# DEVELOPMENT OF AUGMENTED REALITY APPLICATION FOR INTERACTIVE LEARNING OF NURSE ACT BY USING SPEECH RECOGNITION IN SMK KESEHATAN BHAKTI KENCANA CIMAHI

Yusup Deni Gustani

Teknik Informatika – Universitas Komputer Indonesia
Jl. Dipatiukur 112-114 Bandung
Email: ydgustani@gmail.com

## ABSTRACT

SMK Kesehatan Bhakti Kencana Cimahi is one of the educational institutions that produce health workers including nurses to meet the expectations of the community will care qualified health personnel.

Nursing action learning activities conducted in SMK Kesehatan Bhakti Kencana Cimahi still using conventional methods, where teachers deliver material only use guidebooks. The props in schools are still limited, so not all student got a part to use props. In addition, during the practicum, many errors encountered in conducting experiments that can be fatal. The solution expected to solve this problem is to build Application of Augmented Reality for Interactive Learning Nursing Measures Using Speech Recognition.

Application of Augmented Reality for Interactive Learning Nursing Measures Using Speech Recognition in SMK Kesehatan Bhakti Kencana Cimahi need a medium of help teaching to deliver material with more interactive learning to be able to assist the student in learning the nursing measures, make them easier to absorb, stimulate attention and mind in activity learn to achieve learning objectives. In addition payload subject matter can be modified to become more attractive and easy to understand.

**Keywords:** Learning, Interactive, Conventional, Nursing Measures, Augmented Reality, Speech Recognition.

## 1. INTRODUCTION

SMK Kesehatan Bhakti Kencana is one of the educational institutions that producehealth workers including nurses to meet the expectations of the public will be the Ministry of health workers.

Nursing is a form of health care professionals who are an integral part of the health care services that are based on Science and nursing tips.

Nursing action is implemetasi of the process of nursing practice is provided directly to the client to meet the objective needs of the clients, so that it can resolve the problems that are being encountered. The Act of nursing is one of the main basicmaterial for nurses, so that it contains the material presented to all students of SMK Kesehatan Bhakti Kencana Cimahi.

Based on the results of interviews with Anggita Puspasari. S. Kep. Ns., one of the teachers at SMK Kesehatan Bhakti Kencana Cimahi that nursing action learning activities conducted at SMK Kesehatan Bhakti Kencana Cimahi is still using conventional methods, where teachers deliver using only materials handbook. Similarly, based onthe results of the initial research questionnaires against students of SMK Kesehatan Bhakti Kencana Cimahi it can be concluded that the number of props in the school is still not sufficient, so when not teaching all students/i got the parts to try outthe props, the learning material presented less interactive, led to many students who have difficulties in understanding the material act of nursing because students are required to be able to remember and memorize the material described by teachers.

Another problem encountered is at the practical, often found errors when a trialexperiment for example when injecting. Such errors could result in fatal because an experiment done to themselves, resulting in hematoma on the skin.

Solutions that can be used to solve these problems is to take advantage ofmulitimedia learning as an interactive media. The use of interactive multimedia is able to assist students in learning the nursing Act making it easier to absorb, stimulating the attention, and mind in learning activities to achieve learning objectives. Additionally charge the subject matter can be modified to become more attractiveand easy to understand.

Based on the problems that exist today in the SMK Kesehatan Bhakti Kencana Cimahi, auxiliary media of instruction required to deliver a more interactive learning materials,woke up so that applications that are expected to be the solution to these problems is to build an application of Augmented Reality interactive learning for Nursing Actions Using Speech Recognition in SMK Kesehatan Bhakti Kencana Cimahi.

**1.1 Multimedia**

Multimedia in general is the incorporation of a variety of information with the use of computer facilities. Multimedia derived from multiple word meaning many or more than one and a media that can be interpreted presentation somewhere. Multimedia is the use of computers to create and combine text, audio, images, moving (video and animation using links and tools that allow the user to navigate, interact, create and communicate.

The advantages of multimedia is interesting senses and interest, because a combination of sight, sound and motion. Institute of Computer Research and Publishing ie Computer Technology Research (CTR), states that people only remember 20% of the visits and 30% of which are heard. But people can remember 50% of what is seen and heard, and 30% of that seen, heard and done at the same time.

**1.2 Tutorial Method**

Method / Model Tutorial is an interactive learning program that is used in the PBM by using software or software in the form of computer perogram contain subject matter.

Tutorial learning program with the help of computer systems mimic tutors conducted by the teacher or instructor. Information or message presented in the form of a concept computer screen with text, pictures, or graphics

In a simple patterns as a computer operator of the instructor on the model of this tutorial are:

1. Computer presenting the material.
2. Students respond.
3. Student responses were evaluated by computer with orientation in the direction of the students in taking the next achievement.
4. Continuing or repeat the previous step.

Tutorials in an interactive learning program is intended as a substitute for direct human being as an instructor in fact, given the form of text or graphics on the screen that has been providing points questions or concerns.

**1.3 Desktop Based Application**

Desktop-based applications are applications that can run on its own (independent) without using a browser or the internet. Based on information obtained from Informations Communications Group and Microsoft Corporation. Desktop-based applications have advantages and disadvantages as follows.

The advantages of a desktop-based application are:

a. the performance is generally better than the Web-based application "tailored to the specifications of the hardware.

b. Peroses construction much easier compared to the process of building Web-based applications that use the HTML.

c. Easy in modifying settingnya and not depending on connectivity.

A lack of desktop-based applications are:

a. it is difficult to conduct remote access.

b. Hard in a craft made the distribution in a very large congregation because of having to do the installation at any point of the distribution.

c. update process is difficult.

The application can only be opened on a computer that has installed the application.

**1.3 Augmented Reality**

Augmented Reality (AR) is a term for an environment that combines the real world and the 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. Combine real environments and virtual.
2. Run interactively in real time
3. Integration in three dimensions (3D)

In simple terms the AR could didenisikan as a real environment are added virtual object. Merging real and virtual objects is possible with the appropriate display technology, interactivity is made possible through hardware-specific input devices.

AR is a variation of Virtual Environments (VE), or better known as Virtual Reality (VR). VE technology makes users joined in a virtual environment as a whole. When incorporated in such environment, the user can not see the real environment in the vicinity. Instead, AR allows users to see real environment with virtual objects are added to or incorporated with the real environment. Unlike VR that completely replaces the real environment, AR just add or supplement the real environment.

The main purpose of the AR is to create a new environment by combining interactivity real and virtual environments so that the user feels that the environment created is real. With the help of AR technology (such as computing vision and object recognition) real environment around us will be able to interact in digital form (virtual). Information about the object and the environment around us may be added to the AR system then displays the information layer above the real world in real time as if such information is real. Information displayed by virtual objects help users carry out activities in the real world. AR is widely used in fields such as health, military, manufacturing industry and has also been applied in devices that people use a lot, such as on mobile phones [2].

**1.4.1 Augmented Reality Workflow**

Augmented Reality workflow generally begins shooting marker with a camera or webcam. The markers were identified based feature owned, then

into the tracker object (the object being tracked) provided by Software Development Kit (SDK). On the other hand, these markers have been registered and stored into the database. The next object tracker will track and match these markers in order to display the appropriate information. The output of the tracking marker immediately displayed into the computer screen and smart phone screens. Information displayed attached to the marker in question in real time.

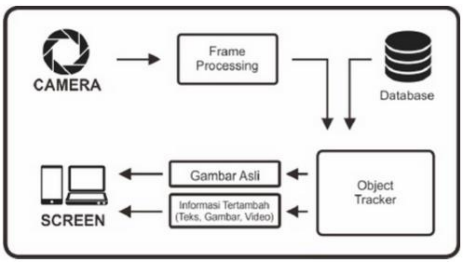



Figure Augmented Reality Workflow.

1. Camera
   Used to scan marker / markerless.
2. Frame Processing
   Pixel calculation process used for the detection of an image or object..
3. Database
   Used to save marked.
4. Object Tracker
   Tracked object that will show in his or her information if in accordance with the existing data in the database.
5. Informasi
   Displays information corresponding to the object tracker already in inisilisasi didatabase.
6. Screen
   To display the output of applications such as Text, Image, Video, and 3D Objects.

### 1.4 Speech Recognition

Speech recognition is the process of identification of sound based on the spoken word. Parameters than is the level of emphasis that sound will then be matched with the template databases that are available. While the voice recognition system based on the person speaking was named speaker recognition (Melissa, 2008). Speech recognition is known as automatic speech recognition or computer speech recognition to translate text into spoken words. In the speech recognition system containing the words require a comparison between the incoming signals from the word and an assortment of existing words in the dictionary (Sunny, 2009). On the Android platform there are features of Speech Input and Text-to-Speech voice recognition as a supporter on the application that will be created.

Speech recognition is one type of biometric recognition, that is, the process computer to recognise any person upon the spoken voice commands are converted into digital print. The design of the system for voice processing consists of the following phases:

1. The first phase, this phase is the phase of learning, also known as the training phase.
2. The second phase, this phase is the phase of testing or operating session.

## 2. RESEARCH CONTENT

### 2.1 System Analysis

System analysis is the decomposition of a system of information that whole into parts of komponenya with a view to identifying and evaluating the problems, needs and barriers which occur. Determine the needs that correspond to the expected needs.

#### 2.1.1 Problem Analysis

Analysis of the problem is the stage of elaboration of the problems that existed before the application is built and aims to help the development of multimedia applications. Analysis of the existing problems include such things as follows:

1. Still using conventional methods, where teachers deliver the material only using manual systems with methods lectures. It can be seen from the large number of records and the attitudes of students who feel saturated in receipt of material because it is claimed to be able to remember and memorize the material described by teachers.
2. One of the problems is the basis of this multimedia application development is the need for a medium to help students in receiving nursing actions matter.

#### 2.1.2 Ongoing Analysis System

Analysis of the running system is analyzing the activities of the working procedures that occur on the system that exists today. The procedure that is currently running on CMS Health Bhakti Kencana Cimahi in teaching and learning activities are as follows:

1. The procedure of granting the Learning Material

The procedure of granting the learning material is illustrated in the picture below on flowmap. As for the procedure is as follows:

a. the teacher prepare learning materials that will be delivered in the classroom.
b. the teacher make a summary of the material as learning materials.
c. Teaching material menyapaikan by means of conventional or lectures and provide a summary of the learning material.
d. Students keep learning material as an archive summary students.

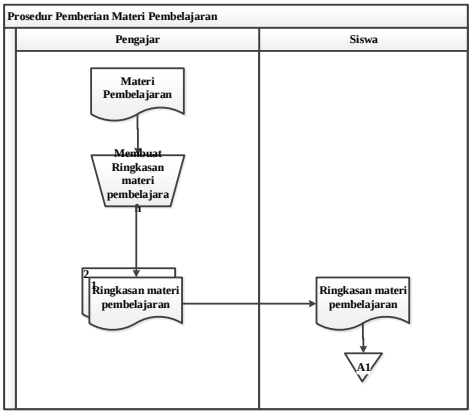



Figure flowmap procedure learning activities Teaching

A1: Archive a summary of the material that is stored by students

2. The procedure of the question of the Exercise

The procedure of granting a matter of practice described in flowmap in figure below. As for the flow of the procedure is as follows:

a. the teacher gives the student exercises for problem in accordance with the learning materials that have been provided earlier.
b. students are working on a matter of practice.
c. Students submit answer sheets question exercise to the teacher when you are finished answering.
d. the teacher collected the results of student answers and check the answer to question practice.
e. the teacher do the recording the value of answer sheets that have been examined.
f. Teachers issued a list of values and save them as the archive value.

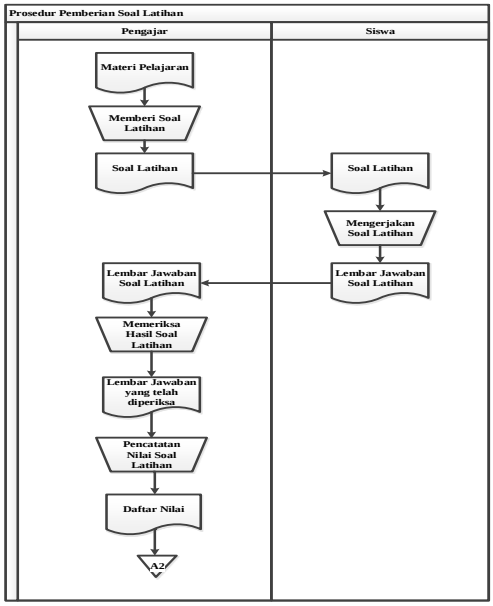



Figure flowmap procedures giving the question of the exercise is running

A2: Archive list of values that are stored by the teacher

3. The course includes lectures procedure Nursing Actions

The course includes lectures procedure nursing action is the activity of learning where the students/i do practicum activities in the laboratory. Now the flow of the procedure is as follows :

a. The teacher makes a summary of the material that will be made teaching materials hands-on labs.
b. Teachers explain the matter to the student practicum based on a summary of the material that has been created.
c. The students receive practicum materials described by the teacher
d. The students do hands-on labs.
e. The students made a report of the results of the hands-on labs.
f. Teachers receive reports of practicum students.

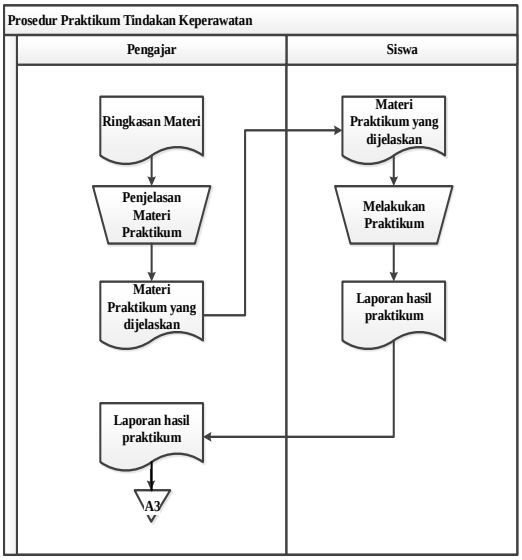



Figure of flowmap practicum learning activities

A3: Archive reports of hands-on labs stored by

### 2.1.3 Analysis system to be set

An application that was built in the form of interactive learning application that aims to help students/i SMK Health Bhakti Kencana Cimahi in learn the material more interactive compared with the conventional way that has been done previously. The application of this interactive learning is learning which contains some materials nursing actions and modules are presented based on the results of a needs analysis and case studies as well as from the book as reference guide.

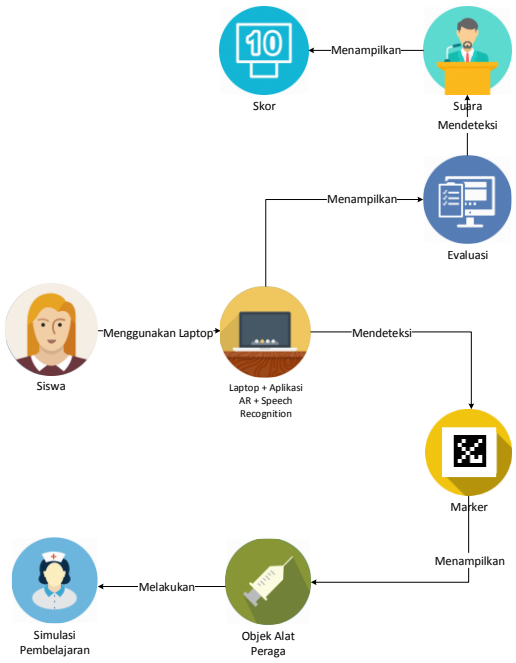



Figure of the system that will be built flow

1. Users who will use this application is the students.
2. Students use laptop computers that have been equipped with applications augmented reality and speech recognition.
3. The application detects marker that is directed to the webcam laptops by students
4. After detected, application displays the object of teaching aids in the form of 2 dimensions.
5. After the object of teaching aids appears, learning simulation can be started.
6. The application displays the evaluation
7. The application detects a voice in say by students/i
8. The application displays the evaluation result score students/i

### 2.1.4 Analysis Interactive Learning Methods

Interactive Learning Application Nursing Action was built using methods/model tutorial. The methods/Model the tutorial is interactive learning program which is used in the multimedia-based learning using the software or software in the form of computer programs contain the subjects. The operation of interactive learning application using the methods/model the tutorial is as follows :

1. Delivery of the material you will learn the nursing actions by students/i SMK Health Bhakti Kencana Cimahi and presented using visual information such as text, images, audio, augmented reality, speech recognition and simulation.
2. Questions and responses in the form of the question of the exercise and simulation that must be done by the students/i. The questions in this application is intended to students/i and the students always pay attention to the material learned and to assess the extent to which the ability to remember and understand the materials. The questions on this learning application is packaged in the form of multiple choice.
3. Giving feedback is a response to the assessment of the response to the students/i if you have finished answering all the questions given. This response is demonstrated by the application with how to display the correct answer one and the value of the end of this application.

### 2.1.5 Design Analysis Augmented Reality

In this research stage of development applications that will be used library Glyph Recognition and Tracking Framework (GRATF) developed by AForge. Library GRATF used in the application to design an environment Augmented Reality based marker (Marker Based Tracking).
Marker that will be used in the application is the illustrations in black and white square with the limit thick black and white color background or commonly called the Glyph with the size of 5x5, box which the position and the orientation of the marker will be recognized by the application on the axles x,y and z. On the position and the orientation of the future will be projected image of objects that seem to be illustrated in the form of 3 dimensions (3D), for example the form of 3D from health tools that will be raised in the simulation AR that will be created in an application.

There are several stages in the use of library GRATF in applications are as follows :

1. The process of adding library GRATF
   The first thing that must be done is menambahkanlibrary AForge.Vision.GlyphRecognition.dll (assembly into the application. Then add library AForge.dll, AForge.Imaging.dll and AForge.Math.dll (as part of the framework of library AForge.NET), because all the library will be used by the library Glyph Recognition.
2. Do the introduction of glyph pattern
   To perform pattern recognition techniques Glyph glyph, done Recognition on library GRATF, namely using the function ExtractGlyphData.RawData, which is the result of this function will provide the data array two dimensions (2D) which contains the values that have been diekstraksi glyph from the picture is processed. The values of this glyph array data in the form of the value of the "0" which represents the field of black cells and "1" which represents the white cells on the glyph.
   Furthermore the results of the data is stored into a data base (database). This database will store all glyph pattern known (detected) which will

then be used more information in the application to process the next stages related to the modules in simulation applications that use Augmented Reality.

3. The identification of the introduction of data base. After that identified data base (database) which has been created in the process of the introduction of using library Glyph Recognition.
4. Find glyph pattern
   After data base determined, can be done using data analysis ExtractedGlyphData.RecognizedGlyph on when the image processing (image / bitmap) which is processed to find the glyph pattern therein (if there is no such pattern, then the value null value). If the library Glyph Recognition successfully identify one of the glyph glyph pattern in the picture, so it can be specified which glyph pattern known and what are the data associated with it in accordance with the data base that has been determined at the beginning.
5. Displays the glyph known
   If one of the glyph known, then the glyph can use RSO may belong to Quadrilateral ExtractedGlyphData, this property make a square in accordance with glyph as defined in the base data (one or more data that can be diekstraksi). This square can be used with something like BackwardQuadrilateralTransformation.

### 2.1.6 Design Analysis Speech Recognition

In multimedia applications that will be built, speech recognition is implemented using class SpeechRecognizer where the process as the following image.

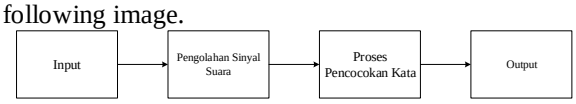



Figure of the process of Speech Recognition

1 Input
First of all users speak a sentence, after that the system will be processed voice signal.

2. Voice Signal Processing
   1. Voice signal processing started by doing a voice signal filter analog signal and change the analog signal to digital, namely with the conversion process analog to digital (ADC).
   2. Convert analog to digital, voice signal to be processed is analog so if done to digital processing, voice signal has to be converted into the digital signal is a sequence number with certain precision level that is named analog to digital conversion.
   3. In the next stage namely take samples with aplitudo that lead to the top of the axis of x and mengabil discrete points value from continuous time signal that is easy to dikuantisasi. Discrete point is the data unit always round in numbers is not the original form of fractions.
   4. The data in the form of voice signal obtained with how to record sound through the microfon external or on a laptop. The voice has a .wav format with sampling frequency is 800Hz.

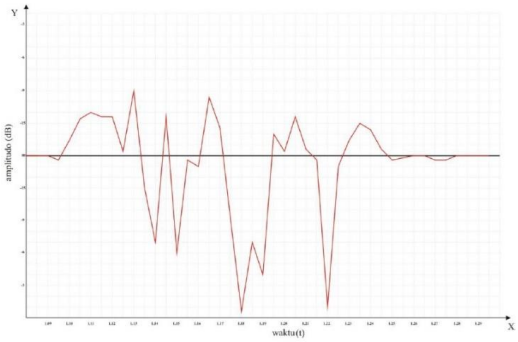



Figure of Analog Signal Sampling

3. The process of Matching Words
   One way to make grammar (grammar) voice recognition is using the constructor and method on the class GrammarBuilder and choices. The following example creates a simple grammar to recognize the words "A", "B", "C", "D", or "E". The words are added using the primary choices. To menyocokkan between voice and grammar (grammar), user must speak one element that has been added by the primary choices. For example add words as an array of string that is the argument for the method Add([]).
   After the primary Choice made and arranged with string choice, for example make GrammarBuilder instance. Using the method Append (Choices), e.g. add the object color to GrammarBuilder instance. On the last line is an example to create instances of the Grammar and menginisialisasikannya instances with GrammarBuilder.
4. The Output
   Displays the answer from the results of the voice of the words.

### 2.2 Functional Needs Analysis

Functional needs analysis describes the needs of the system that will be built on the applications Augmented Reality for interactive learning Nursing Actions Using Speech Recognition. Now the functional requirements on the applications that will be built with the modeling object-oriented. The modeling object-oriented is software that is used in large amounts of this application with tools Microsoft Office Visio that consists of Use Case Diagram (Use Case the Diagram), Activity (Activity Diagram the Diagram), minimally futuristic setting Diagram (Sequence), Diagram Class Diagram (Class Diagram).

### 2.2.1 Use Case Diagram

Use Case diagram of the highest part of the functionality that belongs to the system that will illustrate how a person or the actors will use and

take advantage of the system. This diagram also describes what will be done by the system.

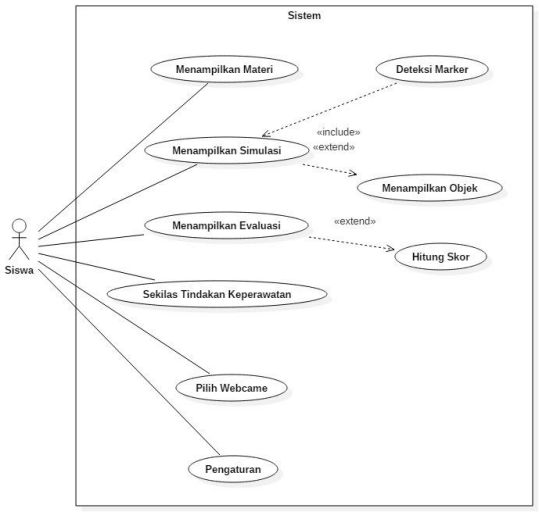



Figure of Use Case Diagram

**2.2.2 Activity Diagram**

Activity diagrams is part of a depiction of the functional system explains the process of logic or function is implemented by the program code. Activity diagrams are modeling events that occurred in a use case and used for modeling the dynamic aspects of the system.

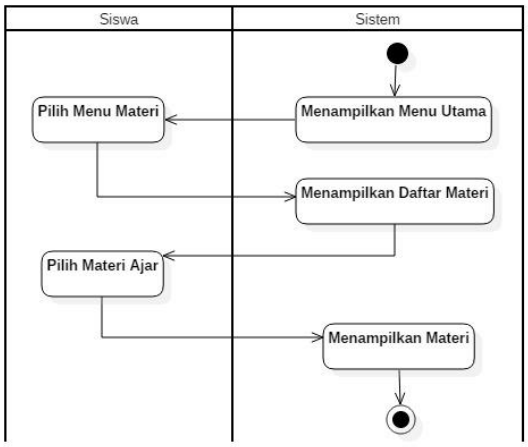



Figure of Activity diagrams show lesson materials

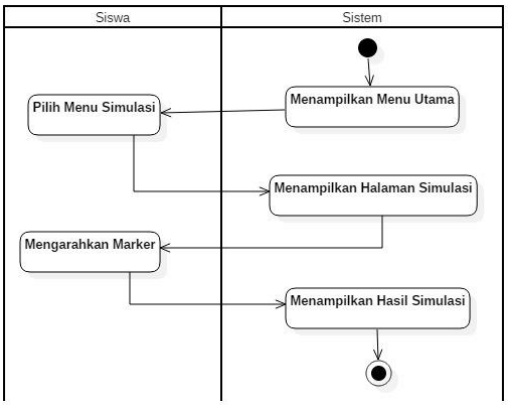



Figure of the Activity the diagram displays the simulation

**2.2.3 Squence Diagram**

Sequence is the graph of two-dimensional diagram where the object/process is shown in the horizontal dimension, while lifeline is shown in the vertical dimension.

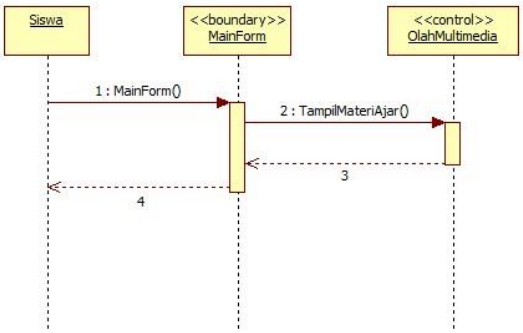



Figure of the diagram displays the arrogant Squence Material

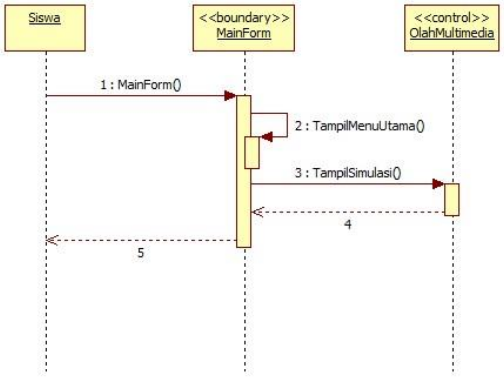



Figure of the Diagram Squence displays the simulation

**2.2 3 Class Diagram**

Class Diagram is a specifications of the functionality that produces the object and is at the core of the development of this application. The picture below explains the class diagram of the system that will be built.

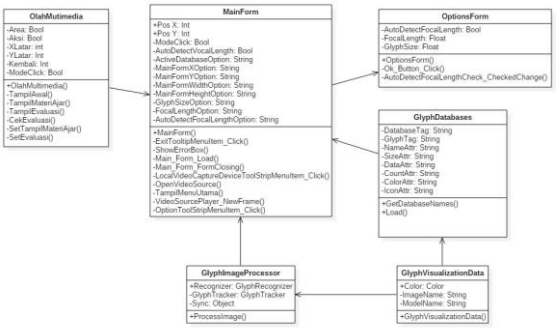



Figure of Class Diagram

### 2.3. System Design

The design of the system is a software development done after through analysis phase. In this stage is described the design of the system that will be built before the encoding done in a programming language.

### 2.3.1 Design the structure of the Menu

Below is the structure of the menu is in interactive pembelajan applications for nursing actions in SMK Kesehatan Bhakti Kencana Cimahi.

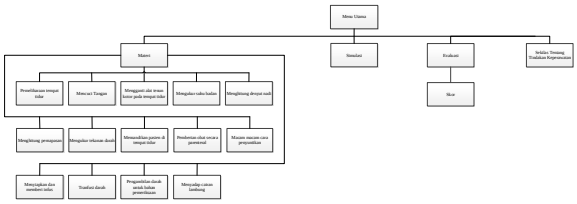


Figure of the design of the structure of the Menu

### 2.3.2 Interface design and implementation

The interface design is a sketch of the depiction of the merger of the elements needed to represent the real conditions of the application is built. The following are pictures of the design of the interface used in the application development.

1. Interface design the Home Page

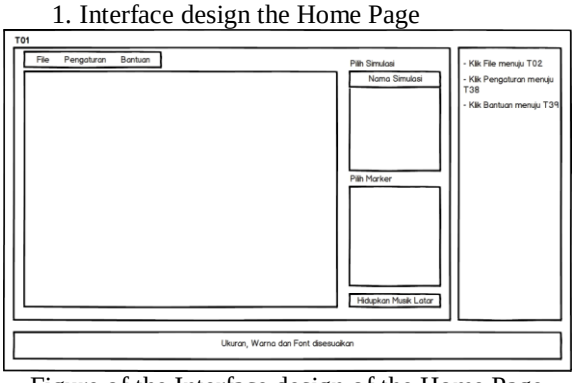



Figure of the Interface design of the Home Page

2. The Interface design of the incoming Page

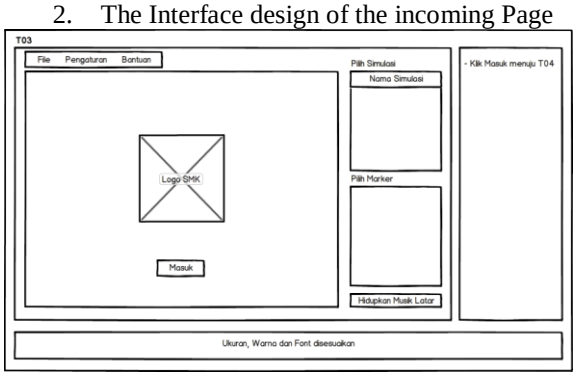



Figure of the Interface design of the incoming Page

3. Main Menu Interface design

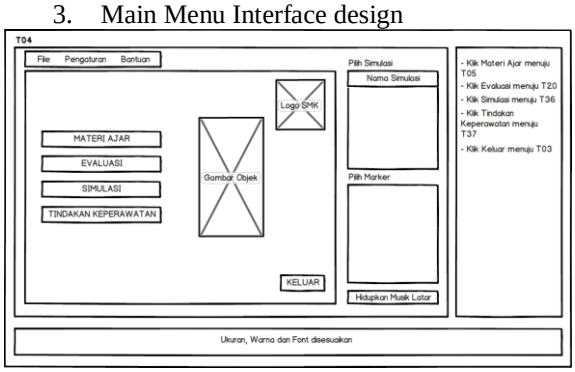



Figure of the Interface design of the Main Menu

4. The Interface design of the lesson materials

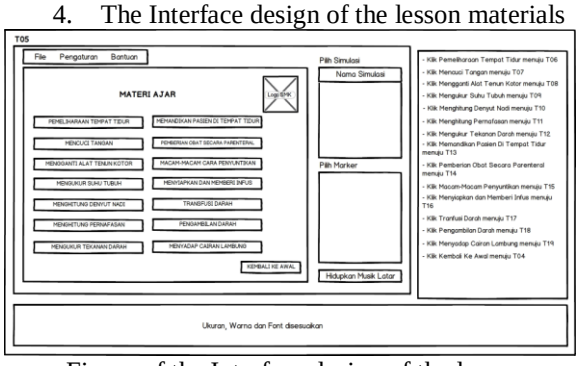



Figure of the Interface design of the lesson materials

5. The simulation Interface design

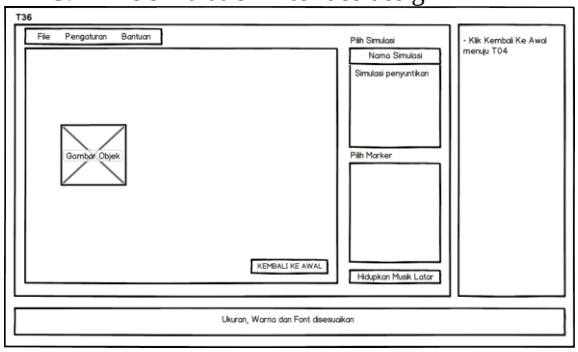



Figure of the simulation Interface Design

6. Evaluation Interface design

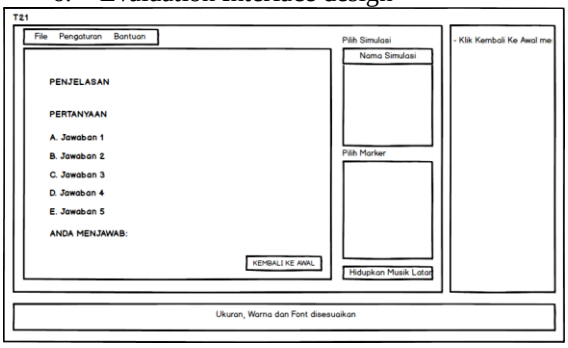



Figure of the evaluation Interface Design

### 2.3.3 Semantic Network

A Semantic network is a graphical representation of the relationship between the object (circle) to which it is connected by the line that shows the relationship between the object. A semantic network that is used in the development of interactive learning application for nursing actions can be seen in the picture below.

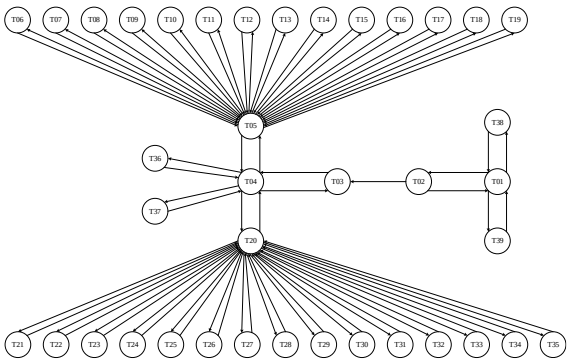



Figure of a Semantic Network

### 2.3.2 Interface Implementation

Pictures of the following is the implementation of the interface from the application of the Augmented Reality for interactive learning nursing actions using Speech Recognition.

1. Interface view Incoming Page
   The following is the interface view the login page.




Figure of the interface Login Page

2. Interface view the Main Menu Page
   The following is the interface display main menu page.

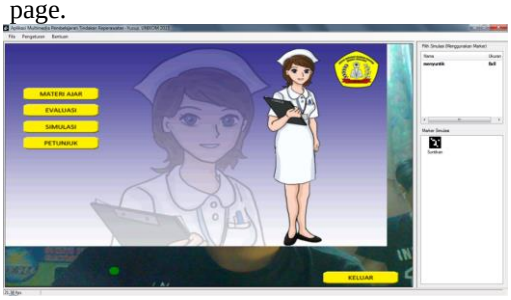



Figure of the Interface Main Menu

3. Interface view lesson materials
   The following is the interface view lesson materials.




Figure of the lesson material Interface

4. The simulation Interface View
   The following is the simulation interface view.

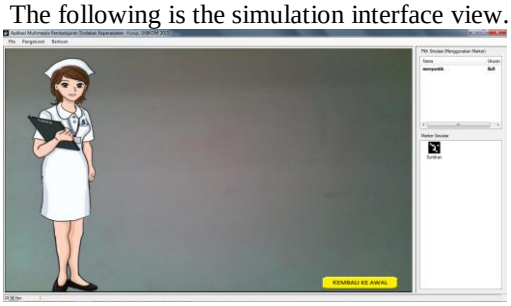



Figure of the simulation Interface

5. Evaluation Interface View
   The following is an evaluation of the interface view.

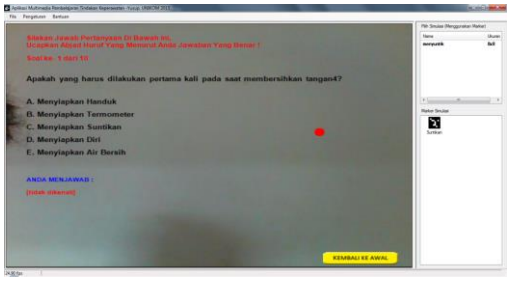



Figure of the evaluation Interface

## 3. CLOSING

The results obtained from the research done in the preparation of this bachelor theses and refers to the aim of the research, it can be concluded

1. This application can help students/i in understanding the material nursing actions.
2. This application helps students/i that no portion to use teaching aids, so that it may be learned using this application like using teaching aids directly.
3. This application reduces the risk level of an accident that occurs when the activities hands-on labs.

## REFERENCES

[1] Bandiyah, Siti, basic skills in nursing, Yogyakarta, 2013.

[2] H. Sutopo, "Multimedia Based Learning Evaluation Development With Fash, PHP and MySQL", Vols. Informatics 6, No. 1, 2006.

[3] Anisyah, "The*analysis and design of Information Systems*". Pt andi Offset. Yogyakarta, 30, 2000.

[4] Suyanto, analysis and Multimedia Design for Marketing, Yogyakarta: Andi, 2004.

[5] E. Computer assisted Learning, Wihardjo, Jember: University of Jember, 2007.

[6] H. Al-Fatta, analysis and design of Information System, Yogyakarta: Andi Offset, 2007.

[7] B. Hariyanto, System Engineering object-oriented, Bandung: Informatika, 2004.

[8] Azuma, Ronald T, "*A Survey of Augmented Reality*". Presence: Teleoperators and Virtual environments, 1997.

[9] Lee, Kai-Fu, *Automatic Speech Recognition*, New York: Kluwer Academic Publisher, 1989.