

CERTIFICATION OF APPROVAL

A Novel Approach in Preserving Gamelan Music

By

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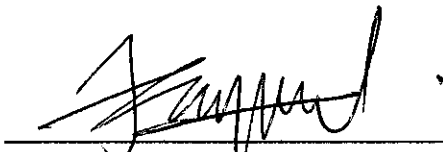
2006

1) Computer graphics

2) IT / IS - Thesis

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not undertaken or done by unspecified sources or persons.



(NAZRUL AZREEN NAZRI)

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ABSTRACT

This research focuses on "A Novel Approach in Preserving Gamelan Music". A computerized software application called Gamelan Pro has been developed. Problems faced by playing Gamelan music through traditional methods are identified. The objective of this research is to preserve Gamelan Music by capturing the actual music by Gamelan instruments and storing them into database. In the literature review of this project, this report starts with the history of Gamelan itself. Two types of Gamelan music namely the Javanese Gamelan and Malaysian Gamelan are studied in this research. The comparisons of both Gamelans are written inside. It has been clearly differentiated by its characteristics. The Gamelan pitches, signs, and short terms are also included in the prototype called Gamelan Pro. The methodology used in this project is described in chapter 3. The type of methodology used and process flow are inside this chapter. Besides, the system architecture is also provided. Chapter 4 is describes the result and discussion of the project. Since the software passed its user-testing phase, all result and findings are within this chapter. A set of questionnaire were distributed to user and the measurement that has been taken for the software testing is based on characteristics described in chapter 4. The final chapter of this report is chapter 5. It consist challenges faced during this project, recommendation for future software's upgrade, and finally the conclusion. At the conclusion part, this report describes that the objective of study and research to develop this new paradigm shift has succeeded in making the Gamelan Pro a useful tool in preserving traditional Gamelan music.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

A gust of wind of change is passing through a traditional way of how music are played and organized. It is not just a changing from a traditional ways of playing music instruments, but also increases efficiency of its operations to a higher standard. The use of technology in music can enhance the quality and ways of playing music. Thus improve the overall efficiency of song. This refers to the initiative of music software which uses computers and Internet to enable user to play music and create song.

In essence, music software is the extensive use of Information and Communication Technology (ICT) in playing musical instruments, so that the user of the software will be able to play music better and more efficiently, at a much lower cost of operating compared to having a music class and at a higher level of productivity. Music software is launched to enable user to play music in a different way which is through computer.

The vision of music software also focuses on an effective and efficient system that enables user to deliver music and sound in a way that the computer becomes more responsive to the changing needs of people. In context of serving the user better, music software sets a new benchmark in the levels of co-operation between the computer and user who will work together for the greater benefit of the music.

1.2 PROBLEM STATEMENT

1.2.1 Problem Identification

The music software is not new in the market. As we can see, there are many of music software created and sold. The most music software sold at the market is made for guitar, piano and violin. Those instruments are popular and played by many people. Among the music software sold, none of them is for gamelan. As we know, gamelan is our traditional music and it is one of Malaysian's heritages. It is also being played by many Malaysians. As we can see, most of formal ceremonies use gamelan as their background music. And this shows that gamelan is still in the heart of Malaysians.

Unlike guitar and other music instruments, gamelan is not an instrument. Gamelan is a group of music instruments. Gamelan contains not just one musical instrument. It contains at least five different musical instruments and a complete gamelan contains thirteen musical instruments. All these instruments need to be played together in order to play gamelan song. Each gamelan musician is assigned to each gamelan instrument. Normally, all gamelan instruments are kept at one place which belongs to one organization such as gamelan music group organization. So, if they want to play or practice gamelan, they need to do it at the place as stated. Most of the gamelan musicians don't have their own gamelan instruments because of its expensive price. Gamelan instrument is quite hard to find at the market as compared to guitar and any others musical instruments.

1.2.2 Poor User Interface Design

User interface design is one of the most important elements of success for any software. Even there are many music software published at the market, some of them are still lack of HCI aspects and only implement plain user interface design. Poor user interface design will lower the usability performance for any software, resulting poor learning performance to the users. For an interactive user interface, feedback to user action is crucial. Delayed processing of user input can lead to strange and irritating effects. The most probable outcomes of poor interface are decrease in efficiency of learning, increase error rates, decrease satisfaction and increase frustration.

1.2.3 Visualization Problem.

Normally, in any music software, user will find it difficult to learn how to read instrument tablatures. The main problem for them is to visualize the outcome of tablature, in other word to get a god picture of how the tablature would sound like. They will need some time to translate the notes written on the tablature using their music instrument. As an example, for guitar music software, they will memorize the notes on the tablature slowly, until they can complete the whole song. The result of this problem is slow learning performance and thus will decrease student's spirit and enthusiasm to learn.

1.2.4 Significant of the Project

By developing Gamelan music software, users can overcome a traditional way of playing Gamelan Music. It is not necessary for them to have Gamelan instrument in order to play Gamelan music. It looks like easy because this software could be as a solution for those who are interested in playing Gamelan music. Even though it is not real, but at least this software could simulate the real sound of gamelan instrument. This software also could enable user to play Gamelan song as they wish to do so.

1.3 OBJECTIVES

- To develop a software that can integrate and present all the information for gamelan user

The project aims to develop software that is capable of providing sufficient information and lessons for user who wants to learn to play Gamelan Music. The primary target of this software is to integrate all the information and lessons, and to be presented in a proper way so that Gamelan user will gain experience of learning Gamelan differently. This does not mean that all Gamelan lessons will be put on this project. Only several Gamelan lessons will be included to show the integration of learning materials and how it is presented. Integration of all information for learning Gamelan means the integration of sound, images and instructional texts.

- To come out with interactive and friendly user interface

Many of available music software at the market only uses plain and simple user interface design on their software. Most of the control buttons that were designed are confusing. The objective of this project is to enhance the user interface of music software, into more interactive and user friendly design.

- To preserve a national traditional music heritage by developing it into software.

As we all know, Gamelan is one of Malaysian's music heritage. It is slowly being forgotten by many Malaysian nowadays. Information technology era could be seen as stepping stone for the development of Gamelan music software. Many of Malaysians are prone to gain information technology knowledge and at the same time, by introducing Gamelan in IT version, hopefully Gamelan music will no longer being forgotten. By enabling users to play Gamelan via computer, Users will notice that there is other way for them to play Gamelan music. Thus, this could spark a new era of they way Gamelan music is played.

1.4 SCOPE OF STUDY

The scope of study is on how the development of Gamelan music software could be useful to user. Developing this system would need some integration of hardware and software. These tools are available and will be used throughout the project. With the tools and sources of information can be found in libraries or by surfing through internet, the project is feasible to be done. Programming tools need to be learned and the hardware components need to be studied and understood. Other than that, some new skills need to learn such as music knowledge skills and sound system synchronizing skills. Currently the main focuses are:

- 1 **Interactive user interface design**
 - Design and develop a user friendly interface design including icons, control buttons, or menus
 - Test it's acceptance and usability with randomly chosen user (as the tester)
- 2 **Integration of sound and software**
 - Design and develop way to integrate all the instruction elements (sounds, images, texts)
 - Present these integrated instruction elements in the most proper way – may require several testing to check user acceptance

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1 THE HISTORY OF GAMELAN [1]

The term "gamelan" refers to various indigenous music ensembles of Java and Bali, the core instruments of which are usually drums, variously tuned bronze gongs, different sets of bronze metallophones, cymbals, and flutes. The bas-reliefs of some of the ancient Hindu and Buddhist temples in Central and East Java, dating from the eighth to fourteenth centuries CE, depict many examples of instruments similar to some of those used in contemporary gamelan orchestras, such as drums, flutes, small knobbed gongs, cymbals, and xylophones. Most contemporary instruments, however, are not represented on these reliefs. They actually much more resemble those used in traditional court orchestras throughout mainland Southeast Asia. The largest of the Javanese court gamelan, usually accompanying the sophisticated court dances (e.g., *bedaya*, *serimpi*, *wayang wong*) and shadow plays (*wayang kulit*), consist of various sets of metallophones (*demung*, *sarong*, *slentem*, *gender*), differently sized horizontally or vertically suspended gongs (*kenong*, *kempyang*, *ketuk*, *bonang*, *gong*), and spoon-shaped, cymbal-like instruments (*kemanak*) made of bronze, as well as drums (*kendang*), flutes (*suling*), plucked (*celempung*) and bowed (*rebab*) string instruments, xylophones (*gambang kayu*), and singing (*pesinden*, *dalang*).

In Bali, a variety of gamelan ensembles have been in use for centuries, both in village life and at the various courts, accompanying rituals as well as dance dramas and shadow plays. They, too, are usually different sets of bronze metallophones (*gangsa*, *kantilan*, *calung*, *jegogan*, *gender*), vertically and horizontally suspended gongs of different sizes (*gong*, *kempur*, *kemong*, *kempli*, *reyong*, *trompong*), cymbals (*ceng-ceng*), drums (*kendang*), and flutes (*suling*). Some of the ensembles also include a bowed string instrument (*rebab*) and singing.

Among the most conspicuous instruments of both the Javanese and Balinese gamelan are the various metallophones. Their bronze plates, struck with mallets, are vertically suspended over either a wooden resonance trough or resonance tubes made of bamboo. Each gamelan is unique in tone color and pitch, fine tuned by master gong-smiths in accordance with the seven-tone *pelog* tonal system, consisting of unequal intervals, or the five-tone *slendro* tonal system, consisting of equal intervals. Javanese gamelan are, in fact, composed of both a *pelog* and a *slendro* set of instruments, whereas in Bali the *slendro* scale is reserved for the ensembles (*gender wayang*) that accompany the shadow plays. Both *pelog* and *slendro* are determined by their respective relative intervals, that is, independently of absolute pitch. Each tonal system allows for different scales, which are classified according to different modes (in Java called *patet* and in Bali *tetekep*).

2.2 GAMELAN IN MALAYSIA [2]

In Malaysia, there are two versions of Gamelan which are Gamelan Johor and Gamelan Terengganu

- Gamelan Johor

Brought by Javanese ancestor who came to peninsular of Malaysia around 18th century. Gamelan Johor is played during “wayang kulit performance”, dances or instrumental, wedding, and “berkhatan”. It is still play by Javanese ancestor in Johor, Selangor and Kuala Lumpur.

- Gamelan Terengganu

Start when “Istana Pahang” received a set of Gamelan from Riau-Lingga around 1800. First time played during the wedding of Pahang’s royal family. The Gamelan Music spread all over Pahang around 19th century, but then it became slowly accepted after of the dead of Sultan Ahmad. Then, the daughter of Sultan Ahmad brought the Gamelan music to terengganu as she married Tengku Zainal Abidin from Terengganu. Since that time, Gamelan music is known at “istana Terengganu”.

2.3 COMPARISON BETWEEN JAVANESE GAMELAN AND MALAYSIAN GAMELAN [2]

Below is the comparison between Javanese Gamelan and Malaysian Gamelan. The major characteristic different in both Gamelan is:

Characteristic	Javanese Gamelan	Malaysian Gamelan
"Laras"	<ul style="list-style-type: none"> • Slendro • Pelog 	<ul style="list-style-type: none"> • Pentatonic
Instruments	<ul style="list-style-type: none"> • Demong • Sarong Barong • Saron Penerus • Slentem • Bonang Barong • Bonang Penerus • Ketuk Kempiang • Kenong • Gambang • Gendang • 4 Kempul • Gong Suok • Gong Agong 	<ul style="list-style-type: none"> • Demong • Sarong Barong • Saron Penerus • Bonang Barong • Kenong • Gambang • Gendang • 1 Kempul • Gong Suok
Song	<ul style="list-style-type: none"> • More on Java music • The song is story about the Java lifestyle 	<ul style="list-style-type: none"> • Prone to Malay song (much Malay song is adapted to Gamelan) • Story about Malay lifestyle
Event	<ul style="list-style-type: none"> • Dancing • Wedding 	<ul style="list-style-type: none"> • "Wayang Kulit" • "Berkhatan"

	<ul style="list-style-type: none"> • Used more on unformal event • Funeral 	<ul style="list-style-type: none"> • Wedding • Formal event like during graduation event • Dancing
--	--	---

Table 2.3: Comparison between Javanese Gamelan and Malaysian Gamelan

2.4 THE PITCH OF GAMELAN [2]

No two gamelans are precisely alike tonally, for each instrument is tuned only to the gamelan for which it is intended rather than to an external standard of pitch. A gamelan typically consists of two sets of instruments, one tuned to the scale of *slendro* (in which the octave is divided into five tones roughly equidistant) and the other to *pelog* (a scale consisting of seven notes of varying intervals of which five are given principal stress). The modes (*patet*) of gamelan music are determined by the relative placement on both scales of the basic note (*dong*) and its fifth above and fifth below. (A fifth is an interval more or less the size of that formed by five adjacent white keys on a piano.)

The highly developed polyphony (multipart music) or heterophony (music in which one part varies a melody played simultaneously in another part) of the gamelan has a rhythmic origin. A nuclear theme extends over a number of "bars" (almost invariably in $\frac{4}{4}$ time), against which other instruments play a largely independent countermelody. Another group plays rhythmic paraphrases of this theme, and a fourth group fills out the texture with delicate rhythmic patterns. Highly important are the punctuating, or colotomic, instruments that divide the musical sentence, marking, as it were, the commas, semicolons, and periods. This last-named function is done with the big gong. Over this shimmering, variegated pattern of hammered sound floats the uninterrupted melodic line of the voice, the flute, or the rebab.

Besides, there also a tune called pentatonic which is based on the sounds of DoReMi. This kind of tune is simple to understand and could be seen more on Malaysian Gamelan. Pentatonic tune also helps much in developing basic skills for new Gamelan musician. This also could be seen as a basic tune of Gamelan.

2.5 SIGNS IN PLAYING GAMELAN [2]

Signs in playing Gamelan are helpful to the musician. The Musicians play Gamelan through the signs given to them. The examples of basic signs in Gamelan are as follow:

1. • = one “ Sabetan”
2. •••• = one “ Gatra”
3. v = Kempul
4. ^ = Kenong
5. O = “Gong” or “Gong Agung” with Kenong
6. + = Ketuk
7. - = Kempiang
8. ρ = Tung (Gendang)
9. b = Dah (Gendang)
10. 2 = One octave higher
11. 2 = Two octave higher
12. 2 = Three octave higher
13. 2 = one octave lower
14. 2 = Two octave lower
15. 2 = Three octave lower

2.6 THE SHORT TERMS IN GAMELAN

Below are the short terms used in Gamelan. It's also a combination of tunes in Gamelan.

The short terms are listed as follow:

1. Lc = Lancaran
2. Ket = Ketawang
3. Ld = Ladrang
4. Gen = Gendang
5. Mr = Merong
6. Um = Umpak
7. Lik = Ngelik
8. Sw = Suwuk
9. PL5 = Pelog Patet Lima
10. PL6 = Pelog Patet Enam
11. SL9 = Slendro Patet Sembilan
12. SL6 = Slendro Patet Enam
13. SL MY = Mayura
14. Bk = Buka

2.7 THE ADVANTAGE OF GAMELAN SOFTWARE

By having Gamelan Software, it could make it easier for Gamelan Musician. In other words, Musicians can only bring notebook (laptop) to perform Gamelan Music. It is not necessary for them to have their own Gamelan instruments. But this doesn't mean to change the traditional way of playing Gamelan music, but to provide a new and alternative way to play it. By maintaining the originality of its sounds, the song produced will be same as played through the real instrument.

This also could reduce the cost faced to organize one Gamelan orchestra. The cost as stated includes buying or renting Gamelan instruments. This software could cost less than the Gamelan instruments itself. Even though it is cheaper, but the sounds produced have the quality of almost same from the real instruments. Besides, space needed to locate the musicians during the Gamelan performance will no longer being a problem at all.

User who wishes to have it at home, this software is much more practical. The price of the software could be less than buying one Gamelan instruments. In addition, this software is not just simulates one instruments but more. At this stage, this software will simulate two instruments which are Bonang and Gong. Even though playing it alone, user can play the Gamelan music because this software have the functionality of playing Gamelan song while user playing Gamelan instruments. Its makes the way Gamelan played through this software look interesting and interactive.

CHAPTER 3

METHDODOLOGY

3.1 METHODOLOGY

This project is based on the hybrid methodology and as far as now, there were no problems at all to follow the project progress based on stages involved in the methodology used. It is a combination of three different methodologies as stated below:

- The waterfall model
- The Sashimi model
- Evolutionary Delivery Model

The hybrid methodology is used because; each of those methodologies has its disadvantages if it is used alone. By combining all these methodologies, surely this will minimize the disadvantages and add more advantages.

3.2 DETAILED METHOD

3.2.1 Requirement and Feasibility Study Phase

The stage consists of requirement analysis and feasibility study of the project. This stage is important for the developer in order to determine the relevancy of the project and also how should they do the project. It means that the developer will have the opportunity to analyze the relevancy of the project based on the feasibility study, and also how they are going to do the project from the requirement analysis. It helps to give a big picture of should they do the project, and how to do the project.

1. Preliminary study

Some background study had been done for the project. Basically, the background of study is the problem faced with playing Gamelan music traditionally. The problems of other music software at the market were then identified. It has been decided that by computerize the way of playing Gamelan, it tends to give more advantages to Gamelan musicians. The requirements of the software were then identified based on outputs of the problem identification. The next step was to identify the objectives of the project. There were 3 objectives identified for the project, which are:

- To develop an software that can integrate and present information for Gamelan User
- To come out with interactive and friendly user interface
- To preserve Gamelan as Malaysian's national heritage

These objectives are very important as a target for the developer to achieve in this project. Lastly, the project's scope of study was identified. The scope of study that has been identified is on how the use of computer can enhance the way Gamelan music is played.

2. Feasibility study

Feasibility study is common thing in the planning phase. Time, scope and budget must be considered at the beginning of any project. Within this time, the scope of study or research had already been determined, and all the topics that will be discussed in final report have also been agreed by the supervisor. As for the time aspect, the time given to complete this project is quite relevant and this matter will not be the issues or constraint in the future. For the budget, it was agreed that students will use their own resources or money upon completion of this project. With this feasibility study, any constraints upon completion of the project had been identified.

3.2.2 Logical Analysis and Design Phase

This stage involve the early work of designing an software which include arranging the data flow, producing story board, and also identification of the software which will be used in developing the software. Below are the detail descriptions of each work that has been done in this stage:

1. Designing the flow of the software

It is necessary to design the flow of software before starting the actual design work because it helps the developer to have a clear view of how the flow of the software should be, making the actual design work more easy. Here, it is necessary to determine several aspects such as “what should be included and what shouldn’t be included in the software”, “how to organize the materials of the software”, and “which instruction topic is suitable to be included”.

2. Designing the storyboard

The purpose of designing a storyboard is to get a better picture of the interface layout of the software. Important aspects such as icon arrangements and the overall layout of the interface need to be designed here.

3. Modifying the designed storyboard

Any functions or designs which don’t meet the requirement need to be modified. The storyboard was presented to the supervisor, to check for any improper design functions. The next step is to modify and enhance the storyboard until the supervisor satisfies with it. There were several modifications were made in the storyboard such as button layout placement, and also they layout design.

4. Identifying the software needed in developing the software

Before starting actual design and development stage, it is important to identify the tools and software needed in the design and development work. Basically, the software that has been selected to develop the software is as below:

- **Macromedia Flash MX – Main tool in developing the software.**
- **Adobe Photoshop – Image editing work.**
- **Sound Forge 6.0 – Capturing and editing Gamelan sounds**

3.2.3 Process Flow of the Project

Process flow diagram indicates the steps taken during the development of the software. Each step is vital and relies on each other. The steps are shown as below:

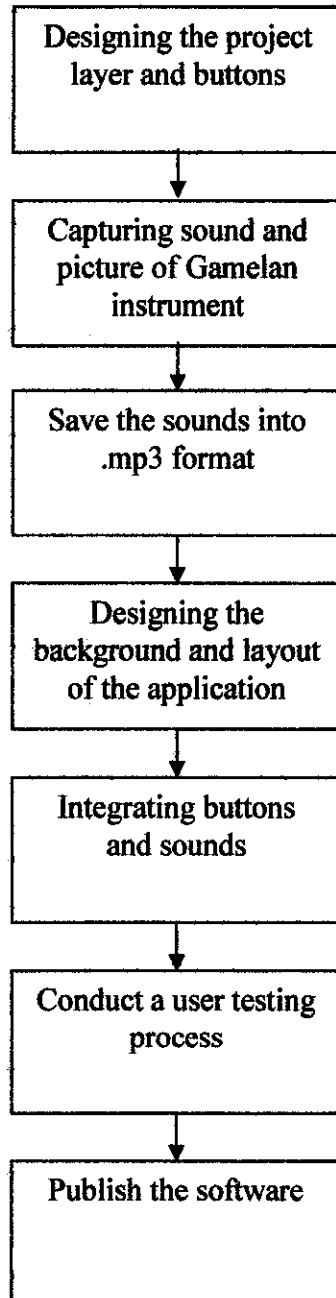


Figure 3.2.3: The process flow of the project

The process flow of the project describes the steps and works that are done throughout the project. The steps and works involved are vital towards the development of the project. Without any each of the steps or work, the objective of software development could not be achieved successfully. The several steps and works include:

1. Designing the project layer and buttons

The actual development work has been started by designing the layer of the software. Then, the buttons that are used within the program is also designed. These buttons were designed using Macromedia Flash MX. It was the longest working process compared to others in this stage because it requires careful work in designing the layer and buttons.

2. Capturing sound and picture of Gamelan instrument

Since finished designing the buttons, it is time to capture sounds needed to be included in the software. There were two method used during the process of sound recording which is through the internet and manual record. Electronic recorder was used to capture gamelan sound manually. All the sounds that have been captured were then edited using a tool called Sound Forge in order to get the same length for each sounds. The pictures of Gamelan instruments were captured through internet and manual. Digital camera was used during the picture capturing process.

3. Save the sounds into .mp3 format

The sounds were then saved into mp3 format. Mp3 format is the most suitable format which can be embedded with the projected software without any error.

4. Designing the background and layout of the software

The layout and background of the software were designed, and then all other minor units (such as buttons and sounds) will be integrated with it. Different color schemes were used in different sections in the software to show significant differences between each of the sections. The work continues by designing the overall layout of the software including the “area for text” layout and “area for buttons” layout.

5. Integrating buttons and sounds

All of the minor units were integrated together in the main program. Buttons and sounds were imported into main layout and were organized according to the storyboard. It requires some action script works in order to integrate the software as one functioning system.

6. Conduct a user testing process

Once the software is starts working, it will then proceed to user testing process. At this stage, a group of selected users will be given a chance to use and test the software. During the testing process, user will also required to evaluate the software based on characteristics given inside the questionnaire form. Any error found on the software will then be corrected before it is ready to be published officially.

7. Publish the software

This is the final stage of the software development process whereby the software is officially ready to be published to the user. The software is considered finish and ready to be delivered. The extra task during this project is continuous improvement of the software besides consider for future upgrade.

3.2.4 System Architecture

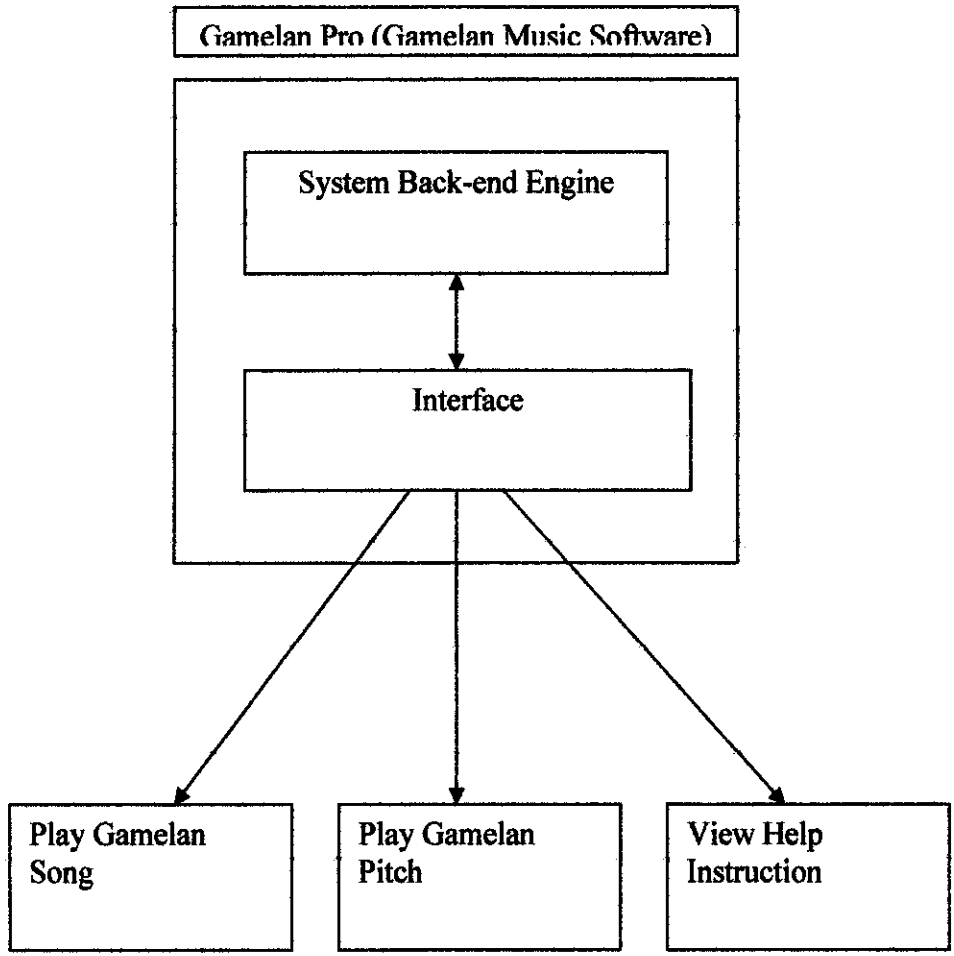


Figure 3.2.4: System architecture of Gamelan music software

3.2.5 Testing

The objective of testing phase is to evaluate the software in terms of usability and level of acceptance. The approach that has been used in order to evaluate the usability of the software is through the distribution of questionnaires. A set of 20 questions were prepared for the questionnaire. These 20 questions represent four major elements which will be analyzed. The elements are: instrument icon, sounds quality, navigation aspect, and layout of the software. Ten evaluators had been chosen to test and evaluate the software. The candidates chosen were Gamelan instructor, Gamelan musician, and Gamelan learners (students). The software was distributed among evaluators along with the questionnaires. Analysis will be done based on the questionnaires evaluated by those 10 evaluators. All evaluators were successfully finished this testing phase. Results were then analyzed and are described more on Chapter 4.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 TESTING

The aim of testing is to evaluate the usability and level of acceptance of the software. The method that was used during evaluation phase is through questionnaires. The reason of conducting heuristic evaluation test is to reach the exact user and get their feedback as much ever could. The evaluators consist of 10 people who have Gamelan music background. They are Gamelan instructor, Gamelan Musician, and Gamelan learners (student). The procedures of testing work are discussed in detail as below:

4.1.1 Preparation of the Questionnaires

20 questions have been delivered to user, and these questions will represent issues such as instrument icon, sounds quality, navigation aspect, and layout of the software. In other word, the questions were segmented into 4 major issues and user has to do evaluation based on their experience and knowledge.

The questions were then created; it should be precise rather than general. The reason why the questions should be specific on the topic is to avoid responses or answers that will probably vary so much that no common trend will emerge. Ratings were given as the choice of answer for evaluators to choose, giving them easier way to answer and more likely to provide useful information to improve interface.

4.1.2 Selecting the Evaluators

Individual evaluators can perform a heuristic evaluation of a user interface on their own. But based on the some researches; single evaluator can found only 35 percent of the usability problems in the interfaces. However, different evaluators tend to find different problems; it is possible to achieve substantially better performance by aggregating the evaluations from several evaluators. Figure below shows the proportion of usability problems found as more and more evaluators are added. The figure clearly shows that there is a nice payoff from using more than one evaluator.

It has been decided that ten evaluators need to be selected for the evaluation of this software. By having 10 evaluators, more than 80% of the usability problems might be found. There will be no bias in the result gathered as the chosen evaluators have background in Gamelan music.

4.1.3 Conducting the Testing Along With Evaluation

The software and questionnaires were distributed among the selected evaluators. Along with these files are the instructions of the test. Basically, these 10 evaluators were given 30 minutes to fully use and discover the software. During that period, the evaluators need to answer the questionnaires that were given to them. Evaluators also need to provide critics or comments on any questions or aspects which they found necessary.

There are 20 questions which need to be answered by evaluators. 5 of the questions were about instrument icon, another 5 questions were about sounds quality of the software, next 5 questions were about the navigation of the software, and the last 5 questions were about the layout of the software. Basically, the evaluators had to answer each of the questions with answer rating from 1 to 5, where:

- 1 = Strongly Agree
- 2 = Agree
- 3 = Not Sure
- 4 = Disagree
- 5 = Strongly Disagree

After all questions had been answered, the evaluators need to send the answers back to the developer of the software. Data analysis work can be done based on all the answers and results that have been collected from the evaluators.

4.2 RESULTS AND DATA ANALYSIS

The 20 questionnaires that were given to the evaluators are actually consisting of 4 major sections. Questions from section 1 focus about the instrument icon in enhancing user interface. Questions from section 2 focus about the sounds quality of the software. Questions from section 3 focus on the navigation aspect of the software. Questions from section 4 focus on the overall layout of the software. The result and data analysis for each of the sections of the questionnaires are described as follow.

4.2.1 Section 1- The Instrument Icon

Section 1 is focusing on the instrument icon in enhancing user interface. The result for section 1 is gathered and shown in histogram and pie chart. In addition, mean was calculated to get the average of answer for each of the questions. The total mean is 1.84. Mod was also calculated to get the total of most frequent answer that the evaluators had given on each of the questions. The total mod in this section is 2.

A histogram was constructed based on the data that were gathered and calculated. The histogram (as in the figure below) shows the distribution of scores for each of the questions in this section:

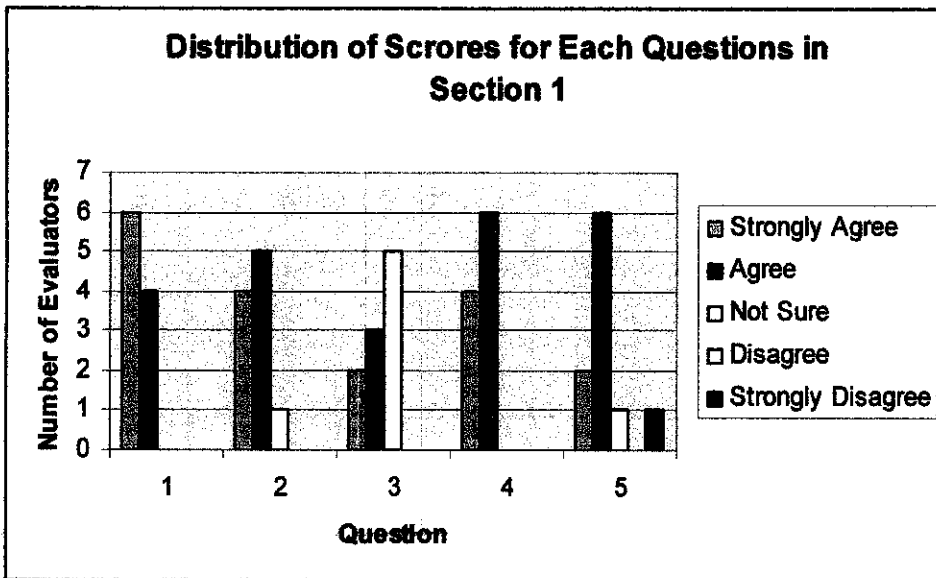


Figure 4.2.1 (a): Distribution of scores for each question in section 1

The information provided by the histogram was not sufficient enough in order to do analysis. A pie chart was then constructed to provide a better view of the result. The evaluators were grouped according to their answer/score, and next the pie chart of this grouped people was constructed. Figure below shows the percentage of evaluator's score in this section.

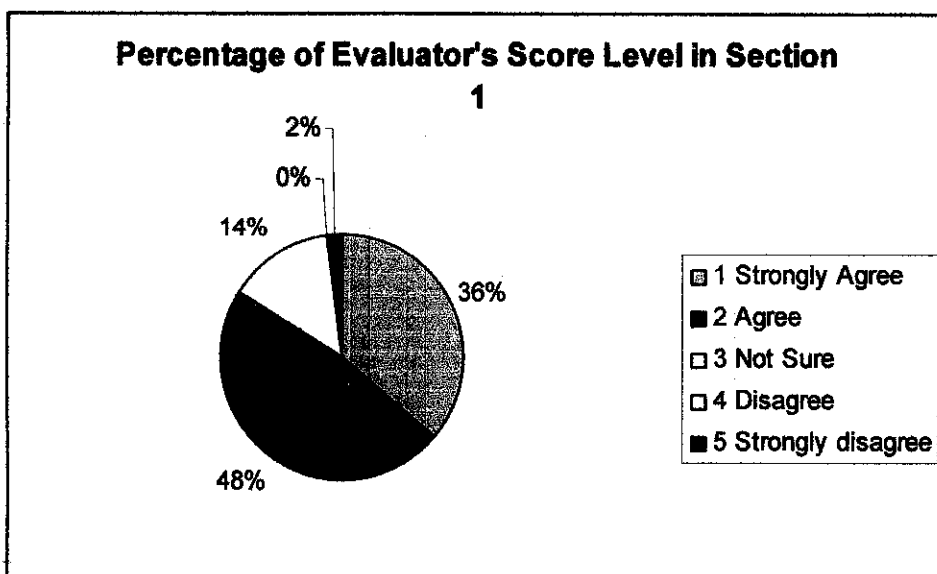


Figure 4.2.1 (b): Percentage of evaluator's score in section 1

4.2.2 Section 2 – The Sounds Quality of the Software

Section 2 is focusing on the sounds quality produced by software. Basically the data were analyzed based on the scores given by each evaluator (same as in section 1). The mean / average of score for each of the questions were calculated, to be used in constructing histogram. The total mod score of this section were also calculated to find the most frequent answer that was given by the evaluators. The total mean for this section is 2.22 while the total mod is 1 and 2.

The histogram below shows the distribution of scores for each of the questions in this section. This histogram was constructed based on the calculation made on the score result of this section.

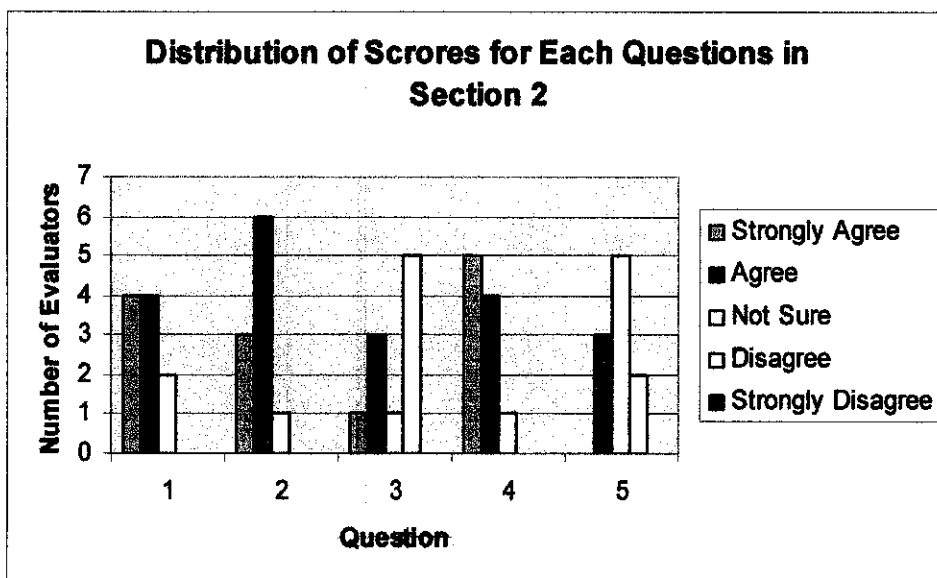


Figure 4.2.2 (a): Distribution of scores for each question in section 2

The histogram had provided some blurry information; the total number of evaluators with the same answer can be calculated based on the histogram. To make this information clearer, a pie chart was created to group the evaluators according to the score that they had given, as in the figure below. It shows the percentage of evaluator's score level in section 2.

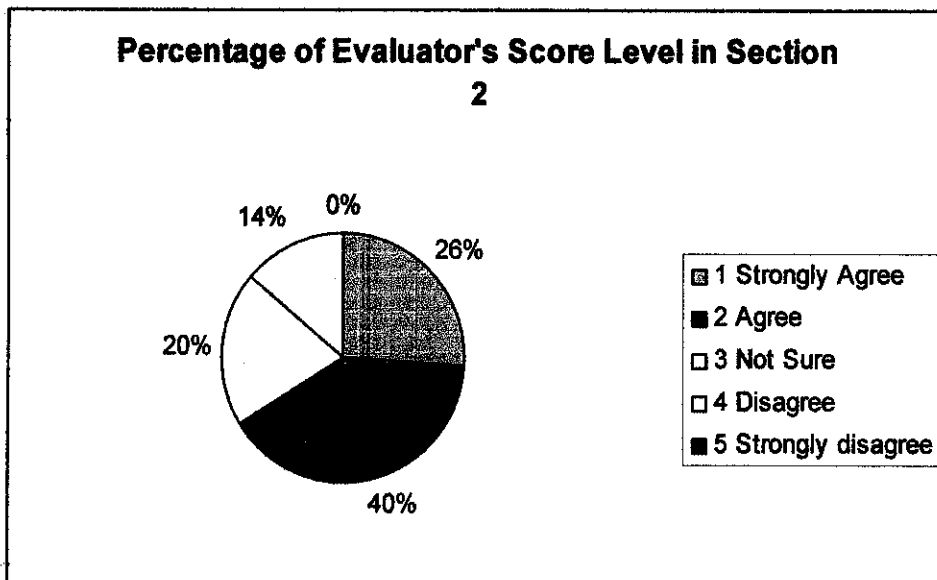


Figure 4.2.2 (b): Percentage of evaluator's score in section 2

4.2.3 Section 3 – The Navigation Aspect of the Software

Section 3 is focusing on the navigation aspect of the software. The data analysis works are still the same as in section 1, where the mean score for each of the evaluators was calculated. The total mean score is 2.32 while the total mod score is 2.

The histogram below shows the distribution of scores for each of the questions in this section. The histogram was constructed based score given by the evaluators on each of the questions.

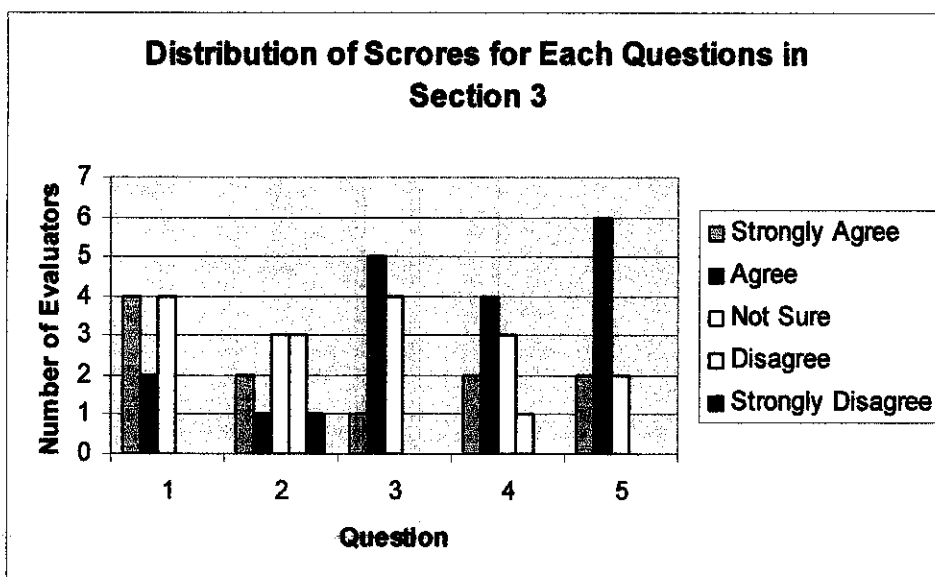


Figure 4.3.2 (a): Distribution of scores for each question in section 3

Next, a pie chart has been constructed to group evaluators based on the average score that they had given. There were 5 different groups identified with different group size percentage.

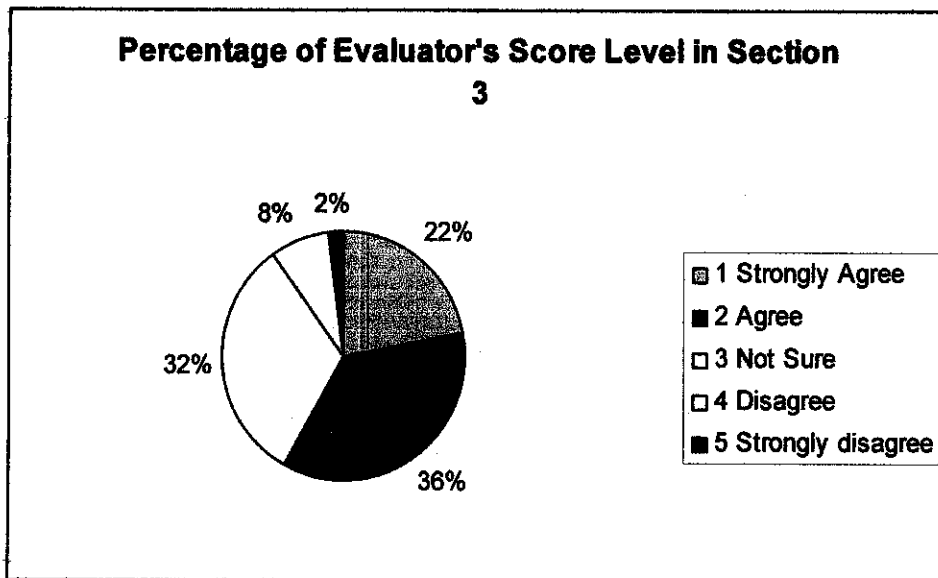


Figure 4.2.3 (b): Percentage of evaluator's score in section 3

4.2.4 Section 4 – The Layout of the Software

Questions from section 4 focus on the overall layout of the software. The data analysis works are also the same as in previous section, where the mean score of each questions, total mean score, and total mod score were calculated. The total mean score was 2.08, and the total mod score was 2.

Histogram below shows the distribution of scores for each of the questions in section 4. It was constructed based on the data gathered from the table above.

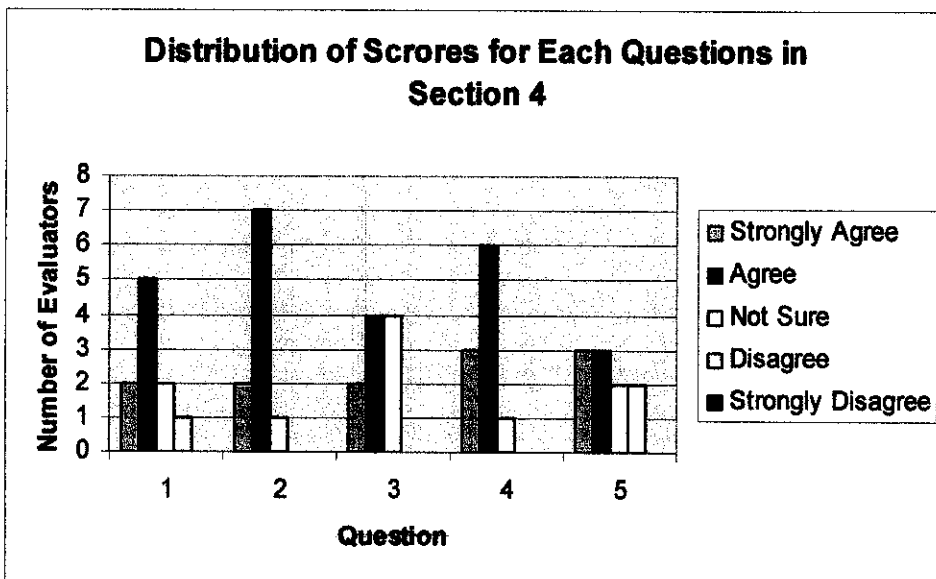


Figure 4.2.4 (a): Distribution of scores for each question in section 4

Lastly, a pie chart has been constructed to group evaluators based on the score that they had given. There were 4 different groups identified with different group size percentages.

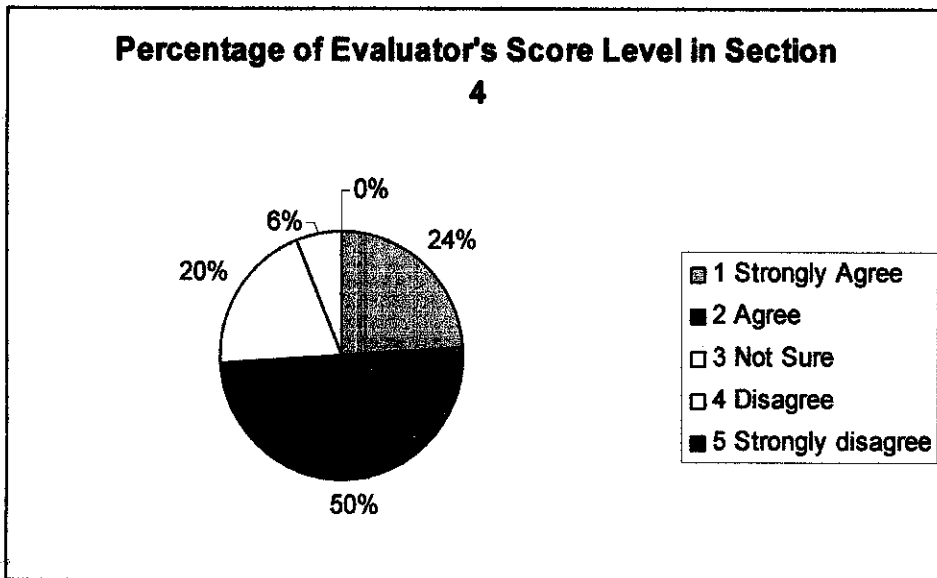


Figure 4.2.4 (b): Percentage of evaluator's score in section 4

4.2.5 Overall Mean Score

Based from the data analysis that has been done on each of the questionnaire sections, the total mean score from each of the sections are as follow:

- The average score for section 1 is 1.84
- The average score for section 2 is 2.22
- The average score for section 3 is 2.32
- The average score for section 4 is 2.08

The discussion of these results will be discussed in detail in the next section of this report.

4.3 DISCUSSION

After all the data have been analyzed, it is necessary to come out with conclusion or discussion. It is very important in order to determine the weaknesses or any inefficiency in the software that has been developed. The analysis will then become the measure and evaluation of the software's usability, fulfilling the objective of the testing stage in the development methodology. Some of the analysis had involved mean calculation, where the results of the calculation were likely in form of the decimal numbers. A score ratio has been created to ease the assumption work based on the mean that has been calculated. The score ratio is as below:

1 - 1.4	=	Strongly Agree
1.5 - 2.5	=	Agree
2.6 - 3.4	=	Not Sure
3.5 - 4.5	=	Disagree
4.6 - 5	=	Strongly Agree

For this section of report, the discussions are grouped according to the sections of the topic in the questionnaires.

4.3.1 The Instrument Icon

The instrument icon was one of the aspects that were questioned in the questionnaire. The objective of evaluating this aspect is to survey whether the instrument icon is better or not in terms of usability. Based on the result that has been gathered, the total mean score is 1.84, and the total for mod score is 2. Since the mean score is 1.84, it can be concluded that average evaluators had agreed that the instrument icons really helped in terms of usability and visibility in the software. In addition, the most frequent answer that had been given by the evaluators in this section is 2 (agree).

Another analysis also was made based on the pie chart that has been constructed. The pie chart shows the percentage of evaluator's score level, the scores were grouped according to their level / type (example: Agree, Disagree etc). Based on the pie chart:

- 36% of the evaluators had strongly agree that the instrument icon really increase usability and visibility
- 48% of the evaluators had agree that the instrument icon helps to increase usability and visibility
- 14% of the evaluators were not sure with the role of instrument icon in enhancing usability and visibility
- 2% of the evaluators had disagree that the use of instrument icon helps to increase usability and visibility

The result above shows that there are distributions of answers regarding the instrument icon, where some of the evaluators agree and some of them were not. These evaluators who didn't agree had given comments that the icons that were used in the software are not appropriate. As for the evaluators who had agreed, they think that the implementation of the instrument icon in the software is good to increase usability, since the instrument icon could give more attraction to the user. Attractions can help users to remember the icons and its functions easily, thus minimizing the memory load.

As a conclusion for this section's discussion, the majority of the evaluators had only 'agree' because they thought that the effectiveness of icons varies according to the type of users. Adult user might say that the icons that was implemented in the software as a distraction when using the software. Still, this fact couldn't be proven as right until an evaluation has made using adult people as evaluators.

4.3.2 The Sounds Quality of the Software

The 'sounds quality of the software' is another aspect that needs to be evaluated in order to measure the usability of the software. The aim was to survey whether the sounds quality of the software is real or not, in order to simulate the real Gamelan instrument. Based on the calculations that was made, the total mean score for this section is 2.22, while the total mod scores are 1 and 2. It can be concluded that the average evaluators had only 'agree' (based on the mean score) that the sounds quality of the software are real. Furthermore, the most frequent answers given in this section are 1 and 2, which adds the point saying that the evaluators had only 'agree' with this aspect of evaluation.

Similar as in the previous section of this report, analysis was also made based on the pie chart that has been constructed. The pie chart shows the percentage of evaluator's score level, the scores were grouped according to their level / type (example: Strongly Agree, Disagree, etc). Based on the pie chart:

- 26% of the evaluators had 'strongly agree' that the sounds quality of the software are real
- 40% of the evaluators had only 'agree' that the sounds quality of the software are real
- 20% of the evaluators were 'not sure' whether the sounds quality of the software were real or not
- 14% of the evaluators had 'disagree' with the fact that the sounds qualities of the software are real.

Based on the 3 major calculations (total mean score, total mod score, and the score based on the score ratio), it has been proven that majority of the evaluators had only 'agree' that the sounds quality of the software are very close to the real gamelan instrument. Some of them said that the sounds produced by the software contain noise. This comment was given by the evaluators who have deep experience in Gamelan music.

4.3.3 The Navigation Aspect

The objective of the survey regarding the navigation aspect was to evaluate whether the navigation of the software is good or not. Before a conclusion can be made, proofs need to be extracted from the data that was gathered. Based on the data analysis that has been made for section 3, the total mean score is 2.32 and the total of the mod score is 2. Roughly, it can be concluded that majority if the evaluators had only 'agree' that the navigation aspect of the software is good.

Analysis was also made based on the pie chart shows the percentage of evaluator's score level, the scores were grouped according to their level / type (example: Strongly Agree, Disagree, etc). Based on the pie chart:

- 22% of the evaluators had 'strongly agree' that the navigation aspect of the software is good
- 36% of the evaluators had only 'agree' that the navigation aspect of the software is good
- 32% of the evaluators were not sure whether the navigation aspects are good or not
- 8% of the evaluators had 'disagree' that the navigation aspects are good
- 2% of the evaluators had 'strongly disagree' that the navigation aspects are good

Compared to other aspect of evaluation, the distribution of answers in this aspect is the greatest, where it involves all of the possible answers. It has been identified that the 2% of the 'strongly disagree' answer had came from question number two of this section. Actually this question was asked in a reverse meaning. The question is as below:

"User will require a lot of help from the 'help' menu to navigate through the software"

It shows here that the 2% of the evaluators who had strongly disagree with this question, are actually strongly agree that the navigation aspects were good. Therefore, the total of the evaluators who had strongly agreed with the navigation aspects of this software is 24%.

As for the conclusion, majority of the evaluators may be 'agree' that the navigation aspects of the software is good because they didn't face many difficulties while navigate through the software during the live test session. One of the comments that the minority had given is that several navigation buttons should be added to ease the navigation of the software. Plus, there should be tool tips / texts describing what are the functions of the navigation buttons.

4.3.4 The Overall Layout Design

This is the last aspect that needs to be evaluated, and the objective of this aspect's evaluation is to find whether the layout that has been designed is good or not. Evaluators need to choose whether they agree or not with the fact that the layout of the software is good in all aspect. Similar as the previous section's discussion, proofs were extracted first from the data before any conclusion can be made. Based on the data that has been gathered, the total mean score for this section is 2.08 and the total mod score is 2. From this data, a rough conclusion can be made: majority of the evaluators had only 'agree' that the software's layout design was good in all aspects.

Analysis was also made based on the pie chart that has been constructed on this aspect of evaluation. The pie chart shows the percentage of evaluator's score level, the scores were grouped according to their level / type (example: Strongly Agree, Disagree, etc). Based on the pie chart:

- 24% of the evaluators had 'strongly agree' that the layout design of the software was well designed
- 50% of the evaluators had only 'agree' that the layout design of the software was well designed
- 20% of them were 'not sure' whether the layout design is good or not
- 6% of them had 'disagree' that the layout design is good

As for the conclusion, majority of the evaluators had only 'agree' that the layout design of the software is good in many aspects. The minority were not sure because they said that the result could vary according to the type of users who are using the software. Some of the evaluators also comment that the buttons should be more standardized and arranged in more suitable place in the software.

4.3.5 Overall Aspects of Evaluation

It is important to conclude the tests and result from the questionnaire as a whole. Based on the data those were gathered:

- 84% of the evaluators agree that the instrument icon increase the usability and visibility of the software
- 66% of the evaluators agree that the sounds quality produced by the software are real
- 58% of the evaluators agree that the navigation aspect of the software is good
- 74% of the evaluators agree that the layout of the software is well designed

For an overall conclusion, the result of this tests and questionnaires were positive, where 70.5% of the evaluators agree with the overall aspect of the software. Still, this result was positive maybe because most of the evaluators are in the similar group of experience or background. The result may vary, if the evaluators are chosen from different group of age and background.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 CHALLENGES

There were many challenges that have been encountered during the completion of this project. One of the biggest challenges is the needs to switch from using JAVA language and tools into Macromedia Flash MX. It is because during the development of the software, the developer found that JMusic library cannot works well with JAVA tools which is Eclipse. Thus that could lead to failure in integrating Gamelan's instrument sound with the software. Furthermore, there was also a challenge which the developer needs to learn Macromedia Flash MX and Sound Forge. It takes several weeks to master the basics of all of this software.

Another challenge of this project was during designing the software, including the layout design, button design, and button positioning. It was challenging because this kind of task requires a lot of human computer interaction skills.

The last challenge of this project was to cope up with the time. As mentioned in the methodology chapter, the Evolutionary Delivery model had been implied onto development stages. There were a lot of iteration processes that occurred along the development phase. Sometimes, the author had to struggle in order to maintain the work / report that need to be submitted in time. The cause of this problem was because of rapid iteration process during the development phase. Although sometimes the time required was not enough, the author had managed to submit all the works / reports on time.

5.2 RECOMMENDATIONS

The software that has been developed were still lack of theories and lessons, since the aim of the project was only to create a 'prototype'. The author would like to recommend that the content of the software should be added in the future in order to make it as software that could 100% simulate the Gamelan's instruments sound.

The second and last recommendation is to make the software available online. It means that the software will be expanded into web pages to be used through local area network, or maybe to be used through internet. In addition of expanding the software into network medium, the features of the software could also be added. Online forums can be made for the users of the software to have online collaborations. There are many more features that could be added if the software is implemented online, thus creating more functionality and benefits.

As a whole, the current product should be improvised more in the future in order to add its value and functionality, so that it can be a reliable tool to overcome a traditional way playing Gamelan.

5.3 Conclusion

This paper introduces an approach to provide an alternative way of playing Gamelan music. Even though this software doesn't stimulate 100% of sound of actual Gamelan instruments, but at least it comes with solution that could be helpful to Gamelan musicians. Resources which have been provided in the software are assumed to be enough for user in order to use it.

The software has successfully integrated and presents all information about Gamelan to its user. Sounds of the Gamelan pitch have been assigned to key board key and will act accordingly to user action. In addition, at the time user pressing the keyboard key, the image of each nodes of Gamelan instrument will blown up. As a result, it can help to improve user to play Gamelan since all of the resources had been integrated together. User can rely on the software in order to play Gamelan music.

The objective to come out with friendly user interface is also successfully achieved. The software has simple interface design and looks easy to be used. Furthermore, the alignment of icons and buttons look great. By adding two Gamelan songs, the software looks more attractive to user.

Lastly, this project is successfully achieve its main objective to preserve Gamelan music by developing it into computerize software. The sounds produced are real and surely user will feel that it is possible to play Gamelan music just by using computer. By developing Gamelan music into computerized software, hopefully this traditional music will be widely known and accepted by Malaysian. All objectives of the project have successfully been achieved, but still there are some aspects needs to be improve in order to ensure this Gamelan music software is really represent Gamelan music as whole.

REFERENCES

- [1] [http://www.seasite.niu.edu/indonesian/Budaya Bangsa/Gamelan/Javanese Gamelan](http://www.seasite.niu.edu/indonesian/Budaya_Bangsa/Gamelan/Javanese_Gamelan)
(Informative research of Javanese Gamelan)
- [2] *Gamelan Slendro 'Irama Lancaran'* by Zaidin Hj. Mohd Noor
- [3] *How to do everything with Macromedia Flash MX* (2004) by Bonnie Blake, Doug Sahlin, (McGraw Hill)
- [4] *Macromedia Flash MX 2004 'Fast and Easy Web Development'* (2004) by Lisa A.Bucki, (Premier Press)
- [5] www.monkeyc.org (Gamelan Informative webpage)
- [6] <http://www.robertinventor.com> (Fractal Tune)
- [7] www.flashguru.com (Tutorial for Macromedia user)
- [8] <http://www.planetsourcecode.com> (Coding source for Macromedia tools)
- [9] <http://www.gamelanwebpage.html>
- [10] http://en.wikipedia.org/wiki/Main_Page (Wikipedia : Source of information for project)
- [11] [http://www.dancemalaysia.com/Dance/Traditional/Court Dance/Gamelan](http://www.dancemalaysia.com/Dance/Traditional/Court_Dance/Gamelan)
- [12] <http://www.progressiveears.com/frippbook/ch09.htm>

[13] <http://www.monash.edu.au/muma/exhibitions/past/1999/gamelan.html>

[14] <http://www.urpress.com/80460887.HTM>

[15] *Balinese Music* (1991) by Michael Tenzer, ISBN 0945971303. Included is an excellent sampler CD of Balinese Music

[16] *Gamelan: Cultural Interaction and Musical Development in Central Java* (1995) by Sumarsam, ISBN 0226780104 (cloth) 0226780112 (paper)

[17] *Music in Java: History Its Theory and Its Technique* (1949) edited by Jaap Kunst, ISBN 9024715199. An appendix of this book includes some statistical data on intervals in scales used by gamelans

[18] *Gamelan Gong Kebyar: The Art of Twentieth-Century Balinese Music* (2000) by Michael Tenzer, ISBN 0226792811 and ISBN 0226792838

[19] *Music in Bali* (1966) by Colin McPhee. New Haven, CT: Yale University Press

APPENDICES



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Testimonial from Expert User

This Gamelan application has created a new way of playing gamelan instrument. The application is user friendly and easy to understand. The way the application is to be used is also simple, by just typing keys on the keyboard. The help instruction within the application provides enough information for user to play it at the first time. Sounds from the application are almost real. As overall, what could I say is this application is interesting and can be used by Gamelan musician. In the future, I hope that this application can simulate a complete Gamelan instruments. Anyway, it is a good job to preserve our traditional heritage.

Ahmad PG Abdullah
16/6/06

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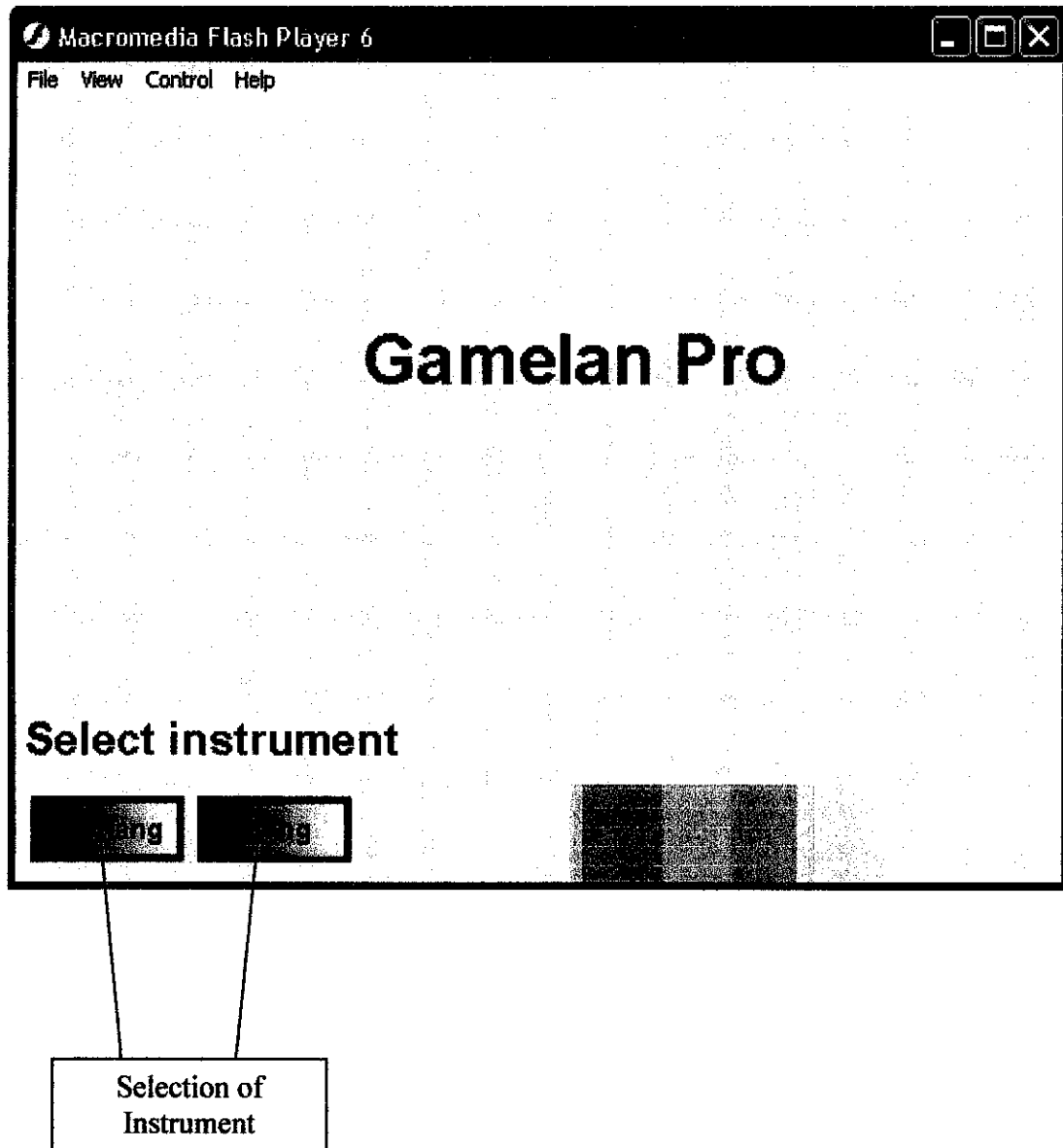
Tel: 605-3688000 Fax: 605-3654075 D. Lines: HRM 605-3688291 Finance 605-3688283 Library 605-3688486

Public Affairs 605-3688237 Student Services 605-3688409 Academic 605-3688345 Security 605-3688313

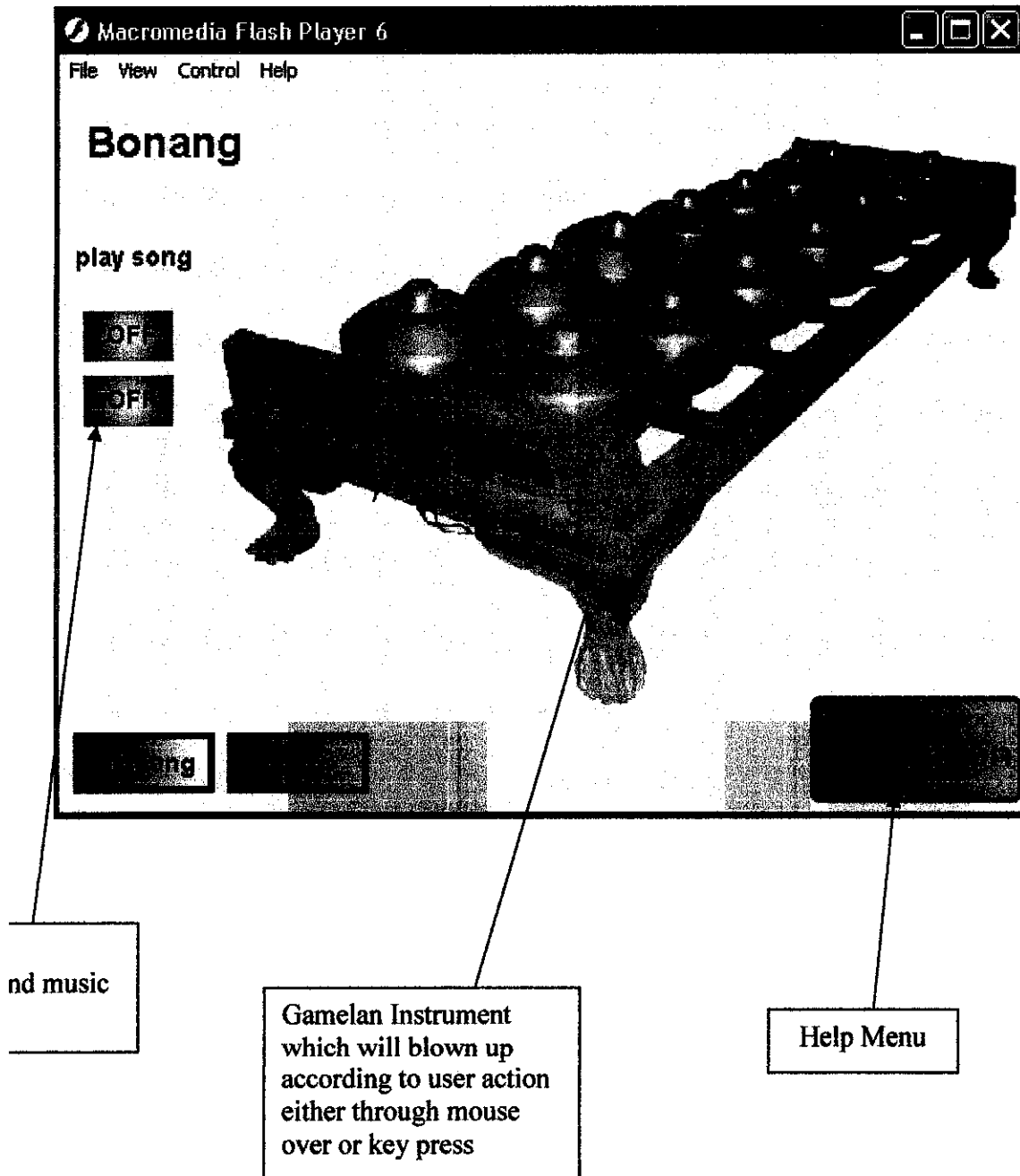
IRM 605-3654075 Finance 605-3654087 Library 605-3667672 Student Services 605-3721286 Academic 605-3654082 Website <http://www.utp.edu.my>

Software Screen Shot

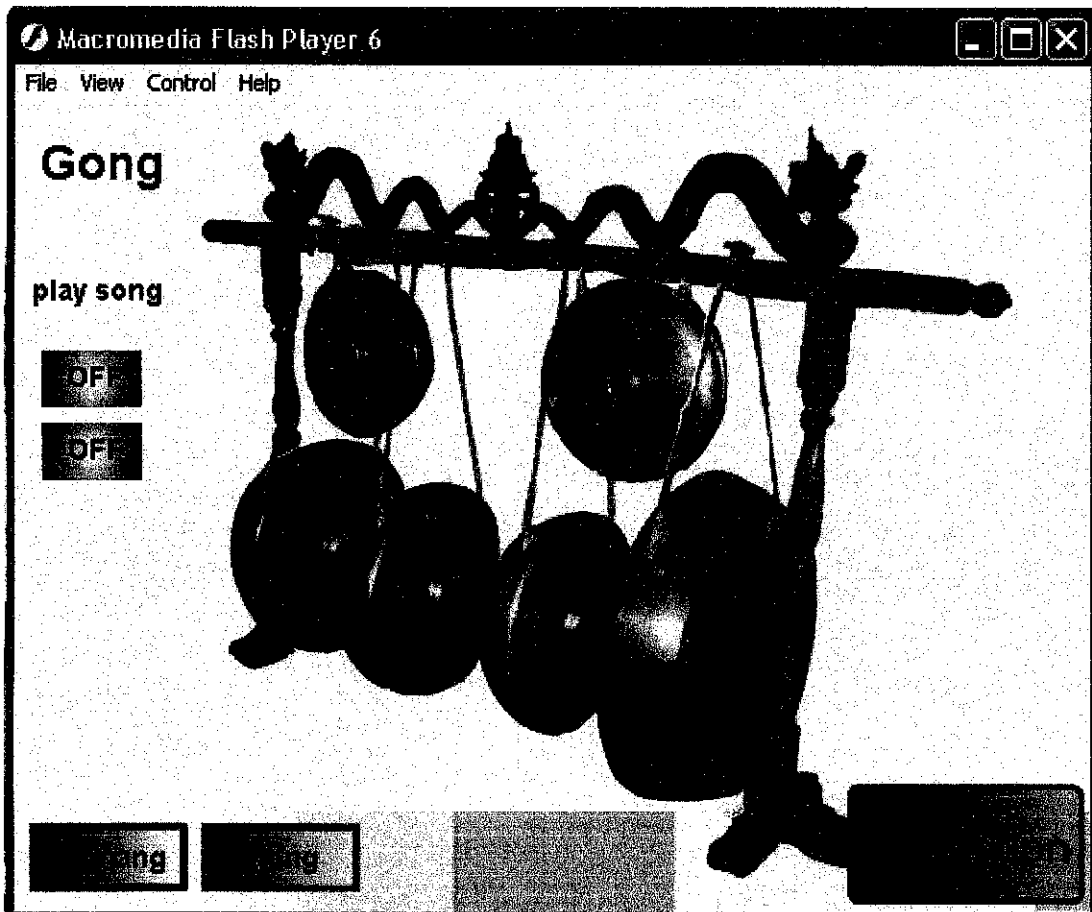
Main Program



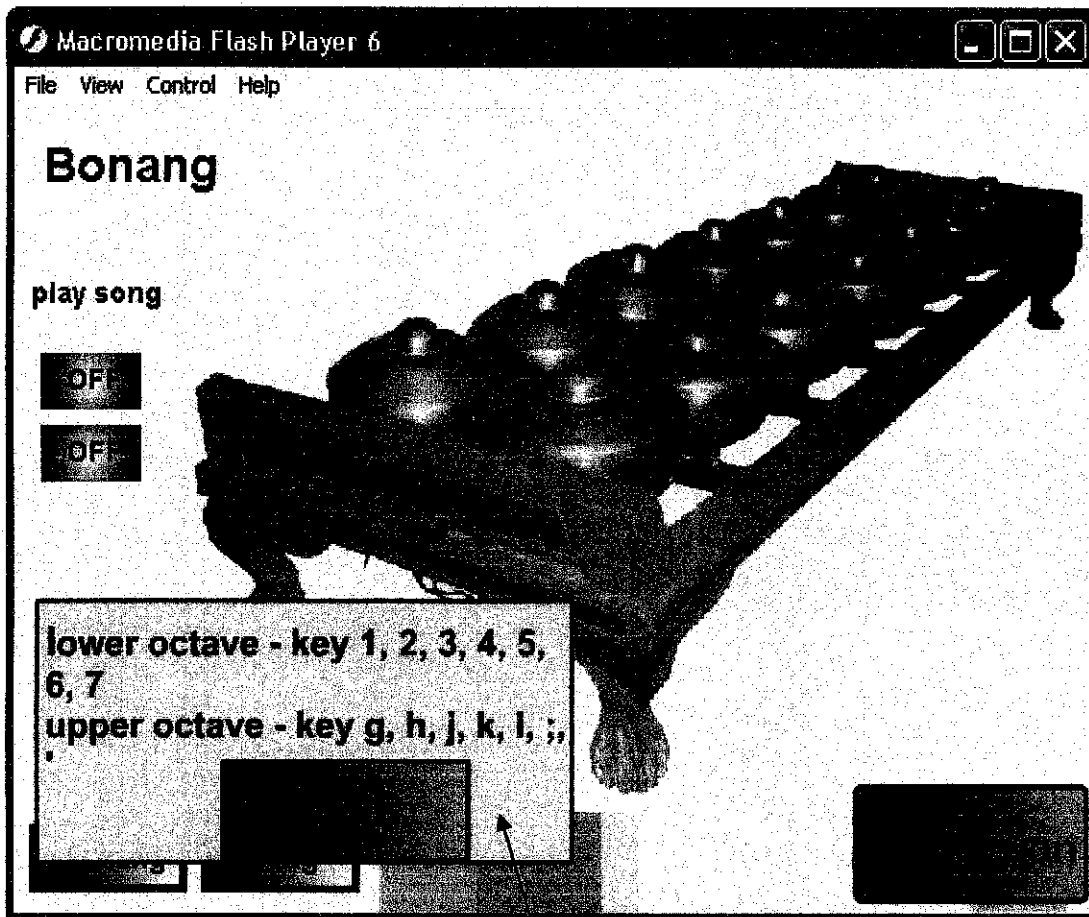
Sub Program (Bonang)



Sub Menu (Gong)

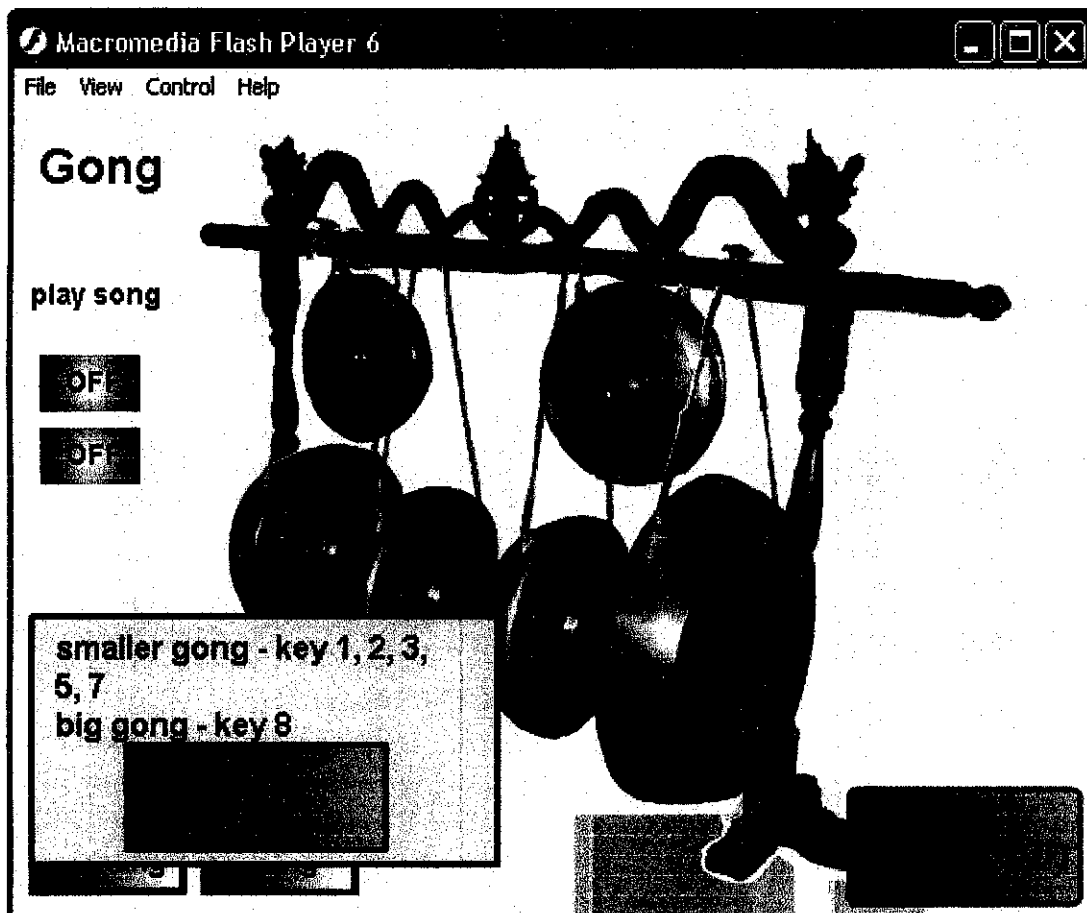


Help Menu (Bonang)



Pop up box appear
as the instruction
button is pressed

Help Menu (Gong)



Questionnaire

All questions must be answered. Any Comments regarding on the aspect and criteria need to be improvised are allowed. Rate your evaluation based on range 1-5.

1- Strongly agree 2- Agree 3- Not sure 4- Disagree 5- Strongly disagree

Section 1- The Instrument Icon

1. Are the buttons attractive?

Answer: 1 2 3 4 5

2. Do the buttons give great visibility?

Answer: 1 2 3 4 5

3. Do the color of the buttons are well suited?

Answer: 1 2 3 4 5

4. Do the usage of the buttons increase the usability of the software?

Answer: 1 2 3 4 5

5. Do the buttons are placed at the good position within the software?

Answer: 1 2 3 4 5

Section 2 – The Sounds Quality of the Software

1. Do the sounds real?

Answer: 1 2 3 4 5

2. Do the sounds produced are attractive?

Answer: 1 2 3 4 5

3. Does the software is really useful for Gamelan user?

Answer: 1 2 3 4 5

4. Does the software is using a good approach in assisting Gamelan user?

Answer: 1 2 3 4 5

5. Do the software really simulate Gamelan music?

Answer: 1 2 3 4 5

Section 3 – Navigation aspect

1. Do the users have problem while navigating the application?

Answer: 1 2 3 4 5

2. Do the users require lots of help while using the application?

Answer: 1 2 3 4 5

3. Do the graphics and icons are really helpful?

Answer: 1 2 3 4 5

4. The application is easy to be navigated / to be used

Answer: 1 2 3 4 5

5. User will require lot of help from the 'help' menu to navigate through the software?

Answer: 1 2 3 4 5

Section 4 – The layout of the Software

1. Layout of the application is good

Answer: 1 2 3 4 5

2. The instructional text and the positioning of the buttons were put in a suitable way for the user to use

Answer: 1 2 3 4 5

3. The layout of the application doesn't give any problem for user to use

Answer: 1 2 3 4 5

4. The usage of color within the layout is good

Answer: 1 2 3 4 5

5. The layout of the application is suitable for every user

Answer: 1 2 3 4 5

Tables (Data from the questionnaire)

1)

Section 1- The Instrument Icon						
Question #	1	2	3	4	5	TOTAL
Evaluator 1	2	2	3	2	1	
Evaluator 2	2	2	2	2	2	
Evaluator 3	2	1	3	2	2	
Evaluator 4	1	2	2	1	3	
Evaluator 5	1	3	3	1	5	
Evaluator 6	1	1	3	2	2	
Evaluator 7	1	2	1	2	1	
Evaluator 8	1	1	1	2	2	
Evaluator 9	1	1	2	1	2	
Evaluator 10	2	2	3	1	2	
MEAN	1.4	1.7	2.3	1.6	2.2	1.84
MOD	1	2	3	2	2	2

2)

Section 2 - The Sounds Quality of the Software						
Question #	1	2	3	4	5	TOTAL
Evaluator 1	2	2	4	2	2	
Evaluator 2	2	2	2	2	2	
Evaluator 3	1	1	4	1	3	
Evaluator 4	1	1	3	1	3	
Evaluator 5	2	2	1	1	3	
Evaluator 6	2	2	4	2	4	
Evaluator 7	1	3	2	2	2	
Evaluator 8	1	2	2	3	3	
Evaluator 9	3	1	4	1	3	
Evaluator 10	3	2	4	1	4	
MEAN	1.8	1.8	3	1.6	2.9	2.22
MOD	1 and 2	2	4	1	3	1 and 2

3)

Section 3 - The Navigation of the Software						
Question #	1	2	3	4	5	TOTAL
Evaluator 1	3	4	2	3	2	
Evaluator 2	1	4	2	2	2	
Evaluator 3	2	3	3	1	1	
Evaluator 4	1	1	3	4	1	
Evaluator 5	1	5	1	2	3	
Evaluator 6	3	3	2	3	2	
Evaluator 7	1	3	2	1	3	
Evaluator 8	2	1	2	2	2	
Evaluator 9	3	2	3	2	2	
Evaluator 10	3	4	3	3	2	
MEAN	2	3	2.3	2.3	2	2.32
MOD	1 and 3	3 and 4	2	2	2	2

4)

Section 4 - The Overall Layout of the Software						
Question #	1	2	3	4	5	TOTAL
Evaluator 1	3	2	2	2	2	
Evaluator 2	2	2	2	1	1	
Evaluator 3	2	1	1	2	2	
Evaluator 4	4	2	2	1	4	
Evaluator 5	1	2	3	2	1	
Evaluator 6	3	2	3	2	3	
Evaluator 7	1	3	2	2	1	
Evaluator 8	2	2	1	1	2	
Evaluator 9	2	1	3	3	3	
Evaluator 10	2	2	3	2	4	
MEAN	2.2	1.9	2.2	1.8	2.3	2.08
MOD	2	2	2 and 3	2	1 and 2	2