# *DEVELOPMENT OF AUGMENTED REALITY APPLICATION TO SIMULATE FURNITURE SET INTERIOR DESIGN IN CV. BOXES SYSTEM*

Kusmayana Rahman[1], Hanhan Maulana[2]
[1,2]Informatika - Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
E-mail : kusmayanarahman@gmail.com[1]

## *ABSTRACT*

*CV. Boxes System is a company engaged in the sale of furniture. This type of furniture sold by CV. Boxes System that is in the form of furniture set like kitchenset, bedroomset, wardrobe and tv cabinet. In the process of ordering furniture made by officer marketing has some problems among them in introducing a model of furniture that only use catalogs, thus making the attendant marketing having trouble explaining the existing furniture in the model catalog, model design using furnitrue drawing paper, so it takes quite a long time and is rather troublesome memodelkannya, as well as with a number of orders in the orders report this will be prone to error in giving the order report , so as to make the production process being hampered. Of the problem then will be built an android-based applications with Augmented Reality Technology and websites, so be the solution of existing problems. Based on the results of the interview noted that the existence of this application can help in improving the marketing officer of the booking process, as well as the furniture in the desired model using this augmented reality technology can simulate with look real, it can also help in submitting data ordering furniture reduce errors in reports to order.*

***Keywords :*** *Augmented Reality, Design, Furniture, Objects, Interior.*

## *1. INTRODUCTION*

*CV. Boxes System is a company engaged in the sale of furniture bediri since year 2006. This type of furniture sold by CV. Boxes System that is in the form of furniture set like kitchenset, bedroomset, wardrobe and tv cabinet. Sales of furniture from CV. Boxes Sytem that is to accept bookings from kosnumen which will be produced by CV Boxes System complies with the furniture diingnkan by consumers, in this order process is conducted by the officer came to the House of marketing with consumers to ensure that the furniture will be in order.*

*After doing an interview with Mr. sarnubi as the head of the leadership of marketing, in the process of ordering furniture made by officer marketing, there is a problem, where the problem was at the time the attendant marketing will introduce furniture products that aims so that consumers can choose furniture that will be dipesanannya. Currently, officers in introducing the furniture marketing to consumers only use catalogs. However the example model furnitre that exists in the catalog does not describe the children's furniture models section in detail, so that the attendant marketing have difficulty in explaining the furniture models exist in the catalog. Other Malasah are not uncommon from consumers in pesananannya want to choose model furnitrue in different colors as well as adjust the placement of the wish furnitrue who will be booked with the Conservatory, the officer will conduct a marketing measurement and model design using furnitrue drawing paper, so the model design furnitrue using paper this image proved less effective. Another problem of this company is with the number of orders and in orders report is prone to error at the time of providing reports of orders so as to make the production process being hampered.*

*Based on the problem then it needs an application to help officer marketing introduced furniture in detail to the consumer and the consumer can choose furniture models in different colors as well as adjust the placement of the desired furnitrue in real-time using the tech Augmented Reality. In addition to reducing kesalahn reports on the order orders can be produced immediately on the order reports can be viewed through the website by the production. So the authors raised the title "development of Augmented Reality Applications to simulate Interior Design Furniture Set in CV Boxes System".*

### *1.2 Purpose and Objectives*

*The purpose of this research was to build an application using an android-based Augmented Reality technology to help officers marketing on the booking process, in addition to help Parties report information by viewing the production order through the website.*

*As for the goal that will be achieved from this research are :*

1. *Help officer merketing in introducing a model of a three-dimensional object with furniture to consumers so that the officer can easily explain the marketing model of the furniture.*

2. *Help officer marketing model furniture to meet the desires of consumers in determining the placement of the furniture in the room in real-time using the technology of Augmented Reality.*
3. *Help in managing their marketing officers report orders to reduce errors at the time of giving the order to the production of the report.*

## *2. ISI MAKALAH*

### 2.1 *Augmented Reality*

*Augmented Reality (AR) is a term for an environment that combines real world and virtual world created by the computer so that the boundary between the two becomes very thin. Ronald Azuma in 1997 mendenisikan Augmented Reality as a system that has the following characteristics:*

1. *Combining real and virtual environments*
2. *Run interactively in real time*
3. *Integration in three dimensions (3D)*

*AR is a variation of the Virtual Environments (VE), or more commonly known by the term Virtual Reality (VR). Create user VE technology incorporated in a virtual environment as a whole. When incorporated in these environments, users can not see the real environment in the vicinity. In contrast, AR allows users to see the real environment, with virtual objects that are added or incorporated with the real environment. Unlike VR which completely replaces the real environment, AR simply add or complement the real environment.*

*The main purpose of the AR is to create new environments by combining real and virtual environment interactivity so users feel that the environment that was created was real. [12]*

### 2.2 *Workflow Augmented Reality*

*Augmented Reality workflow generally starts from shooting marker with a camera or webcam. The marker identified by featured, then entered into the tracker object (the object being tracked) that is provided by the Software Development Kit (SDK). On the other hand, the marker have been registered and stored into the database. The next object tracker will track and match the marker so that it can display the appropriate information. The output tracking marker immediately displayed into a computer screen and screen smartphones. The displayed information is attached to the marker in question in real time. [13]*

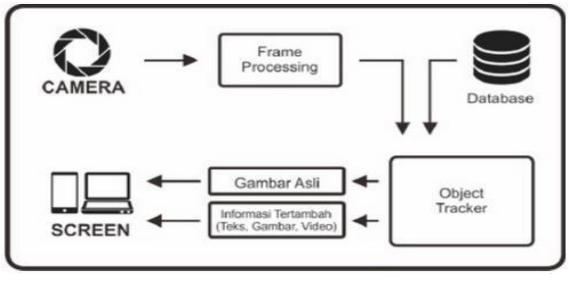



***Figure 1.*** *Augmented Reality Workflow*

### *2.3 Marker Based Tracking*

*Marker is a pattern that is made in the form of images that will be recognized by the webcam. Pendefinisi serves as a marker of Augmented Reality. Marker information will be used to define and display an object of Augmented reality. Marker is also the picture of border outline and pattern image as shown in the following figure.*

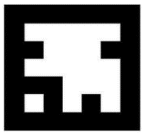


***Figure 2.*** *Example Marker*

*Marker is usually a square black and white illustrations with thick black and white background. The computer will recognize the position and orientation of the marker and creates a 3D virtual world that is the point (0, 0, 0) and 3 axis i.e. X, Y, and z. Way of making a simple pun, but must note the thickness of the Marker to be created, the thickness of Marker do not less than 25% of the length of the line edges so that by the time the process of detection of the Marker can be more accurate. While the color white as the background object, which will be used as the objects that will be rendered. [13]*

### *2.4 Android*

*Android is an operating system for cell phones are Linux-based. Android provides an open platform for developers create create their own applications to be used by a variety of mobile device. Initially, Google Inc. bought Android Inc., a newcomer to create software for mobile phones. Then to develop Android, an Open Handset Alliance, a consortium of 34 corporations hardware, software, and telecommunications, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and Nvidia. At the time of the release of Prime Android, November 5, 2007, along with the Open Handset Alliance Android States support the development of open standard (open source) on a mobile device. On the other hand, Google released the code – Android code under the Apache license, a free software license and open standard mobile device. There are two types of distributors operating system Android, first got full support from Google or Google Mail Services (GMS) and the second is right – free distribution without the direct support of Google or known as the Open Handset Distribution (OHD). [17]*

### *2.5 Discussion*

*Development of Augmented Reality Applications to simulate Interior Design Furniture Set in CV Boxes System is an application that can help officers marketing on the booking process with the application to be built is an android-based applications and website now on android*

*applications that use the technology of augmented reality. Augmented reality technology was chosen because it has several advantages, one of which is this technology can display three-dimensional objects in real-time, so that it becomes the solution to a problem that can help in the process of marketing officers ordering furniture by introducing examples of furniture products in detail to the consumer in order to ensure furniture fits your wishes and consumers can determine the placing to adjust to his room as well as the attendant marketing reports from furniture that had been ordered by the consumer , as well as on the website of the parties can view reports production orders that have been sent by the attendant marketing so that furniture can be produced. As for the applications to be built three dimensional objects and require a marker as the major needs in applications of augmented reality to be built.*

*In showing objects augmented reality based marker methods used with object tracking techniques. The process object tracking used help from Library Vuforia SDK. Vuforia SDK library was chosen because the library has an excess of komputasinya is very quick in detecting an object, because it is only dependent on the number of features that are present in a target object.*

### *2.6 System Architecture*

*System architecture aims to identify the architecture to be built based on two android-based application subsystem using augmented reality technology and website.*

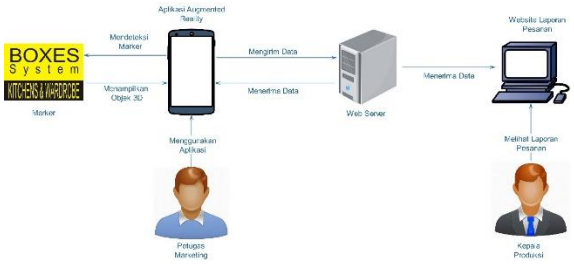



***Figure 3 System Architecture***

*The following is a description of the architecture of the system to be built :*

1. *Marketing officer with applications of augmented reality.*
2. *Application of detect marker.*
3. *The application displays a three-dimensional object after the marker is detected.*
4. *The application can send report data to the web server order.*
5. *The application can receive data report orders.*
6. *The head of the production order view reports through the website report orders.*
7. *Order report website can receive data from a web server.*

### *2.7 Data Needs*

*Need data on the application to simulate the interior design is by utilizing the technology of augmented reality. Where the required input data, among others, in the form of a three-dimensional object and marker as the main input in the application. On augmented reality, the application process will bring up a three dimensional objects if the application detects the marker that is directed on the camera, so that this application requires an input image taken in real-time using input devices, namely in the form of a camera.*

#### *2.7.1 Modeling Of Three Dimensional Objects*

*modeling of three dimensional objects is modelling stage the three dimensional object based on the data products from the catalogue. where is the three dimensional object model that will be created is a model Kitchenset, Wardrobe, TV Cabinet with Bedroomset tools used is SketchUp. Here is one example of modeling three-dimensional object model in applications that will be built.*

1. *Stages of a three dimensional object model is created based on the catalog of bedroomset there are three dimensional object model cabinets, mattresses, shelves and dressers. Beriut is a result of modeling bedroomset.*

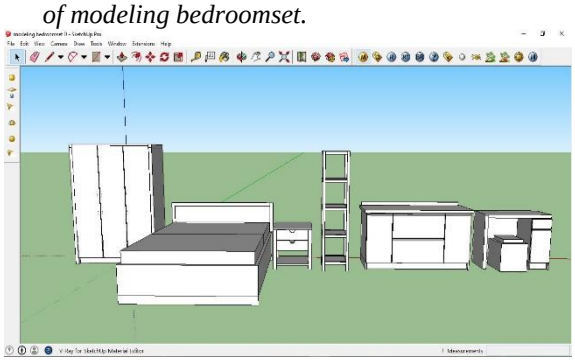


***Figure 4.*** *Modeling Bedroomset*

2. *give the texture on the object based on the catalog of bedroomset. Following are the results of the teksturing model bedroomset.*

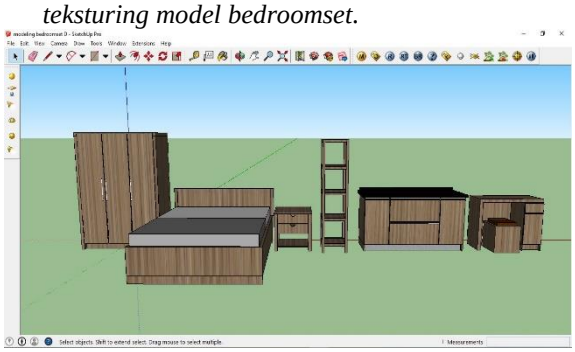


***Figure 5.*** *Texsuring Model Bedroomset*

3. *Then at this stage will be performed on the object rendering. Following are the results of rendering model bedroomset.*



***Figure 6.*** *Rendering Model Bedroomset*

### *2.7.2 Analysis Of Marker*

*In this application, the marker that is used in the form of company logo image CV Boxes System, where on the marker in the process augmented reality displays three-dimensional objects. This aims to improve the quality of companies from the booking process conducted by officers of the marketing. The following is an example of a marker that will be created can be seen in Figure 7.*




***Figure 7.*** *Marker*

### *2.7.3 Making Of Marker*

*Making of marker is the process of taking pictures as data input that will be used as marker data marker used is the company logo of CV. Boxes System. Here are the stages of making the marker which is done in the web API vuforia.*

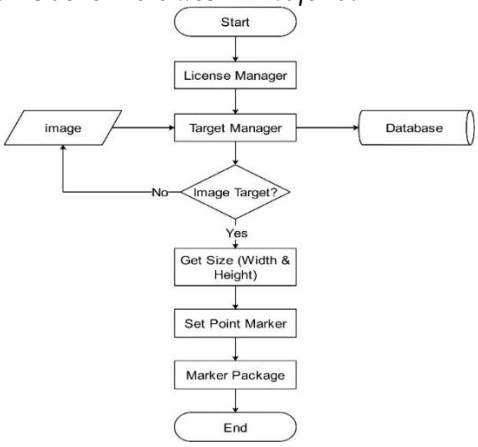



***Figure 8.*** *Stages Of Manufacture Marker*

*The process of making an image marker be done by marker Vuforia by getting lecense managaer, then upload the image to be modified through the target as a marker manager engine API provided by Vuforia. After the image is uploaded it will be tersipan in the database as dataset files treacking, megubah height and width size of the marker to get set point so that the marker pendetksian marker can be quickly processed by the system. Generates a file with the unitypackage file format then made entries on Unity3D to detect images that serve as a marker.*

### *2.7.4 Augmented Reality*

*Augmented reality is the application to be built, by utilizing the technology of augmented reality is how the process of combining three-dimensional objects with the real world using a marker. Overall, the process of augmented reality, starting from an already calibrated camera will detect a given marker. Then after recognizing and marking pattern marker, the camera will do the checking of whether the marker is detected in accordance with the data marker that is owned by the application. If not, then a three-dimensional object will not be shown, but when appropriate then a three-dimensional object will be displayed at the top of the marker. In this research process stages built augmented reality application is divided into stages that can be seen in the following*

.

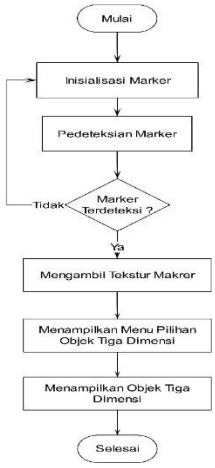



***Figure 9.*** *Stage Analysis Of Augmented Reality*

*In Augmented Reality, marker is one of important components. The determination of the type of marker is influential to the workings of the Augmented Reality application to read marker and display three-dimensional objects, as for the introduction of tracking marker has several stages. In outline there are three main parts, namely :*

1. *Initial Marker.*
2. *Detection Of The Marker.*
3. *Displays Objects In Augmented Reality.*

### *2.7.5 Initial Marker*

*At this stage the application of Augmented Reality will do the initial marker. After that the application will be connected with the camera through a process of detection of marker. Then the application will perform the initial variable initialization is used to accommodate temporary*

*marker, status checking, as well as variable information that will be displayed. Here is one example of a marker that is used can be seen in Figure 10.*




***Figure 10.*** *Example Marker That Is Used*

### *2.7.6 Detection Marker*

*NFT (Natural feature Tracking) is a method used in Qualcomm's Vuforia Library to detect the presence of the marker or images. Before doing the pendektesian features that are present in the image, first conducted the process of identification marker. Identification of marker is to capture the image captured by the camera. The images obtained are considered marker regardless or no actual marker on the image. After marker retrieved then the next process is to change the marker becomes grayish grayscale or process. This process is done to facilitate the detection of features on the marker. A marker has been changed into a grayish then detected features using the method of NFT. Examples of process detection feature can be seen in Figure 11.*




***Figure 11.*** *Process Detection Features Marker*

*As for the components in the process of detection features are as follows:*

1. *Trackable Type*

a) *UNKNOWN_TYPE : Tracking that is unknown.*
b) *IMAGE_TARGET : Tracking based on image*
c) *MULTI_TARGET : Merge tracking*
d) *MARKER : Marker tracking*

2. *Trackable Name*

*Trackable function Name is used to find out the name of ImageTarget detected by camera*

.

3. *Trackable Status*

*Trackable The status is used to find out the status of a camera being detected imageTarget whether or not. Different status are tracked can be one of the following :*

a) *UNKNOWN : a place or location tracking that is unknown is usually refunded before tracker initialization.*
b) *UNDEFINE : a place or location tracking is not defined.*
c) *NOT_FOUND : a place or location is not ditemuan on the destination database.*
d) *DETECTED : a place or location tracking is detected in the frame.*
e) *TRACKED : tracking has been detected in the frame.*

### *2.7.7 Displays Objects In Augmented Reality*

*The results matching the target objects that have been done on the process before becoming a data reference object to display Augmented reality that corresponds to the target object data in the database. Library Vuforia SDK provides functions to display the objects in Augmented reality. The application will display the object of augmented reality in the form of a three dimensional object corresponds to an existing target object data in the database file tracking. Following the design of three-dimensional objects on a display image target can be seen in Figure 12.*

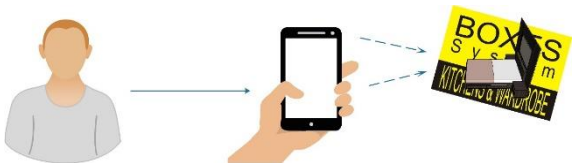


***Figure 12.*** *Displays Objects In Augmented Reality*

### *2.7.8 Use Case Diagram*

*Use Case Diagram is a construction to describe relationships that occur between actors with activities that are present in the system. From the analysis of the existing application users then use case diagrams seen on the picture below.*

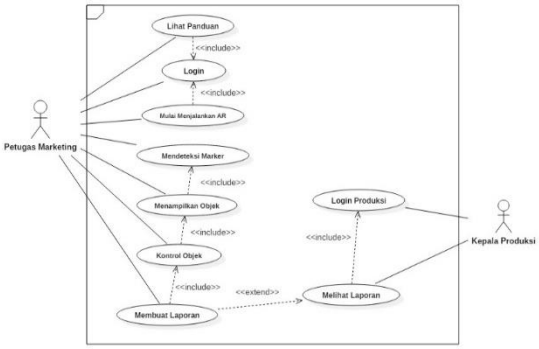



***Figure 13.*** *Use Case Diagram*

### *2.7.9 Class Diagram*

*Class Diagram illustrates the structure and relationships between objects that exist on the system. The structure includes the following attributes and methods that exist in each class. Class diagram of the application to be built can be seen as in Figure 14.*

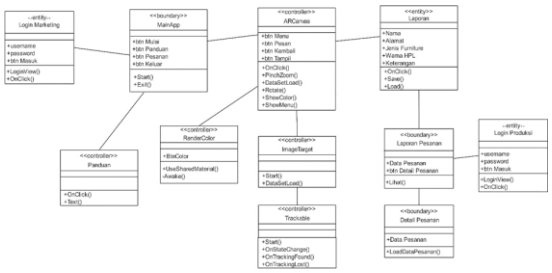


***Figure 14.*** *Calss Diagram*

***Table 1.*** *Class Diagram*

| *No* | *Nama Class* | *Type Class* |
|---|---|---|
| *1* | *Login Marketing* | *Entity* |
| *2* | *MainApp* | *Boundary* |
| *3* | *Panduan* | *Controller* |
| *4* | *ARCanvas* | *Controller* |
| *5* | *Render Color* | *Controller* |
| *6* | *Image Target* | *Controller* |
| *7* | *Trackble* | *Controller* |
| *8* | *Laporan* | *Entity* |
| *9* | *Login Produksi* | *Entity* |
| *10* | *Laporan Pesanan* | *Boundary* |
| *11* | *Detail Pesanan* | *Boundary* |

### *3. Implementation Interface*

*Following is the display of the interface of the system that has been built :*

1. *Implementation interface Login Marketing*




***Figure 15.*** *Interface Marketing*

2. *Implementation Interface Main Page*

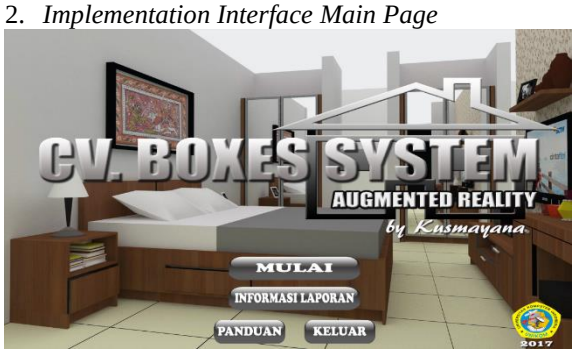



***Figure 16.*** *Interface Main Page*

3. *Implementation Interface Guide*




***Figure 17.*** *Interface Guide*

4. *Implementation Interface Augmented Reality*

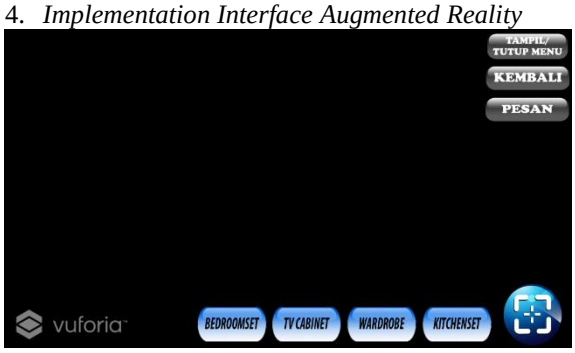



***Figure 18.*** *Interface Augmented Reality*

5. *Implementation Interface Order Report*




***Figure 19.*** *Interface Order Report*

6. *Implementation Interface Login Head Of Production*

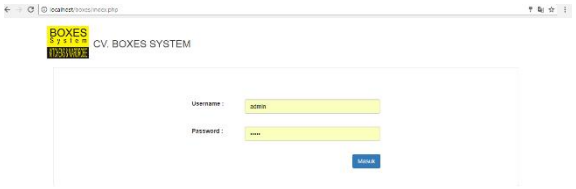



***Figure 20**. Antarmuka Login Head Of Production*

7. *Implementasi Antarmuka Order Information*

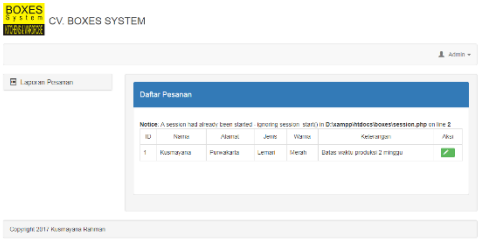



***Figure 21.** Antarmuka Order Information*

8. *Implementasi Antarmuka Order Detail*

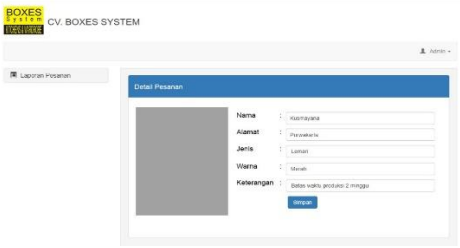



***Figure 22.** Antarmuka Order Detail*

### *4. Marker Testing*

*Testing done to find out how the marker technology is Augmented Reality work while reading the marker. Here the author tried several studies on marker, among which is the limit of distance and angle reading marker due to technology displays used here is handheld, and the influence of light intensity towards the marker because of the light into one of the problems that often occur in the process of the reading of the marker. Testing done because the marker that will be read by the camera is greatly affected by distance and viewing angle marker, with the light conditions.*

### *4.1 Testing Distance And Angle*

*Testing this is testing on the augmented reality applications have been built. This testing is done on testing against the distance and angle of the camera against a marker that will detect for displaying three-dimensional objects.*

*After doing a test on the application of augmented reality as much as 5 times at each distance and angle are tested, then showed that the distance at a minimum of 10 cm and a maximum distance of 60 cm and a minimum angle of 10 ° and a maximum of 70 ° can detect marker to display the three dimensional object.*

***Table 2.** Test results of distance and Angle*

| *Test results of distance and Angle* | |
|---|---|
| *Minimum distance and angle* | *Maximum distance and angle* |
|  |  |

### *4.2 Light Testing*

*The reading of the marker on the technology of Augmented Reality relies heavily on a good pencaahayaan. With good lighting, then the camera can be faster in matching marker. To test the reading of the marker by using 2 pieces of each lamp, 10 Watts power as well as 15 watts. Then as for the room that was used in testing the long room has a size of 1.5 meters wide and 1 meter room, with a distance of lights against the marker as far as 2.5 meters.*

*From the results of the test results can be obtained with a 10 watt lamp power marker can only be read between the distance of 20-40 cm, while the power of 15 watt lamp marker can be read between the distance of 20-50 cm. This proves that good lighting can affect the success of the reading of the marker.*

***Table 3.*** Test Results Light

| *Test Result Light* | |
|---|---|
| *Light 10 watt* | *Light 15 watt* |
|  |  |

## *2. CLOSING*

*Based on the results of the end of the development of Augmented Reality applications to simulate Interior Design Furniture Set in CV Boxes System then it can be inferred.*

1. *This application can help officers marketing furniture in the sales process by introducing products with three-dimensional objects.*
2. *This application can customize the placement of furniture desired consumers.*
3. *With this application can help head of production in order for the report to see the data consumer is easily accessed through the website without having to wait.*

## *BIBLIOGRAPHY*


[1] Rita Novita Sari, "Visualisasi Desain Rumah Pada PT. Fujiama," Yogyakarta: STMIK Amikom Yogyakarta, 2016, pp 2.

[2] Fandy Tjiptono, "Perspektif Manajemen dan Pemasaran Kontemporer," Yogyakarta: Andi, 2000.

[3] Fandy Tjiptono, "Pemasaran Jasa," Malang: Bayumedia Publising, 2005.

[4] Fandy Tjiptono, "Prinsip-prinsip Total Quality Service." Yogyakarta: Andi, 2002.

[5] Yordanus, "Kajian Material dan Motif Ragam Hias Kursi Tamu Studi kasus CV. Jepara Lestari Furniture Art di sanggu Lendo, Kalimantan Barat," Bandung: Universitas Pendidikan Indonesia, 2013, pp 1-2.

[6] Dwi Retno Sri Ambarwat, "Antara Desain Interior Dan Dekorasi *Interior* Sebuah Kajian Komparatif," Yogyakarta: Institut Seni Indonesia, 2011, pp 6-8.

[7] Ariesto Hadi Sutopo, "Multimedia Interaktif dan Flash," Yogyakarta: PT Graha Ilmu, 2003.

[8] Kadir Abdul, "Pengenalan Sistem Informasi," Yogyakarta: Andi, 2002.

[9] Anisyah, "Analisa dan Desain Sistem Informasi," Yogyakarta: PT. Andi Offset, 2000.

[10] Shaddiq Fajar, 2014. Konsep Dasar Pemodelan 3D. [Online]. Available : http://sikatku.blogspot.com/2013/11/konsep-dasar-pemodelan-3d.html. [Accessed 12 Juni 2017].

[11] Pressman Roger S, "*Software Engineering a Practioner's Approach*," Fourth Edition, Singapore: McGraw-Hill International, 1997.

[12] Azuma, R. T, RevA Survey of Augmented Reality," Teleoperators and Virtual Environments, pp 6.

[13] Anggara, A, "Pembangunan Aplikasi Augmented Reality Sebagai Media Promosi Desain Lemari Kaca & Aluminium Di Toko Sinar Arafat," Bandung: Universitas Komputer Indonesia, 2015, pp 22.

[14] Permana, Nugraha, "Pemanfaatan Augmented Reality Sebagai Penanda Objek," Bandung: Universitas Widiatama, 2014, pp 2-3

[15] Kasman, A. D, 2013, "Trik Mudah Menguasai OOP dengan PHP," Yogyakarta: Lokomedia.

[16] Kim Hamilton and Russell Miles. "Learning UML 2," O'Reilly : Sebastopol, 2006.

[17] Nicolas Gramlic, Andbook : Android Programming. [Online] http://andbook.anddev.org. [Accessed 30 Maret 2017].

[18] Anhar, "Panduan Menguasai PHP & MySQL secara otodidak," Jakarta: Mediakita 2010.

[19] Rouf, A, "Pengujian Perangkat Lunak dengan Menggunakan Metode," *White Box dan Black Box*. Semarang: STMIK HIMSYA Semarang, 2014.

[20] Vuforia, *Vuforia API References* [Online]. https://developer.vuforia.com/resources/api/main. [Accessed 20 Juni 2017]

[21] Nazruddin Safaat H, "Pemrograman Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android," Jakarta: INFORMATIKA, 2012.