



Article

# The Design of Basic Computer Networking Simulation Learning using Multimedia Development Life Cycle Method based on Augmented Reality at SMKN 1 Tangerang

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## A B S T R A C T

Augmented Reality has entered technology trends in all fields, both marketing and education, Augmented Reality media also requires users to be comfortable when interacting. SMKN 1 Tangerang organizes a distance education system with various methods, in this case the subject which is Basic Computer Networks uses mobile-based learning simulations with Augmented Reality which aims to develop students' abilities in the world of networked computers independently. This system also requires a user experience and user interface development method, namely Luther's Multimedia Development Life Cycle model because it has six stages, namely concept, design, data collection, merging, testing, and distribution, resulting in interactive applications.

## INTRODUCTION

The rapid development of technology encourages humans to be more creative in managing science that is able to change their mindset to keep up with the world of technology in Era 4.0 [1] and with the process of keeping pace with the fields in the world of technology, making learning media is also growing [2] which makes the world of education more innovative in the era of 4.0 and beyond. The results of the observation that there were several obstacles in learning activities, such as limited resources for tools and materials because some expensive products resulted in learning about the

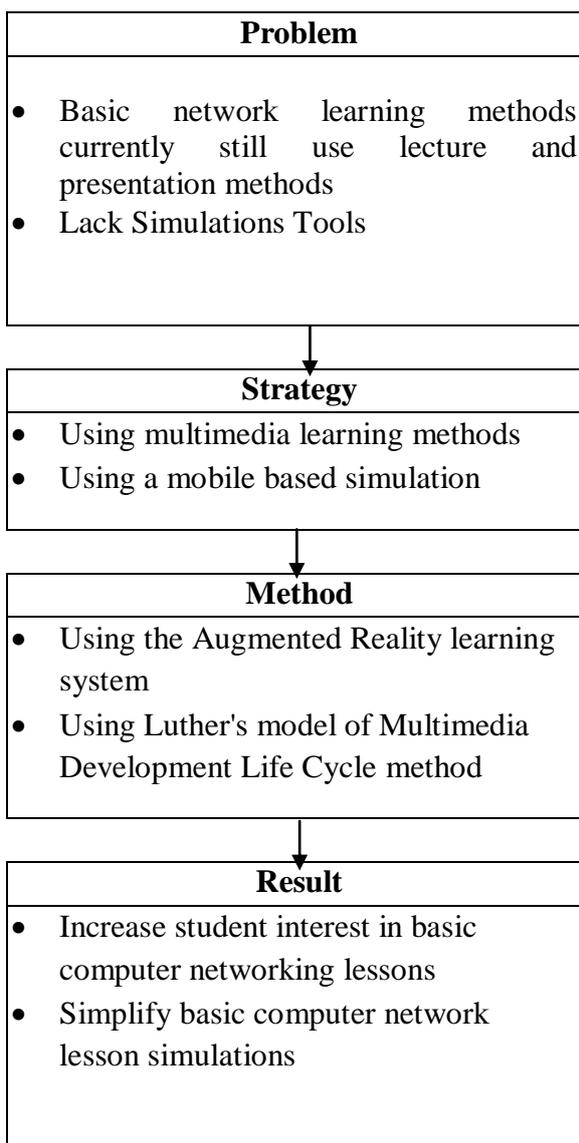
introduction of network devices to the extent of explaining and introducing existing devices without seeing the whole thing. In addition, the lecture learning method also makes students less motivated, resulting in at least student feedback in enjoying learning, this is reinforced by several findings of researchers who state that the achievement of scores in the aspect of knowledge is low, if presented only 35% are complete while 65% of students are categorized as not. complete in mastering knowledge of computer network concepts. Conditions like this require teachers to be more innovative in the delivery of teaching materials, and be creative in making learning media, in order

to get students 'motivation and interest in learning activities so as to increase students' understanding of teaching materials[3]. Augmented Reality (AR) is a technology that combines computer-made objects, two-dimensional or three-dimensional, into the real environment around the user in real time. AR-displayed objects assist the user in generating new perceptions that allow them to interact with the real environment [4]. Learning media based on Augmented Reality is one of the tools created with the aim of being a teacher's aid in delivering material. Learning to use Augmented Reality learning media will certainly attract more students in elementary schools to attract and understand the material to be delivered [5]. Considering that technology Augmented Reality has also entered technology trends in all fields, both marketing and education [6] media Augmented Reality must also adjust users' comfort when interacting. To add to the impression of the user, while the system in the media requires a method to develop the user experience and user interface. Basic Computer Networks is one of the learning activities at SMKN 1 Tangerang which aims to develop students' abilities in the world of computer networks. However, the resources for tools and materials are limited because some products require more maintenance and are fairly expensive, resulting in learning about the introduction of network devices to the extent of using the lecture method and introducing existing devices without looking at the whole.

**I. LITERATURES REVIEW**

Previous research concluded that the learning media is very feasible to use with the validation results obtained by an average value of 92.67% from 5 validators, namely ease, motivation, attractiveness, usefulness [4]. And the results of field trials to 30 students fall into the very good category with a feasibility value of 4.520625 and a percentage of the quality of educational game learning media 90.42% [7].

**II. FRAMEWORK**



**III. METHODS**

In making this application, it is assisted by the Multimedia Development Life Cycle (MDLC) method which functions to coordinate the stages of making the application. The MDLC used here is Luther's version. Luther's MDLC version with 6 stages, that is:

1. *The Concept*  
Making Requirements Elecation and Flowcharts.

2. *Design*  
Manufacture Wireframing for mapping the layout and Mockuping for granting the reference color, fonts, images, and animation concepts
3. *Material collection*  
Where buttons and symbols are obtained from mockups and markers that are inspired by objects on Cisco Packet Tracer Stealthwatch made using Corel Draw X7 and also 3D objects obtained from the 3d SketchUp repository on the site [3dwarehouse.sketchup.com](http://3dwarehouse.sketchup.com) which are converted into extensions .dwg
4. *Merging*  
Applications made in C # with the game engine tools Unity 3d and the Software Development Kit (SDK) Vuforia Engine.
5. *Testing*  
Which at this stage the results obtained blackbox test from the application
6. *Distribution*  
at this stage will be published to students of SMKN 1 Tangerang and the results of the assessment from students of SMKN 1 Tangerang are obtained.

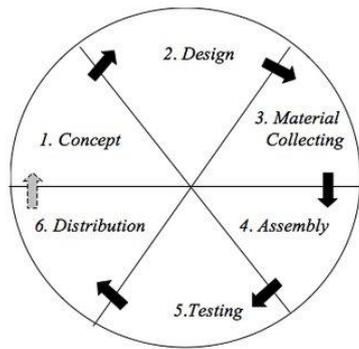


Figure 1 :The Luther's MDLC

## IV. RESULT

### Mobile Application

#### 1. Main Menu

Contains the main menu and there are several menu options namely Start,

Tutorial, Theory, Exit and About developer which are located below. For the button, a moving animation is inserted to make it look dynamic.

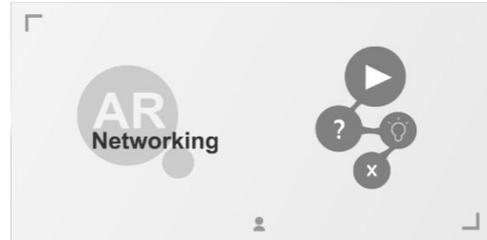


Figure 2 : Main Menu

#### 2. Tutorial Menu

The tutorial aims to provide steps for how to use the application and there is also a link marker in the form of the button. The tutorial is also shown in the form of animated movements.



Figure 3 : Tutorial Menu

#### 3. Theory Menu

Theory serves to provide an explanation of the theme of the material used as an application, along with the theoretical appearance.



Figure 4 : Theory Menu

## Augmented Reality

### 1. 3D Objects

View of Augmented Reality displays that appear 3d objects when the camera is pointed at the marker are bellow.

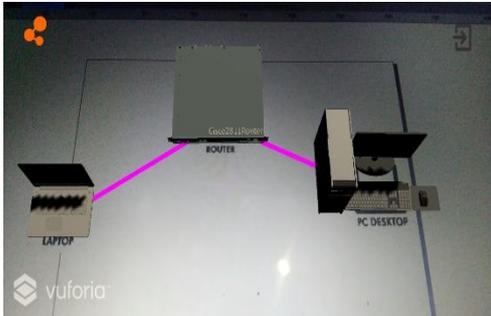


Figure 5 : Augmented Reality Camera View

### 2. Topology

Display 3D objects that are connected by the *Line-Connector* when the *button* topology is active. The *line-connector* will follow the movement of 3D objects.



Figure 6 :Topology display when the Topology button is active

### 3. Flowchart

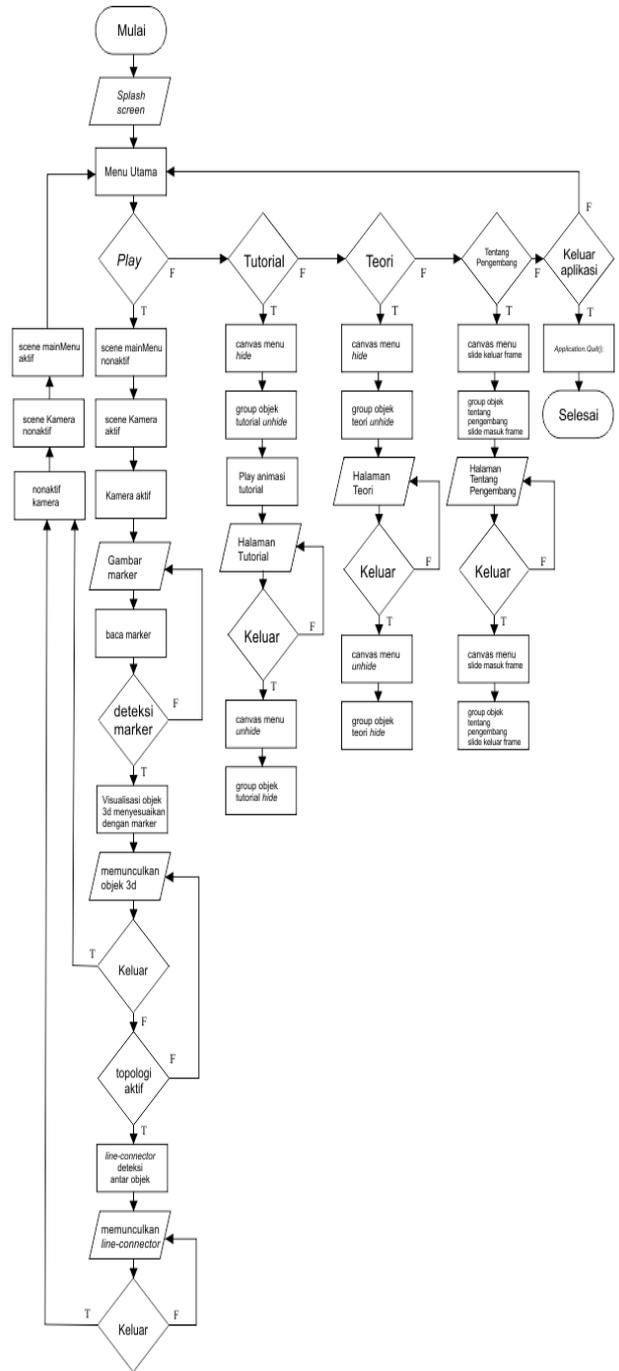


Figure 7 : Flowchart

**V. DISCUSSION**

**Augmentable Vuforia Engine testing**

The results of the augmentable marker ratings from the Vuforia engine are bellow.

Target Name	Type	Rating
cs_laptop	Single Image	★★★★★
wap_cs	Single Image	★★★★☆
switch_cs	Single Image	★★★★☆
router_cs	Single Image	★★★★☆
pcdesktop_cs	Single Image	★★★★★

**Figure 8: Augmentable levels based on the Vuforia engine**

**Testing Distance and Light**

The marker testing in Augmented Reality is done manually using the Lux Light Meter application to test the distance and light based on the calculation of lux light, and distance testing using a meter tool. The following results are obtained.

**Table 1. Distance and Light Testing**

No	Questions	Score		
		Good	Enough	Less
1.	Menu Display	7	3	0
2.	Guide / Tutorial Display	10	0	0
3.	Theory Display	7	3	0
4.	Development Display	10	0	0
5.	Augmented Display	8	2	0

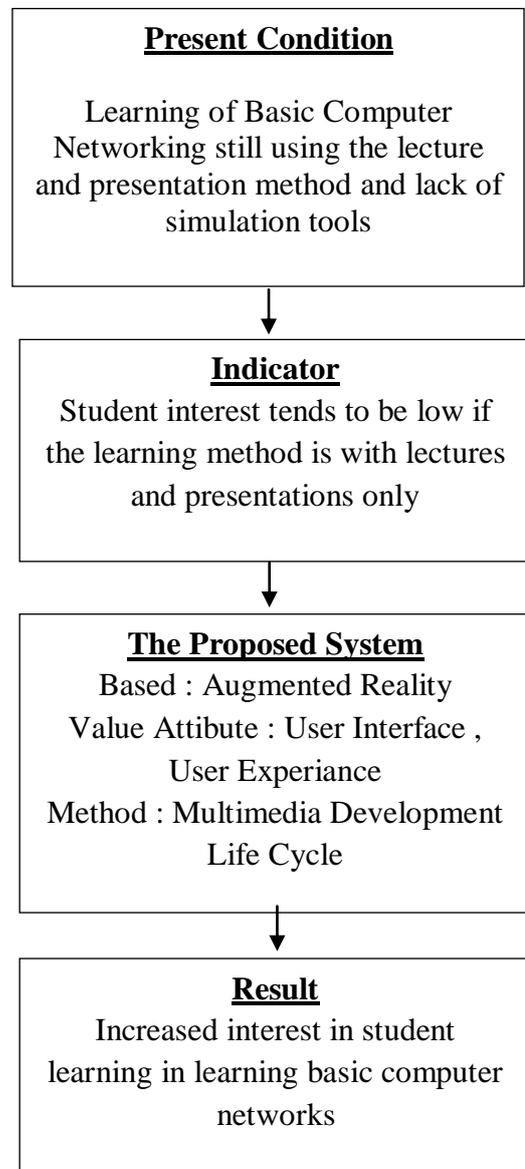
**User Acceptance Test**

This test involves students of SMKN 1 Tangerang in the form of a response questionnaire to displays User Interfaces and User Experience. Obtained 10 students with name, email, and NISN data. With the assessment factors of “Good”, “Enough”, and “Less” as bellow.

**Table 2. Questionnaire Results**

Distance	10 cm	40 cm	50 cm	60 cm	100 cm
<b>Lux</b>					
<b>18 (dim lights)</b>	Showing	Showing	Not Showing	Not Showing	Not Showing
<b>34 (brigh lights)</b>	Showing	Showing	Showing	Not Showing	Not Showing
<b>430 (outdoor lights)</b>	Showing	Showing	Showing	Showing	Not Showing

**Hypothesis**



**Figure 9: Hypothesis**

## VI. CONCLUSION

The conclusions about the basic network simulation application based on Augmented Reality that have been described are:

1. With this-based simulation application Augmented Reality, students of SMKN 1 Tangerang get the potential in its development.
2. Based simulation applications Augmented Reality have the potential to assist learning at home during a pandemic.
3. The importance of using the Multimedia Development Life Cycle method in

making and developing applications, especially User Interfaces and User Experience. The

## VII. ACKNOWLEDGEMENT

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## BIOGRAPHY

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