary value.

2.2.2 Dance

Dance is a form of imaginative statement contained through the unity of the symbols of movement, space, and time (Bambang Pudjasworo, 1982: 61). Dance in the realization always as a form of total integration of an imaginative patterns of movement, space, and time can be seen with the naked eye. Forms of total integration between imaginative patterns with a pattern of invisible it can be said that dance is a form of expression statements (psychic), a statement of illusion, and is a rational form of human expression. Motion, space, and time is presented as a whole unit representatives [3]. The basic concept of the universal dance is movement, space, and time.

In social life there are some other functions of dance, such as:

1. Medium of Religious and Traditional Ceremony

In religious life, since the first human use of dance as a means of communicating with God. Usually dance is used as a means of religious is sacred. In Bali there are religious dances as a means of communication with the gods and ancestors. This dance is usually performed in Ostensibly. Example dance namely, Sang Hyang, Kecak, Kris, Rejang. The dance is usually used as a traditional ceremony is divided into two, namely:

a. Natural events

Dance ceremonies that are natural are usually associated with natural events. An example is the rice planting ceremonial dances, dances for soil fertility / for rain, the harvest of rice, for safety and starting reinforcements. The dances are: Dance Ngaseuk (growing rice) from West Java, Dancing Seblang (rice crop) of East Java, Dancing Fisherman (ask for safety when sailing) from Irian Jaya.

b. Life events

Dance ceremonies on life events commonly associated with human life. An example is the events marriages, births, circumcisions until death. The dances are: Dance Sisingaan (circumcision ceremony) from West Java, Dancing Wolane (marriage ceremony) of Maluku, Dancing Holana (welcomed the birth of a baby) from NTT and Dance Ngaben (funerals) from Bali

2. As a Medium of Society

Humans are social animals that require interaction with other individuals to emerge familiarity. To get the atmosphere of intimacy, human beings need a vehicle. One of those tools is dance association. Social dance is a type of dance that is intended to express the harmony of society. One of the clearest examples of social dance that Jaipongan dance where dancers and the audience can dance together on one stage. Another example is from East Java is Tayub Dance, Adu Jago Dance from Surabaya and Manduda Dance from West Sumatra.

3. As a Show or Performances

The final function of the art of dance is as a spectacle or show. Almost every area of the archipelago have a dance spectacle. Dance spectacle or show is a kind of dance that were presented as mere entertainment. Expected spectators who witnessed this dance will be comforted.

2.3 Augmented Reality

Augmented reality is a new technology which involves the part of computer graphics in the real world [4]. According to Ronald Azuma AR is combines the real and virtual world, nature interactive in real time, and a 3D animation. Paul Milgram and Fumio Kishino in 1994, defines Milgram's Reality-Virtuality Continuum. They describe a continuum that runs from the real environment to a pure virtual environment. They conclude that AR is closer to the real world and augmented virtuality closer to the virtual world.

In application Augmented reality has several components that must exist tosupport the performance of image processing digital. R. Silva, J explain the components are as follows:

a. Scene Generator

Scene Generator is a component that is in charge of rendering images captured by the camera. Virtual objects to be captured and then processed so that the object can then be displayed

b. Tracking System

Tracking system is a component of the The most important in Augmented Reality. In the process tracking done a detection object pattern virtual to the real object so in sync between both in terms of virtual projection with real projection must be equal or nearly equal to affect the validity of the results to be obtained.

c. Display

In the construction of an AR-based systems where the system combines the virtual world and the real world there are some fundamental parameters that need to be considered, namely optics and video technology. Both have a relationship that depends on factors resolution, flexibility, point of view, tracking area. There are limitations in the development of Augmented Reality technology in the process of displaying objects. Among them are to be no limit lighting, screen resolution, and image illumination differences between virtual and real images.

d. AR Devices

There are several types of media that can digunakanuntuk display objects based Augmented reality is by using optical, virtual retinal system, video viewer, monitor-based AR and AR-based projectors.

2.4 Vuforia Qualcomm

Vuforia Qualcomm is a library that is used to support the augmented reality on the android operating system. Vuforia analyze the images using marker-detection and generate 3D information of a marker that has been detected via the API. Programmers can also use it to build a virtual 3D objects on the camera.

Some of the advantages gained when developing applications using vuforia, including:

a. Local target detection faster
b. Tracking is strong and not easily lost when the device is moved
c. Better results in low light conditions
d. Optimization ensures better graphics and more realistic when rendering

e. Simultaneous tracking of up to five targets

As concrete examples of making 3D objects using vuforia is as shown in Picture 2



Picture 2. 3D Car Object

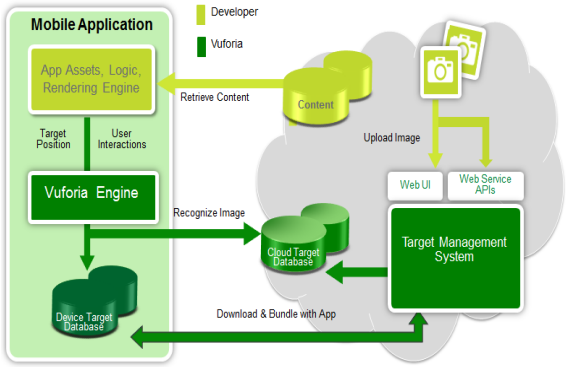
Picture 2 is the development of applications using Qualcomm AR platform. The platform consists of two components which are:

1. Target Management System

Allow developers to upload images that are registered by the marker and then downloading the target image to be displayed.

2. QCAR SDK Vuforia

Allow developers to make the connection between the applications that have been created with a static library, for example libQCAR.so on android.



Gambar 3. Library QCAR SDK

Picture 3 provides an overview of application development with Qualcomm AR platform. The platform consists of QCAR SDK and Target Management System developed in QdevNet portal. Users upload images inputs for the targets to be used as a marker and then download the resource targets, which dipackage with the app. QCAR SDK provides an object that is divided libQCAR.so that should be associated with the app.

2.5 Unity 3D

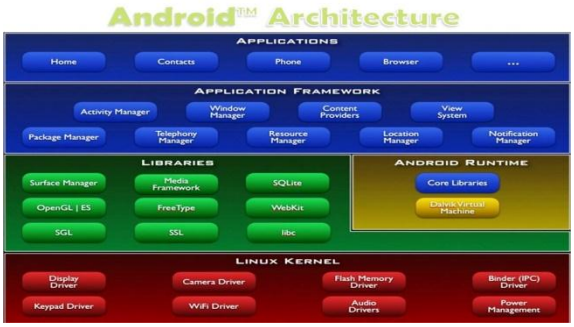
Unity Engine is a game engine that keeps evolving. This engine is one of game engine with a proprietary license, but for a development license is divided into two, namely free (free) and paid the appropriate target device application development.

Unity does not restrict the publication of the application, users unity with a free license can publish applications created without having to pay licensing fees or royalties to unity. But the use of limited free version with some features that reduced or bonus modules / prefab certain retired and is only available to paid users.

2.6 Android

Android is an operating system for mobile devices that includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications Initially, Google Inc. bought Android Inc. who is a newcomer to the software maker for mobile phones / smartphones formed the Open Handset Alliance (OHA) At the inaugural release of Android, 5 November 2007, along with OHA Android states support the development of open source on mobile devices.

Android is not just a smartphone operating system, but also become a major competitor of Apple in the Tablet PC operating system. The rapid growth of Android as an open source operating system that freely distributed and used by any vendor Moreover android platform is complete, both the operating system, application and tool development, android app market, as well as very high support from the open source community. Here architecture of Android as in picture 4

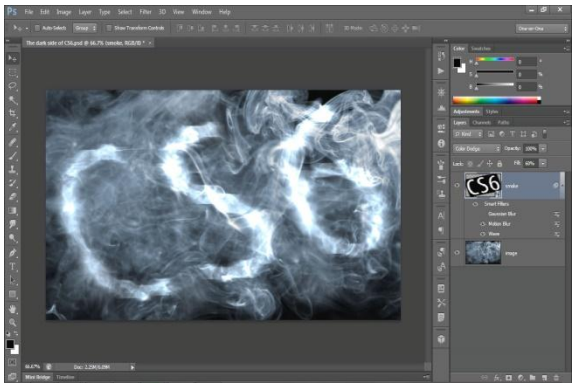


Picture 4. Android Architecture

2.7 Adobe Photoshop

Adobe Photoshop is an advanced software that can be used to create, edit and manipulate the display including color correcting and giving effect to see on a picture or photo. The results of the program Adobe Photoshop is an image or images in computer graphics program is divided into two groups, namely bitmap and vector images (Madcoms, 2005).

Adobe Photoshop is a graphics software-based bitmap (pixel), which is used for editing photos, creating illustrations and even web design. So widely used in photo studio, printing, production house, architectural firm, textile factories, and fields related to Information Technology.



Picture 5. Adobe Photoshop Main Page

2.8 System Analysis

System analysis is the decomposition of a complete information system into its component parts which are intended to identify and evaluate all the problems and barriers that occur and needs expected to be a reference to his proposed improvements. Systems analysis phase is very important because if an error occurs in this stage will result in errors at a later stage, it is necessary for the level of precision and accuracy high to be able to get good quality work system.

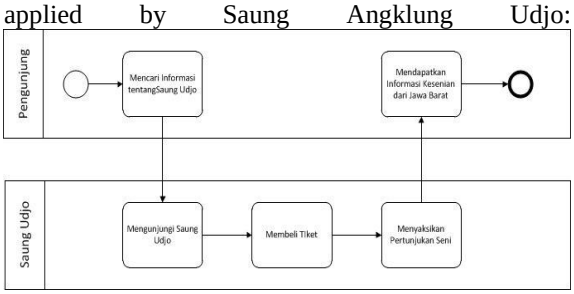
2.9 Analysis of the Problem

Analysis of the problem is the stage of elaboration of the problems that exist before the application is built and aims to help the development of this application. Analysis of existing problems include the following:

1. Introduction West Java arts to people still use the conventional method of the performing arts in some places one at Saung Angklung Udjo. So people should come to the venue directly.
2. Still the lack of use of technology in the process of introducing the arts to the public. The use of technology is still limited to only the data collection and documentation of art events are held.

2.8 Analisis Sistem yang sedang berjalan

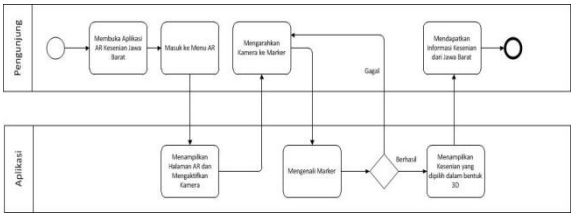
Analysis of the current system is analyzing the activity of work procedures that occur in existing systems. Working procedure in question is the process of introducing the public to the arts of West Java. Due to the introduction of this application to the public will be conducted at Saung Angklung Udjo, then we take the business processes of Saung Angklung Udjo as a comparison. Here are the business processes of the procedures currently applied by Saung Angklung Udjo:



Picture 6. Business Processing from Saung Angklung Udjo

2.9 Analisis Aplikasi yang Akan Dibangun

The applications will be built using Augmented Reality technology. AR technology requires a marker as its medium to bring up images of 3D animation. Business processes can be seen in Picture7



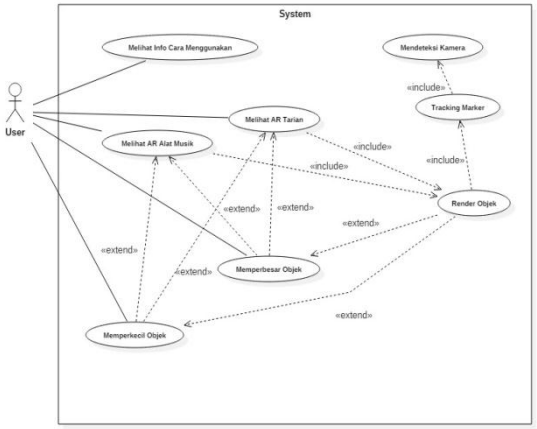
Picture 7. Business Processing from Application that will built

2.10 Functional Requirement Analysis

In this functional requirement analysis, used the concept of Object Oriented Programming. Analysis of functional requirements is modeled using UML (Unified Modeling Language).

2.10.1 *Use Case Diagram*

Use case is the construction to describe how the system looks in the eyes of the user [5]. Target of use case modeling is to define the needs of the functional and operational use of the system by definingscenario.



Picture 8. *Use Case Diagram*

2.10.2 *Use Case Identification*

The following table identifying the use cases presented in the applications:

Table 1. *Use Case Identification*

No	Use Case	Deskripsi
1	View How to Use	functionality to display the information how to use the application
2	View AR Music Instrument	functionality to view 3D objects in the form of a musical instrument
3	View AR Dance	functionality to view 3D objects in the form of dance
4	Detecting Camera	functionality detect the presence of the camera
5	Tracking Marker	functionality to detect the presence or identify marker
6	Object Render	functionality for displaying objects to the screen
7	Enlarge Object	functionality is to enlarge the size of the object
8	Minimize Object	functionality to minimize the size of the object

2.11 System Implementation

Once the system is analyzed and designed in detail, then the next will be towards the implementation phase. The purpose is to confirm the implementation of the program module design on the perpetrators of the system so that the user can provide input to the system builder.

2.11.1 Hardware Implementation

The hardware required to implement Augmented Reality Application of Music Arts and Dance Typical West Java can be seen in the following table:

Table 2. Hardware Implementation

Num.	Hardware	Specification
1	Processor	1,5 Ghz
2	Screen	Touchscreen
3	Memory RAM	2 GB
4	Camera	8 MP

2.11.2 Software Implementation

The software needed to implement Augmented Reality Application of Music Arts and Dance Typical West Java can be seen in the following table:

Table 3. Software Implementation

Num.	Software	Spesifikasi
1	Android Operating System	OS Android 4.0

2.11.3 Interface Implementation

Implementation of the interface is a display-interface on Augmented Reality Applications of Music Arts and Dance Typical West Java. Here is a list of interface

Table 4. Interface Implementation

No.	Menu	Deskripsi
1	Splash Screen	The Animation Screen before enter the main menu
2	Main Menu	Main page of the application. This page contains instructions for using the application as well as buttons to go to AR Music Instrument Menu, AR Dance Menu and Exit.
3	AR Music Instrument Menu	To display 3D objects of Musical Instruments
4	AR Dance Menu	To display 3D objects of Dance

2.12 System Testing

Testing of the system is the most important thing that aims to discover errors in the software being tested. The test aims to determine the software that made already meet the criteria in accordance with the purpose of designing the software.

2.12.1 Plan of Testing

The first step is Alpha Testing focusing on the functionality of the software that is built using black box testing methods. The second stage of Beta testing will focus on the assessment of software that is built, data collection method is to do a questionnaire to the 30-man visitors Saung Angklung Udjo.

2.12.2 Alpha Testing

In Alpha testing methods to be used are black box testing methods. Black box testing focuses on functional requirements of software consisting of test scenarios, case and test results, and the conclusion of testing.

2.12.2.1 Alpha Testing Scenario

Alpha testing is focused on the functional requirements of software built. Plan of testing can be seen in the following table

Table 5. Alpha Testing Scenario

Menu	Butir Uji	Jenis Pengujian
Main Menu	Choosing AR Button Music Instrument	*Black-Box*
	Choosing AR Button Dance	*Black-Box*

	Selecting Exit Button App	*Black-Box*
AR Music Instrument Menu	The camera panned towards marker	*Black-Box*
	Turning on Flash	*Black-Box*
	Enlarge 3D Object	*Black-Box*
	Minimize 3D Object	*Black-Box*
	Selecting the back button	*Black-Box*
AR Dance Menu	The camera panned towards marker	*Black-Box*
	Turning on Flash	*Black-Box*
	Enlarge 3D Object	*Black-Box*
	3D Object far	*Black-Box*
	Selecting the back button	*Black-Box*

2.12.2.2 Alpha Testing Conclusion

Based on the results of testing with test samples that have been done to the conclusion that the testing process is done is correct. Filtering processing errors in the form of landing page display messages is fairly maximum. Functional system can already produce the expected output.

2.12.3 Beta Testing

Beta testing is testing conducted objectively, where testing is done directly in the study. Beta testing is done by giving questionnaires to 30 visitors from Saung Angklung Udjo.

2.12.3.1 Beta Testing Questioner

Questioner of beta testing a questionnaire given to visitors Saung Angklung Udjo as a correspondent and user applications. From the results of the questionnaire will be calculated so that it can be asserted against the assessment of the implementation of applications that are built. This questionnaire consists of 5 questions using a Likert scale of 1 to 5 scale.

Likert scale is a psychometric response scale is mainly used in the questionnaire to obtain the preferences of respondents on a statement or series of reports. Likert scale is a non-comparative scale engineering and unidimensional measure that is only a single trait. Respondents were forced to indicate their level of agreement on a statement using an ordinal scale [6].

2.12.3.2 Questioner Conclusion

Based on the results of beta testing the questioner, it can be concluded some conclusions as follows:

1. Augmented Reality Application of Music Arts and Dance Typical West Java has an attractive user interface
2. Application of Augmented Reality Music Arts and Dance Typical West Java is easy to use
3. Augmented Reality Application of Music Arts and Dance Typical West Java interactive
4. Application of Augmented Reality Music Arts and Dance Typical West Java is easy for people to obtain information about the arts of West Java
5. 3D Object displayed in Augmented Reality Applications of Music Arts and Dance Typical West Java is already attracting

3. CLOSING

Based on test results obtained from studies conducted in the preparation of this thesis as well as referring to the purpose of the study that has been created, it can be concluded that:

1. This app can help visitors learn more about the art of musical instruments and dance of West Java with the concept of Augmented Reality
2. Based on the analysis of Alpha testing, this application has berajalan well and can display 3D objects along with animated motion and sound of the 3D objects, either in the form of musical instruments and dance
3. The marker detection process is highly dependent on the focus of the camera and the lighting used for the marker would be difficult to detect when the lighting used is too dark or too bright.

The advice given in order that future Augmented Reality Application of Music Arts and Dance Typical West Java can be better, namely:

1. The Info menu is displayed in multiple languages or English language menu plus for visitors Saung Angklung Udjo not only from the local visitors but also international
2. Objects 3D display can be added again, not only limited to only 15 objects
3. AR Dance Menu and AR Musical Instruments Menu should be merged because the functionality is the same just different kinds of objects that are displayed. So the more impressed applications simple.

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