

# Virtual Angklung Application using Adobe Flash

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**Abstract**— Virtual music instrument simulator is one of the most popular applications that people nowadays play, with this technology the user will be able to play music without necessarily having a real physical musical instrument. But recently, the virtual music instrument simulator that the developer develops are modern musical instruments such as guitar, drum, piano, etc., very few of them develop virtual simulators with traditional instruments such as Angklung. The aim of this thesis is to do research about how the people react to Angklung that will be developed virtually, and to develop virtual Angklung simulator using Adobe Flash for desktop that later can be embedded into web browser to accommodate the demand of the people who wants to play Angklung. The result of this application is successfully developed according to the proposed design, the scopes has been met. Based on the user acceptance test that has been conducted, 91% of the total respondents are satisfied with the prototype application and 88% of the total respondent said that they are still interested in using this application.

**Keywords**— Angklung, Simulator, Music, Adobe Flash

## I. INTRODUCTION

The importance of education and knowing what their country's culture is indisputable nowadays, even though some people may not neglect this importance. By having knowledge about their country's culture, people can retain the culture so it will not vanish as the time flies and let our children and future leaders see the beauty of the culture with their own eyes. Consequently, it can be inferred that the higher level of the country that love their culture and make full use of the culture in terms of making appeal to the world, it can be one way to attract tourist from other country to come to our country, make income to the country and have higher probability to develop the country.

One of the cultures in our country Indonesia is having a traditional music instrument which is Angklung, it is made from two bamboo tubes and attach to a bamboo frame, the tubes are carved to have a resonant pitch when struck and then tuned into octaves on each of them. It is a unique musical instrument, but there are still a lot of people who did not know how to play Angklung since there are few and less ineffective ways to learn how to play it. Angklung plays a role as one of the Indonesian traditional instruments and it undeniably have big prospect to be taken by other country because of its uniqueness and its hidden potential to attract tourists.

Some people had tried to give training for the people that want to play Angklung by directly teaching them in person by going to national cultural park and training workshops. This method is useful in learning the instrument but somewhat lacks in availability and portability for the people who live far away from the training workshop and do not have time to spend travelling there. By making interactive animation for Angklung, it gives the solution to the availability problem for those who want to learn Angklung from anywhere. Information Technology (IT) industries also take part in the development of the country, nowadays many aspects of life are supported by IT.

So, in this research, building a simulation-like application for Angklung to give education and of course entertainment for the people to accommodate the availability and the portability of Angklung itself, but is this application still need physical Angklung for the people to know about Angklung entirely? Or this application can automatically replace conventional Angklung to minimize the use of bamboo rod that is not necessary? Actually the answer for this is both of them, because back to the old Indonesian saying "Bagaikan Katak Dalam Tempurung"[1] it means that the only knowledge that a person knows is only the knowledge that he/she sees, know, and felt inside his/her shell, not knowing other knowledge outside their shell, so it is expected for the people to widen their knowledge, reference, and experience with both applied Angklung media.

The aim of this research is to design and create prototype applications using Adobe Flash for desktop platform, so that can be one alternative way to help people to learn about Angklung.

## II. THEORITICAL FOUNDATION

### A. Multimedia-based Education

Multimedia-based education is one effective method that uses games or other multimedia aspects to deliver material to the students, and this method of learning is liked by most children because of its fun and interactive way. There is a principle known as 'multimedia principle' by Mayer stating that "people learn more deeply from words and pictures than from words alone" and he also says that there are two separate channel inside human body for processing information which are auditory and visual, Mayer also discuss the role of three memory stores: sensory (receive stimuli and stores for a short time), working (human actively process information to create mental construct), and long term (repository of all things that has been learned), so that in this case simply adding words into

picture to learn something is not an effective way to achieve multimedia learning, the real way to achieve it is by giving instructional media to accommodate how the human mind works [2].

### *B. History of angklung*

The importance of education and knowing what their country's culture is indisputable nowadays. By having knowledge about their country's culture, people can retain the culture so it will not vanish as the time flows. Consequently, it can be inferred that the higher level of the country that love their culture and make full use of the culture in terms of making appeal to the world, it can be one way to attract tourist from other country to come to our country, make income to the country and have higher probability to develop the country [3].

One of the cultures in indonesia is having a traditional music instrument which is angklung, and it is a traditional multitoned music instrument which is made from joints of piece of bamboo, and it is usually developed by sundanese people in western of java island. The use of angklung is by swaying and shaking it by hand, the word angklung is derived from sundanese word "angkleung-angkleungan" that means the movement of the one who plays angklung and with the "klung" sound that comes from the instrument [4].

In the past, angklung was a religious instrument that have function as a medium to invite dewi sri (goddess of rice and prosperity) to come down to earth to give fertility to plants, at that time they use three tones angklung, four tones angklung, and five tones angklung, and this kind of angklung is called angklung buhun which have meaning of 'old angklung' that haven't influenced by other elements, and now angklung buhun still be used in many traditional ceremonies, such as pesta panen, ngampihkeun pare, seren taun, nadra, turun bumi, etc. Now, angklung has been officially registered and recognized by united nations through unesco as masterpieces of oral heritage world non-material from indonesia on 18th november 2010 [5].

### *C. How to play angklung*

The kind of angklung that is made for this application is padaeng angklung, this kinds of angklung was decided because this type of angklung is the one that is being renown to all people in the world rather than other kinds of angklung that only be known by the people where that kinds angklung is invented. Furthermore, this padaeng angklung can be played with more than one people, not like other traditional angklung that only played by one person, by this way the harmonization can be reach with teamwork values within the team [6], as for how to play it is as follows:

- The higher tube of angklung is on the right side of the player, and the short tube is on the left, straight and not slants.
- The right hand of the player holds the below side of the angklung, while the left hand holds the upper know of angklung, and both hands should in the straight position.
- To shake the angklung, simply shake the right hand with the left hand just stay hold the angklung without moving it, the movement of the right hand is from right to left, and it is done by wrist.

### *D. Adobe flash*

Adobe Flash is a multimedia software platform that can be used to make animation, games, graphics, and internet applications that can be played by Adobe Flash Player. In interactive multimedia, Adobe Flash can capture input from user by mouse, keyboard, microphone, and camera. Flash can manipulate vectors and raster graphics and support bi-directional streaming of audio and video, originally designed to create animations for display on web pages, because vector graphics are lightweight and making it ideal for webpages [7]. And it contains a scripting language called Actionscript.

### *E. Actionscript*

Actionscript 3.0 is an object-oriented programming language that is used to program Flash applications. Actionscript 3.0 is an update version of Actionscript 2.0, many hardcore developers that already have experience in coding in other programming language like Java and C# are preferred to use Actionscript 3.0 because it is like the languages that they already know, different from interactive designer that likely to add the code into their timeline and have only basic knowledge of object-oriented programming [8].

## III. EXISTING APPLICATIONS

Playing music in digital application especially Angklung is starting to grow in Indonesia, from the availability of Angklung applications in smartphone's store like Android Play Store, Apple Store, and Windows phone. There was a time when an Indonesian game developer called ABIGDEV made Angklung-related game named 'Angklung Heroes' in Flash and publish it online, but now the game was shut down for unknown reason [9].

### *A. Virtual Angklung*

This application was made for Android smartphone, and it have smartphone functionality which is shaking the phone, the applications is very interactive that allow user to shake their phones, but the instruction to do so is not clear, it only show raw text in bright color and small font size, furthermore it is blend with the background make it hard to read like in the Figure 1. This application was made in purpose only for simulation, and it did not give any information or education about Angklung for its user like history of Angklung, how to make it, how to play with it, etc.

### *B. Angklung Indonesia*

This application is a collaboration project by the developer with Saung Angklung Udjo, one of the biggest Angklung and Sundanese conservation in Indonesia. This application allows the user to play Angklung, read the history and everything about Angklung, and even listen to the pre-made song from the developer refer to Figure 2. The bad feature of this application is this application can only play one note each session, if the user wants to change the node, they should go to the node selection first and then select which node they want to play, then play that one node.



Fig.1. Virtual Angklung Gameplay [10]



Fig.2. Angklung Indonesia [11]

### C. Play Me Angklung

Play Me Angklung is a simulation application for Angklung. This application was made for Windows smartphone users, and it lets the user know how to play the application by having instruction section, how to play it is by shaking the phone refer to Figure 3. Too bad that this application only intended to simulate how Angklung sounds like, there is no education and information about Angklung in this application. In addition, the user is only allowed to play the nodes one by one on each screen.



Fig.3. Play Me Angklung User Interfaces [12]

### D. Angklung Memory

This application (Figure 4) was made for memory testing, the application will play random nodes and after that it is the user's turn to play the node exactly following what nodes that the application plays before, and it was made for Windows phone users. This application was intended for a memory game, it only gives memory games and gives the user score based on how they memorize the nodes.



Fig.4. Angklung Memory Gameplay [13]

### E. iAngklung

This application (Figure 5) was made for iPhone operating system, and just like other smartphones this application also supports shaking movement to play with the application. iAngklung have their unique feature than other Angklung application did not have, which is Angklung calculator, it allows the user to customize their virtual angklung, but there is no instruction how to play around with the Angklung calculator, so that the user should have their own time to learn how to use it.

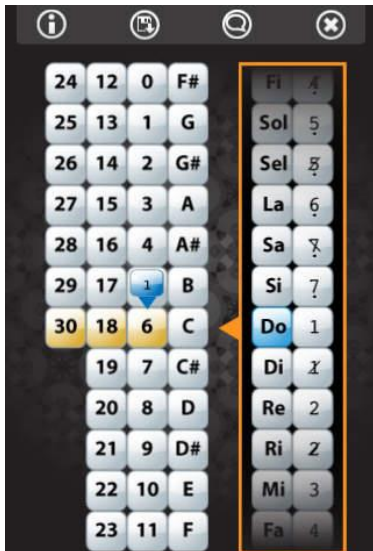


Fig.5. Angklung Calculator for iAngklung [14]

1. The main target of this application is anyone who has an interest in studying Angklung or anyone that is willing to make music with this musical instrument.
2. The language that this application use is English to accommodate user from outside Indonesia, user who did not know English may need help from other people who know English to help them interact with the application.
3. User should have Adobe Flash player in their desktop to run this application correctly.
4. User can choose whether they want to play this application by themselves and were given one set of Angklung instrument, or to play with their friends and was given only one note of Angklung they desired.
5. Other than only to play the application, the user can learn about Angklung in the Learn Angklung page that give information about Angklung.
6. There will be a tutorial page that provides the user with a set of nodes that should be followed to play the song.
7. User will be allowed to upload their text file that consists of music nodes (one to eight in the form of numbers) to the application, and the application will play the music if the nodes are written correctly.

F. Comparison Table

To make the comparison easier for the existing Angklung application that has been out, Table I shows comparison between those applications with Virtual Angklung application.

TABLE I. ANGKLUNG APPLICATION COMPARISON TABLE

Name	Platform	Education about Angklung	Tutorial	How to Play	Single / Multiple Note	Play Pre-made Music
Virtual Angklung	Android	No	No	Yes	Both	No
Angklung Indonesia	Android	Yes	No	No	Single	Yes
Play Me Angklung	Windows Phone	No	No	Yes	Single	No
Angklung Memory	Windows Phone	No	No	Yes	Multiple	No
iAngklung	iPhone	No	Yes	Yes	Single	No
<b>Virtual Angklung (this research)</b>	Desktop	Yes	Yes	Yes	Both	Yes

IV. SOLUTION DESIGN AND DEVELOPMENT

In this section, it discusses the procedure to play the application and all necessary diagrams that are used to develop this application.

A. Procedures

Below are procedures that should be followed while using this Angklung Application:

B. User's Use Case Diagram

Figure 6 below will explain the use case diagram of the prototype of Angklung application using Adobe Flash.

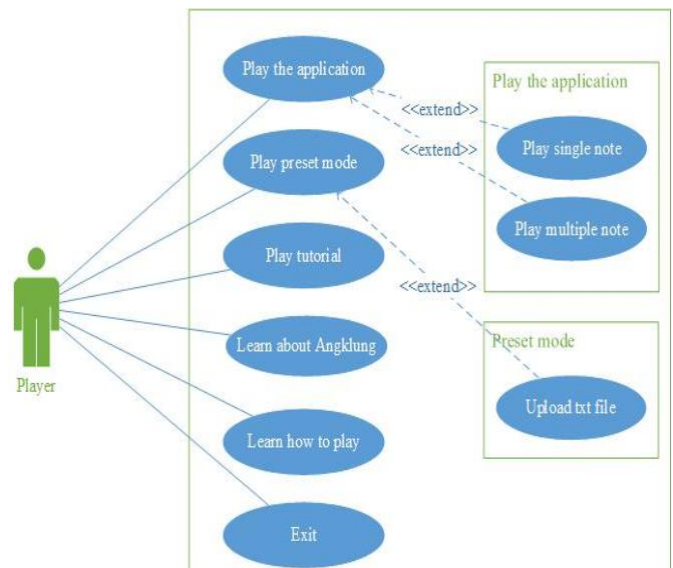


Fig.6. User's use case diagram

Table II below will describe what are the roles of the use case diagram that mentioned above.

TABLE II. ANGKLUNG APPLICATION'S USE CASE TABLE

Use Case Name	Use Case Description	Participating Actor and Role
<b>Play the application</b>	This event occurs when the player clicks 'Play' button at the main menu home screen, it is the first step that the player should do to play the application.	Player
<b>Play single note</b>	This describes the event when the player has already done clicking 'Play' button in the main menu. This use case is one of the options that the player must play the application beside play the application using multiple notes. If the player decided to play single note Angklung, the player will be asked to choose which note that they want to play with from the list of notes provided, then give the player only the note that the player chose.	Player
<b>Play multiple note</b>	After the player has done clicking the 'Play' button in the home screen, this use case comes up as one of the playing options besides playing the application with single note. If the player decided to play the application with multiple notes, it will give the player all notes that the player can play in one screen.	Player
<b>Play preset mode</b>	Represents the event when the player didn't want to play the application manually and would rather prefer to hear the application itself to play the Angklung music for them, and this use case allows the player to choose songs from the list and then play the song.	Player
<b>Upload text file</b>	This is an extended function of play preset mode use case. This occurs when the player executes play preset mode use case and then the player have additional option to upload the text file that has been made before with specific format, then the application will play the song from that text file.	Player
<b>Play tutorial</b>	This event occurs when the player chooses to play tutorial of the application. It will give the user set of alphabetical notes on top of the screen, and the user should follow the notes with the Angklung buttons provided.	Player
<b>Learn about Angklung</b>	This describes the event when the user wants to know more about Angklung, it will show the user the history of Angklung and many other information about Angklung.	Player
<b>Learn how to play</b>	This event represents the event when the user is not sure how to play with the application and they want to learn how to play the application first before really playing it. It will teach the user how to play the application, both single note and multiple note version, in an easy to learn text format	Player
<b>Exit</b>	This use case represents the event when the user wants to end their play and want to exit the application, it will close the application so that the user can do other things they intended to.	Player

C. Context Diagram

Shown Figure 7 is the context diagram of the application; there are three elements in the diagram, which is player, text file as a data source, and the Angklung application itself.

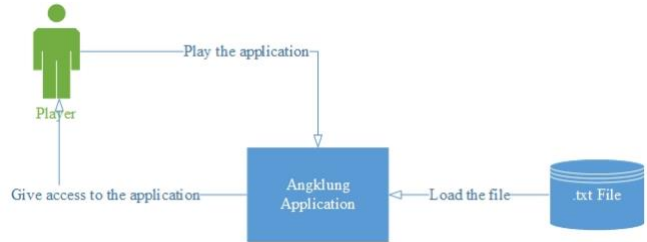


Fig.7. Application's Context Diagram

The player can play the application, and then the Angklung application will give access to the application to the player. If the user in the state of playing the application wants to load the song from text file, the Angklung application will load the targeted text file's data. The application and the database have a relationship on loading the data only because it only needs to extract the data from text file then play it from the application.

D. Main Menu Module

On Figure 8, it describes the module of what the user will face when the user is successfully start the application, this module will redirect the user to other module that the user desires, like playing the application, execute the preset mode, learn how to play, learn more about Angklung, and even tutorial about it. If the user wants to play the game, they need to click one of the buttons and the application will redirect the user to the selected module. There is a special case for 'exit' diagram, it will not redirect the user to other module within the application, but it will close the application so that the user can end the application entirely.

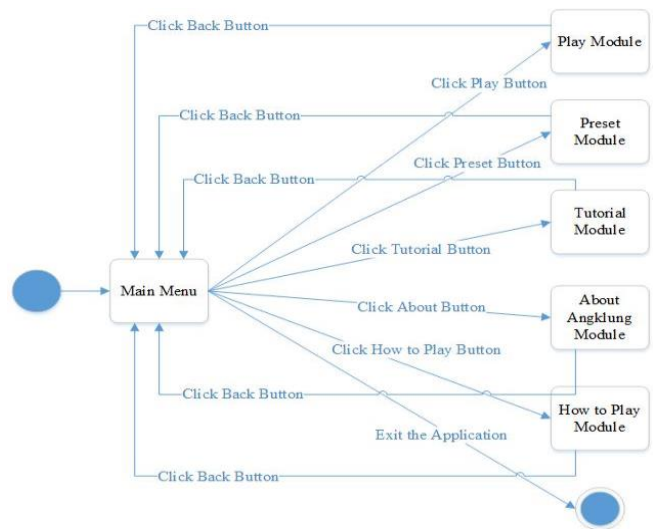


Fig. 8. State Diagram Main Menu Module

### E. Play Module

In the play module, the user will be given two options before playing the application which is single note, and multiple notes. If the user chooses to play the application with single note, it will ask the user again which note that the user wanted to play from the eight basic notes then give the user an interface of that selected note. But if the user prefers to play the application with multiple notes, the application will give the user all eight notes in one interface so that the user can freely play all the notes alternately, and it will be shown in Figure 9.

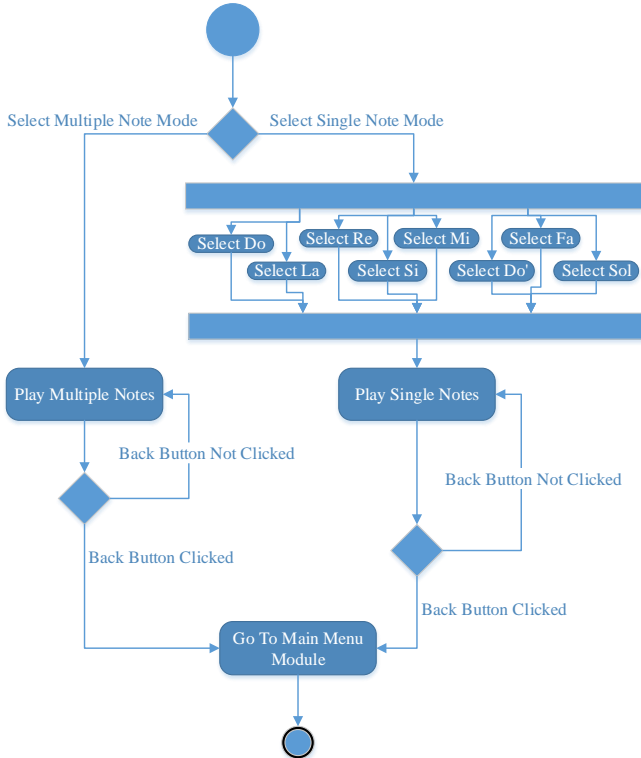


Fig. 9. Activity Diagram Play Module

### F. Preset Mode Module

In this module, the user will be allowed to play the pre-made song in the application so that the user can hear music made from Angklung instrument without manually playing them. The user can choose the songs from the list and click the play button to hear the song. Furthermore, within this module the user can also upload their text file that has been made before with specific format to the application and let the application play the music based on the user's pre-made text file. The step is clicking the upload button, then locate the file on the directory target, then hit the play button so that the application will read and play the song from the uploaded file, refer to Figure 10.

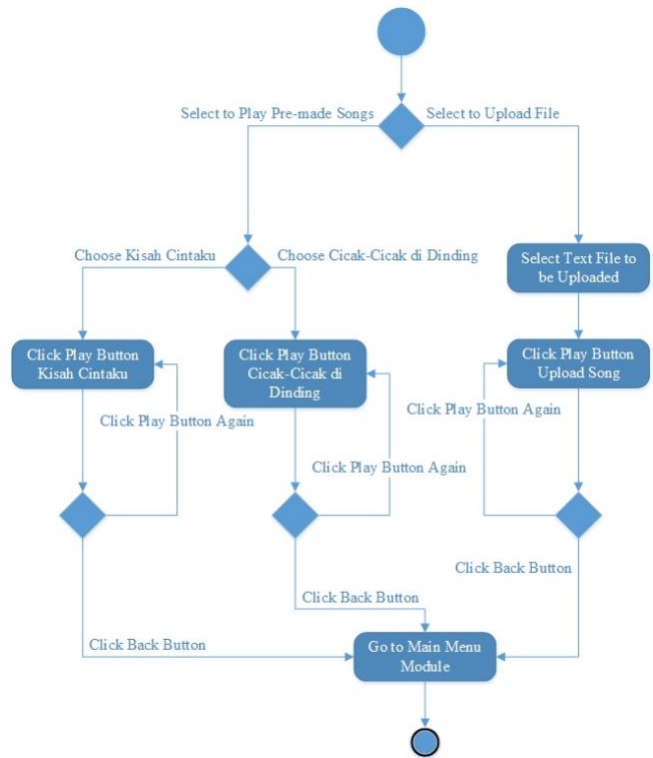


Fig. 10. Activity Diagram Preset Mode Module

### G. Text File Format for Upload Feature

The format to make the text file which will be read by the prototype application of virtual Angklung with Adobe Flash is that this prototype application will read four characters in one second, it implements the regular musical annotation which is 4/4 beat, which means that every 250 milliseconds the application will read and play one character that it reads based on the characters on the text file.

The user will be required to write a music note in a text file, which is ranged from character number 1 (as lower do) until number 8 (as high do), and if the user wants to make delay between notes the user can simply add number 0 to make the delay for 250 milliseconds, as shown in Figure 11. Any other kinds of characters aside from the mentioned numbers before will not be read by the application.

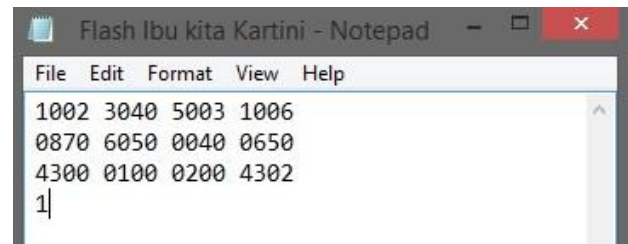


Fig. 11. Sample Text File Format

Based on Figure 11 can be seen that the application will only read the number characters as music note from 1 to 8 and will read 0 as a delay with no sound played. Any other characters aside from number 1 to 8 and 0 such as alphabet, symbols, whitespaces, enter key, etc. will be ignored by the application. Because when the text file is uploaded, the application will read the entire text file first and then it will carefully select only the numbers 1 to 8 and 0 to be inserted to the application's array one character per index, then after the user click play button the application will play the notes based on the character nodes that is stored in the array, with the reading execution speed of 250 milliseconds per index of array. And white space and the enter key that is shown in Figure 11 was made only to make the text file easier for the user to read and organize, because whitespace and the enter key will be ignored and will not be put to the application's array by the application just like other characters and symbols as mentioned before.

#### H. Software

The lists of software that will be used in developing the prototype of Angklung application using Adobe flash are stated in Table III below:

TABLE III. SOFTWARE USED IN MAKING THE APPLICATION

Software Name	Description
Adobe Flash Professional	Used in making Angklung application, the design layout, and Actionscript as the main programming language
Sound Recorder	Used to record real Angklung's sound that will be imported to the application.
Adobe Illustrator	Main software to make images, graphics, and other design to the application.
Adobe Photoshop	Additional software for finishing or retouching the designs that Adobe Illustrator generates.
Adobe After Effect	Used to edit sound source that will be imported to the application.

### V. TESTING AND IMPLEMENTATION

#### A. Specification

The hardware specification used in the development and testing is a PC with Windows 8.1 Pro (64 bit) operating system, 4 GB RAM, the processor is Intel(R) Core (TM) i5-3317U CPU @ 1.70GHZ (4 CPUs), keyboard, and mouse.

The software that used to develop this prototype are:

- Adobe Flash Professional CS5 - acts as a main role in developing the prototype of virtual Angklung using Adobe Flash. It includes all the designs that have been made, animations, and the codes to play the application.
- LG – G2 Sound Recorder - built-in application for LG mobile phones to let the user record any sound that they hear. Used this application to record the sound of Angklung notes by notes, and then import the sound to the Adobe Flash Professional.

- Adobe Illustrator CS5 - used to make majority of the graphical user interface design that is placed on the application.
- Adobe Photoshop CS5 - to convert images format to the format that needed.
- Adobe After Effect CS5 - all sound cutting and cleaning are done with Adobe After Effect.

#### B. Testing and implementation

On Figure 12 shows that there is animation going when the user wants to click the options that the main menu provides, button number 1 will redirect to the main feature of this application which is play the virtual Angklung, button number 2 will allow the user to play pre-made song from the application's database or upload their pre-made song in specific format of text file, button number 3 will let the user play tutorial for this prototype application in the form of following the notes, button number 4 was made to accommodate the user who want to know more information about Angklung, then button number 5 will redirect the user to the how to play screen where the user can learn how to play with the application, and the last is button number 6 to close the application.

The objective of this module is to let the user know what these buttons do in the form of text, and in addition it also gives the user extra experience in experiencing interactive multimedia. It needs pre-condition which is opening the main menu screen, and input from mouse which is mouse cursor's hovering and mouse clicks. And from that, the expected output is that the user will be redirected to the module that they select.

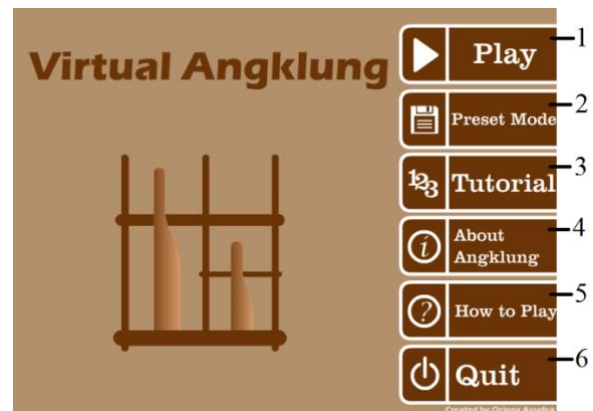


Fig. 12. Main Menu Button Clicks and Animation

Shown Figure 13 below will show the user interface of how to play module, this module is a place where the user can learn about how the user played with the prototype of virtual Angklung with Adobe Flash application, this module will show the user two different modes in playing the prototype application in a clear text and table format to make the differentiating easier.

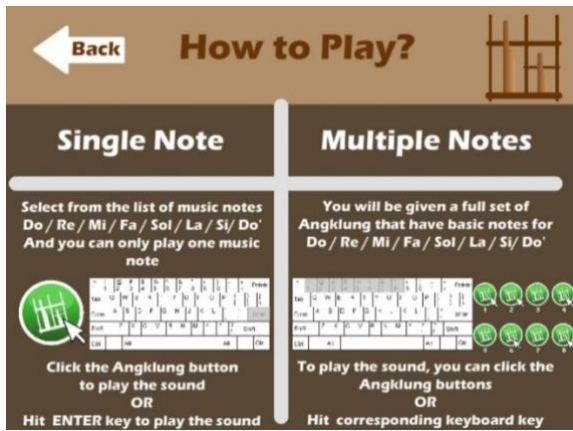


Fig. 13. How to Play Page

Tutorial module will allow the user to play the prototype of virtual Angklung using Adobe flash with the help of note numbers which are displayed on screen. It will ask the user to play the notes one by one correctly to produce the song as shown in Figure 14 below.

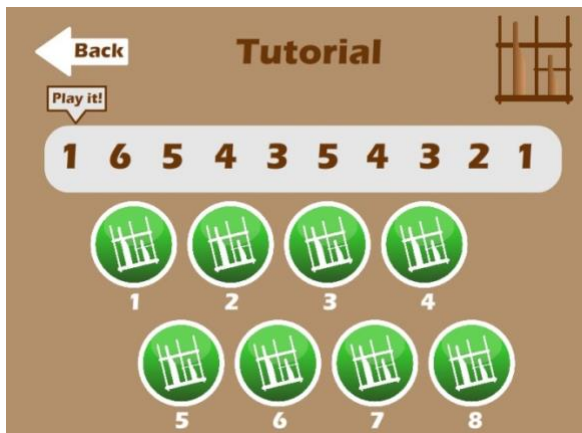


Fig. 14. Tutorial Page

Figure 15 shows the user a list of songs that the user can select to play, the button that has song name as the button's label is letting the user play the song that is saved in the application's database. This module requires the user to select and click preset mode button in the main menu as the pre-condition requirement.

Once the user gets into this module, the user can select one of the songs to listen to from the application's database with their mouse for input criteria. And what is expected from this module is that the user redirected to the preset play the song module to later play the song that they have selected.

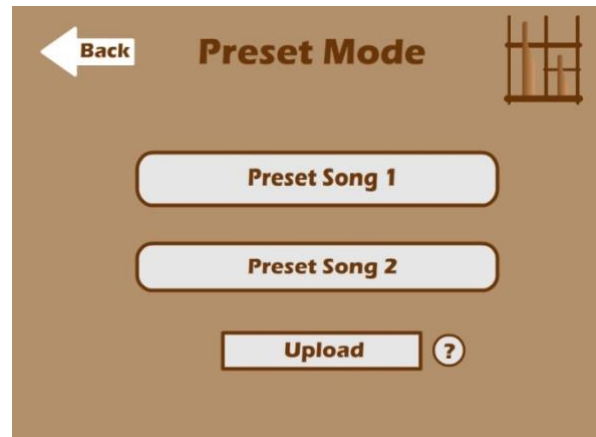


Fig. 15. Preset Mode Select Song Page

Upload text file module is the sub-chapter of the preset mode module, in this module the user will be allowed to upload their pre-made song that is written in text file with specific format, and then the prototype of virtual Angklung application using Adobe Flash will read the file and play the song from that file that has been made by the user beforehand by clicking the upload button as shown in Figure 6, and if the user needs help in what format that they should use to make the text file, the user can click on the help button as shown in Figure 16 below.

The pre-condition requirement of this module is that the user should click the preset mode button in the main menu screen to get to the preset mode screen, and then click the upload button provided to upload the text file that the user made. The input criteria to this module firstly are the mouse click of the user to the upload button, and the text file in the specific format that will be uploaded and read by the application. The expected output from this module is that the application will redirect the user to the preset play screen if the text file that the user wishes to play is already chosen.

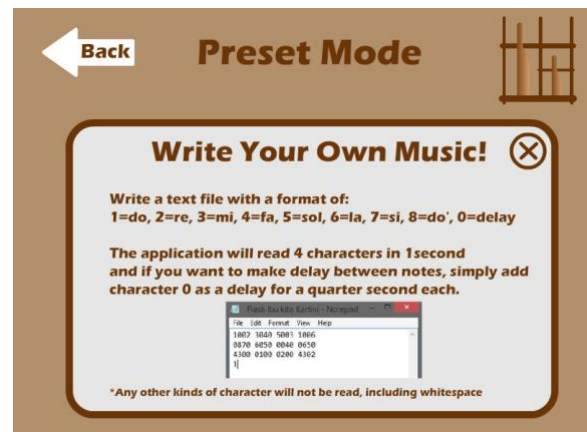


Fig. 16. Preset Mode Upload Text File Help Page

### C. User Acceptance Test (UAT)

When the UAT is conducted, the users are required to make sure the prototype application of virtual Angklung can handle all the required tasks according to the application's



specifications. This test was done by 34 respondents. 78% of respondents said they ever play musical instruments. 82% of the total respondent said that they are directly know how to use this application and 88% said that the prototype application is easy to use. 32 out of 34 respondents said that instructions feature helps them in interacting with this application.

### CONCLUSION

This prototype application of virtual Angklung was successfully developed according to the proposed design, the scopes has been met, the biggest challenge that this prototype application development face which is uploading the text file and already run according to the scope that the author described.

To conclude, all the functional requirements and the scopes mentioned were met, and the system is interactive to give the user the experience about multimedia application besides also giving the user entertainment. Based on the user acceptance test that has been conducted before, 91% of the total respondents are satisfied with the prototype application and 88% of the total respondent said that they are still interested in using this application. In addition, the user able to learn how to use the application without any direction from the author.

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