Design of Melodi Nusantara Rhythm Game to Introduce Traditional Indonesians Song

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Abstract— At The culture of traditional music and songs in Indonesia is one of the results of intellectual and cultural richness, which plays an important role in the lives of traditional communities. In addition, traditional music and songs are also national assets that embody strategic values for both Indonesia and foreign parties. Therefore, there is a need to protect traditional music and songs in Indonesia. "Melodi Nusantara" is the name of a game developed to support and introduce traditional music and songs of Indonesia. The game "Melodi Nusantara" is a rhythm game genre. The rhythm game genre is very popular and loved by all, and this game requires players to follow the rhythm of a song. This game is very suitable for listening to music while playing. With the existence of the "Melodi Nusantara" game, it is hoped that players will be able to recognize the music culture of each region in Indonesia. And researchers can also see if the "Melodi Nusantara" game will continue to be useful for players and if they would want play the "Melodi Nusantara" game in the future.

Keywords— Rhythm Game, Music, Tradisional Music.

I. INTRODUCTION

Music in Indonesia has become a necessity for people, with a large number of music enthusiasts from various backgrounds. The presence of music as a part of human life is not new. Every region and culture in the world has its own music that is specifically played or listened to during historic events in the lives of its members. There is music played to express gratitude for the birth of a child, and there is also music specifically played during certain ceremonies such as weddings and funerals. Music is also the main support for completing and perfecting various forms of art in various cultures.[1]

In this era of globalization, technology has certainly developed widely everywhere, including in Indonesia. Technology has become the foundation to help people in their daily lives, which of course continues to develop every day. With easy access to various genres of music such as pop, classical, and jazz, especially among young people, the interest in traditional music has decreased among various groups. Traditional music is an identity of the nation in every Indonesian citizen. Indonesia itself has various ethnic groups, languages, customs, beliefs, and social layers.

After mentioning the above points, there must be innovation in the development of this era to attract the interest of the Indonesian people to be more attentive to culture with multimedia. Rhythm games are a suitable medium that, in my opinion, can be introduced to the Indonesian people because rhythm games themselves are only known by a small community in Indonesian society.

Therefore, researcher want to create a rhythm game based on traditional songs in Indonesia such as Apuse (Papua), Yamko Rambe Yamko (Papua), Potong Bebek Angsa (East Nusa Tenggara), Anak

Kambing Saya (East Nusa Tenggara), and Burung Kakatua (Maluku). Rhythm games are a suitable medium for introducing traditional music as a fun medium because in the game, players need skills in listening to music rhythms, scoring, and much more, tailored to the interests of the players/readers. Of course, music is the strongest element in a rhythm game.

II. LITERATURE REVIEW

2.1 Music Theory

Music theory is the study of the principles and practices of music, including the elements of melody, harmony, rhythm, form, and texture. It is a branch of musicology that seeks to understand and explain the workings of music, as well as the historical and cultural context in which it was created.[2]

2.2 Game

A video game is a type of interactive entertainment software that allows players to engage in a virtual world with a set of rules and objectives. Players typically control a character or avatar within the game world and interact with the environment, objects, and other characters in order to achieve specific goals or progress through levels.[3]

2.3 Rhythm Game

A rhythm game is a type of video game that challenges players to keep time with a beat or rhythm of music. The gameplay often involves pressing buttons or tapping on a touchscreen in sync with the music, with varying degrees of difficulty as the tempo and complexity of the music increases.[4]

2.4 Game Design

Game design is the process of creating the content and rules of a video game, including its objectives, challenges, characters, storyline, environments, and gameplay mechanics. It involves a combination of creativity, technical skills, and knowledge of player psychology, as well as an understanding of the target audience and the goals of the game.[5]

2.5 Godot Game Engine

Godot is a free and open-source game engine designed for creating 2D and 3D video games. It was created in 2014 by Juan Linietsky and Ariel Manzur and is maintained by a community of developers.

Godot offers a wide range of features and tools for game development, including a powerful visual editor, scripting language, physics engine, animation tools, and a variety of export options. It supports a range of programming languages, including GDScript (Godot's own language), C#, and C++, and can be used to develop games for a variety of platforms, including Windows, Mac, Linux, Android, iOS, and web browsers.[6]

2.6 Waterfall Model

The waterfall model is a sequential software development process model that is commonly used in the development of software products. It was first introduced in the 1970s and is characterized by a linear, sequential approach to software development, with each stage of the process building upon the previous one. The waterfall model typically consists of several distinct stages, including requirements gathering, design, implementation, testing, deployment, and maintenance. Each stage is typically completed in sequence, with the output of one stage serving as the input for the next.[7]

2.7 Sound

In music theory, sound refers to the physical vibrations of air molecules that create our perception of music. Sound is produced when an object vibrates, creating pressure waves that move through the air and reach our ears. These pressure waves are then converted into electrical signals that are processed by our brains as sound. Sound can be characterized by various properties such as pitch, volume, duration, and timbre. Pitch refers to the perceived highness or lowness of a sound and is determined by the frequency of the

vibrations that produce the sound. Volume, also known as sound intensity, refers to the strength or loudness of a sound and is determined by the amplitude of the pressure waves. Duration refers to the length of time a sound is heard. Timbre, also known as tone color, refers to the unique quality of a sound that distinguishes it from other sounds with the same pitch and volume.[8]

2.8 Rhythm

In music theory, rhythm refers to the pattern of sounds and silences in music. It is the arrangement of musical sounds and silences in a way that creates a sense of movement and flow. Rhythm is created through the duration, accent, and timing of musical notes[9]. Duration refers to the length of time a note is played and is usually represented by musical notation symbols such as whole notes, half notes, quarter notes, and so on. Accent refers to the emphasis placed on a particular note or beat, which can be achieved through changes in volume or pressure. Timing refers to the placement of notes within a measure or phrase and is usually represented by the use of time signatures, tempo markings, and rhythmic notation.[10]

2.9 Notation

Music notation is a system used to write down music using a combination of symbols and signs that represent the different elements of music. The basic elements of notation include pitch, rhythm, dynamics, articulation, and tempo. Pitch refers to the highness or lowness of a note, while rhythm refers to the timing and duration of the notes. Dynamics refer to the volume or intensity of the music, and articulation refers to how the notes are played, such as staccato or legato. Tempo refers to the speed at which the music is played.

With the use of this perspective, it will provide a feeling that feels real for players to be able to feel themselves in the game world itself.[9]

2.10 Traditional Music

Traditional music is music that has been passed down from generation to generation in a society, preserved not only as a means of entertainment but also used for healing and sometimes as a means of communication between humans and their creator, according to each person's belief. Traditional music is a local art treasure in society. Traditional music in Indonesia includes gamelan, angklung, and sasando, among others. In addition to traditional music originating from local cultures, there are also traditional music influences from foreign cultures, such as gambang kromong, marawis, and keroncong.[2]

III. RESEARCH METHODOLOGY

3.1 Source of Data

1. Primary Data Source

Primary data sources are taken from questionnaires of at least 50 (fifty) respondents, data collection will be carried out online so the location cannot be specified. To be more specific, it is carried out for individuals aged 13-26 years.

2. Secondary Data Source

Secondary data sources are taken and obtained from journals or references from the internet, also from physical and non-physical books with topics related to game design and research topics.

3.2 Data Collecting

1. Initial Research Questionnaire

This technique is carried out by creating a questionnaire on the Google form and distributing it to certain people who are considered qualified to become resource persons. The questionnaire will be distributed via social media so that it can be reached by Indonesian people who have a link to access the form. The survey will use an assessment using the Likert technique with a scale of 1 (one) to 5 (five). A scale of 1 is given to strongly disagree statements and a scale of 5 is given to strongly agree statements

2. Literature Study

Data collection techniques through written information sources, for example scientific journals, papers, and online journals.[11]

3.3 Data Collecting

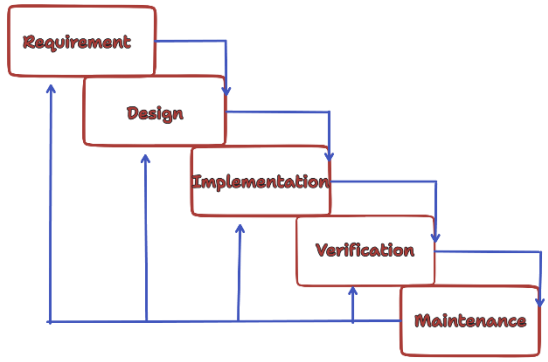

Figure 1 Waterfall Methodology

The method to be used is the waterfall method. This method has stages and is systematic. Each stage must be completed first in order to proceed to the next stage. These stages are in the form of Requirement, Design, Implementation, Verification, and lastly Maintenance.[12]

IV. RESULTS AND DISCUSSION

4.1 Application of Rhythm Game

Melodi Nusantara, is a rhythm game featuring a collection of traditional Indonesian songs and combining gameplay elements from the game Osu! Tatakae! Ouendan. The game Osu! Tatakae! Ouendan was released in 2005, developed by iNis and published by Nintendo. The use of rhythm games here is as a medium to introduce traditional Indonesian songs, and the game design requires players to listen to the music rhythm in order to score points.

4.2 Game Design

This game will feature a collection of traditional Indonesian songs, each with its own beatmap. The gameplay will take inspiration from the game Osu! Tatakae! Ouendan. In this game mode, players will click on circles in time with the song's rhythm (beat). This is the main game mode in this rhythm game.

4.2.1 Game Flow

Gameplay design is focused on each track of the song, where players can freely choose which track they want to play. The track selection menu is designed to be very simple, providing information about the title of the song and the region the song comes from.

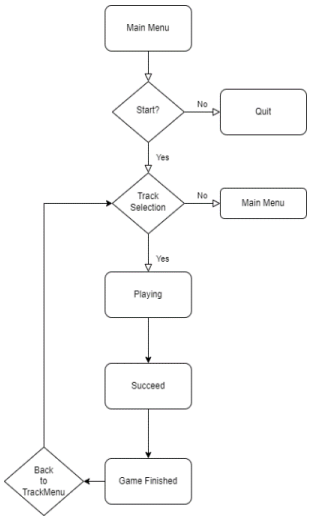

Figure 4.1 Game Flow

4.2.2 Music Theory Implementation

1. **Beat**

   In music theory, a beat or rhythm is a basic unit of time measurement that determines the rhythmic structure of a musical composition. When someone taps their foot along with music, they are most likely tapping their foot to the beat or rhythm. Beats in music notation are used as time markers to indicate the timing of musical components such as the hitbeat.[13]

2. **Time Signature**

   A time signature in music notation is a numerical symbol that appears at the beginning of a piece of music or a section of a composition. It tells the performer how many beats are in each measure (or bar) and what kind of note receives one beat. In this rhythm game, the time signature is used to determine how many beats are in each measure of a music notation.[14]

3. **Tempo**

Tempo refers to the speed at which a song is played and is usually measured in Beats Per Minute (BPM). The higher the BPM, the faster the music will sound, while the lower the BPM, the slower the music will sound. The tempo of a song can be indicated in sheet music using specific tempo markings such as Allegro, Andante, or Adagio. For example, a song with a tempo of 120 BPM will have 120 beats in one minute, and by knowing how many beats there are in a minute, we can estimate how many seconds each beat lasts. In this way, each beat will be used as a spawn point for Hitbeat nodes.[15]

4.3 Implementation Of Game in Godot 3.5

1. **Synchronizing Beats**

In any application or game, sound and music playback will have a slight delay. For games, this delay is often so small that it is negligible. Sound effects will come out a few milliseconds after any play() function is called. For music this does not matter as in most games it does not interact with the gameplay. Still, for some games (mainly, rhythm games), it may be required to synchronize player actions with something happening in a song (usually in sync with the BPM). For this, having more precise timing information for an exact playback position is useful.

The most common way to reduce latency is to shrink the audio buffers (again, by editing the latency setting in the project settings). The problem is that when latency is too small, sound mixing will require considerably more CPU. This increases the risk of skipping (a crack in sound because a mix callback was lost). This is a common tradeoff, so Godot ships with sensible defaults that should not need to be altered.

2. **Hitbeat**

The HitBeat is one element the player will interact with. It's a button touch or click in sync with the beat.

Figure 4.2 Sprite Hitbeat

3. **Spawning Hitbeat**

.Songs are made typically composed of bars of music, with many having four beats per bar. For instance, a bar consisting of four whole-beats is a common time unit in music theory. In the image below, the notation 4/4 represents the song's time signature. It means that each bar in the song is divided into four beats (the upper number), with each beat lasting one quarter note (a common time-unit). In electronic music, this often corresponds to when the kick sounds, which marks the song's rhythm at regular intervals.

To create more varied rhythmic patterns, our rhythm game will detect half-beats instead of whole-beats. The more divisions of beats we have to work with, the more varied and interesting patterns we can create. If the player only tapped on the whole-beat of the song, it would quickly become boring. By splitting the whole-beats into half-beats, we can add half and whole-beat rests to break up the rhythmic patterns. This addition gives us 2^8 (256) possible combinations. When creating the pattern editor, we'll discuss beats and half-beats in more detail, including supporting songs with a different number of beats per bar.

4. Beatmap

The beatmap in this game project is used to structure the hitbeat in the Godot editor. The beatmap patterns consist of hitbeat instances that appear at specific times and positions on the screen. The beatmap design is created by the author. The author can create a custom plugin used in Godot to draw the desired pattern. This would be a good investment if deciding to continue or develop the rhythm game commercially. However, this also takes time and is beyond the scope of this project. For now, setting it up in the Godot scene editor is sufficient.

5. Scoring

The scoring process in rhythm games is crucial to how players synchronize their beats with gameplay. In this explanation, we'll cover the creation of visuals and setting up scoring within hitbeats. In the creation of this rhythm game, the player's rhythm and timing will be tested and scored. The score given will be higher if the beats played on Hitbeats are closer to the requested rhythm. To assist players in determining the timing of the beats, there is a shrinking white target circle. Every time a player taps a Hitbeat, the system will check the scoring area of the target circle.

4.4 Responden's Profile

1. Respondent Current Educational Status

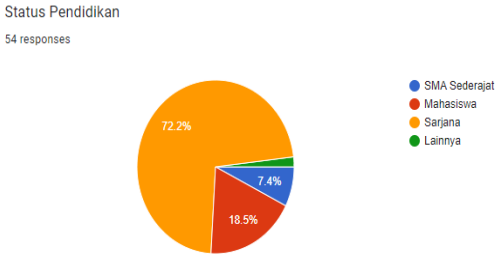

Figure 4.4 Respondent's Educational Status Result

In figure 4.4, it shows that out of 51 respondents, the majority of respondents have a bachelor's degree with a percentage of 72.2% or 39 respondents. Next, 18.5% or 10 respondents out of the total of 54 respondents have a student status. Furthermore, there are 7.4% or 4 respondents who are still in high school or equivalent. Lastly, there is 1.9% or 1 respondent who has an education status outside of the options provided.

2. Respondent's Gender

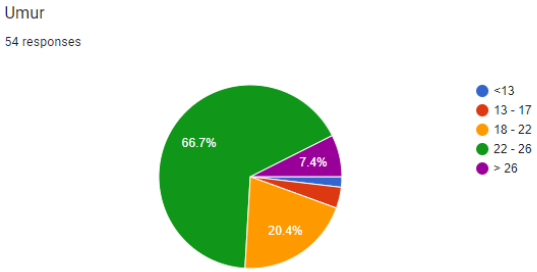

Figure 4.5 Respondent's Gender Result

In Figure 4.5, it can be seen that out of the total of 54 respondents, the majority of the respondents are male with a percentage of 74.1% or 40 respondents, while female respondents account for 25.9% or 14 respondents.

4.5 Reliability Test

In Table 4.1, it can be seen that the PE variable has acceptable internal consistency, the EE variable has excellent internal consistency, the HM variable has questionable internal consistency, and the BI variable has acceptable internal consistency.

Variable	Cronbach's Alpha	Internal Consistency
PE	0.703	Acceptable
EE	0.904	Excellent
HM	0.608	Questionable
BI	0.718	Acceptable

Table 4.1 Reliability Test Result

4.6 Correlations Test

From the results shown in Table 4.10, it can be seen that variables with strong correlations are indicated by asterisks. The correlation results between the average

scores of the PE, EE, HM, and BI variables, which have been transformed into RPE, REE, RHM, and RBI, lead to the following conclusions:

a) PE is significantly correlated with BI with a significance value less than 0.05 and is marked with an asterisk.

b) EE is significantly correlated with BI with a significance value less than 0.05 and is marked with an asterisk.

c) HM is significantly correlated with BI with a significance value less than 0.05 and is marked with an asterisk.

Correlations

		RPE	REE	RHM	RBI
RPE	Pearson Correlation	1	.506**	.536**	.675**
	Sig. (2-tailed)		.000	.000	.000
	N	54	54	54	54
REE	Pearson Correlation	.506**	1	.520**	.586**
	Sig. (2-tailed)	.000		.000	.000
	N	54	54	54	54
RHM	Pearson Correlation	.536**	.520**	1	.612**
	Sig. (2-tailed)	.000	.000		.000
	N	54	54	54	54
RBI	Pearson Correlation	.675**	.586**	.612**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	54	54	54	54

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.2 Correlations Table

V. CONCLUSIONS

5.1 Conclusion

Based on the results of development and research, the following conclusions can be drawn:

1. The introduction of traditional songs in the "Melodi Nusantara" game is incorporated into its gameplay, utilizing the rhythm game genre where players need to listen to the song and follow the beats, rhythm, and timing in the music, which is where players can score the highest points.
2. With a variety of songs of traditional music and interesting beatmap creations, "Melodi Nusantara" provides a unique way of introducing traditional songs, as players need to follow the rhythm and beats in the music.
3. "Melodi Nusantara" game has an attractive and easy-to-understand game concept, as evidenced by the correlation test between the variables of PE (Performance Expectancy), EE (Effort Expectancy), and HM (Hedonic Motivation) towards the variable of BI (Behavioral Intention) with each value above 0.4.

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