360-Degree Illustration Based on Virtual Reality (The Cisadane Folktale)

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Abstract. Folktales are a cultural heritage, both in oral and written form, which needs to be preserved because of their significance in the continuity of the cultural identity of a region. The story of the Cisadane Warrior is a folktale valued as Tangerang's cultural identity. The lack of understanding about the existence of the Cisadane Warrior story has prompted the creation of a virtual reality-based 360-degree illustration design. In literature, the industry has widely used virtual reality media as a storytelling medium because of its advantages in creating an immersive, imaginative world formed from a combination of three-dimensional images or illustrations. In order to enhance the immersivity, 360-degree illustration, supported by animation will be used. The research methods are literature review, study existing, and observations, while the design method includes considerations in selecting and developing narratives (storytelling), choosing the story's atmosphere, and executions using Quill as the primary tool. The observation result of the design process, obstacles encountered, and demo to the selected audience specifies the concept of immersion in building a story, thus allowing the use of virtual reality-based 360-degree illustration design to communicate and introduce local heritages.

Keywords: Virtual Reality · 360-Degree Illustration · Immersive · Cisadane · Folktale · Cultural Identity

1 Introduction

Folktales are stories of cultural heritage in written, and oral form passed down from generation to generation and can help someone understand, reflect, and appreciate the reality of human diversity. It has long acted as a medium where wisdom and cumulative values of society and technology designed in the past are preserved and introduced to the present generation. Folktales are used as a representative approach and transmission of knowledge about the literary, social, cultural heritage, values, morals, habits, and even the philosophy of a society in an area or country thus supporting the importance of folktales' role in maintaining the continuity of the region's cultural identity [1, 2].

Indonesia has a wide variety of cultures and, of course, folktales. One type of folktale widely developed in Indonesia is a story of warrior figures in their respective areas, such as the story of the Cisadane Warrior from Tangerang. This story tells about a

warrior named Surya who was born in the 1930s in Rawa Kidang, Sukadiri District. He is known to have martial arts abilities used to fight the invaders and protect the area around the Cisadane river. Nowadays, the Cisadane Warrior nickname is used by Persita, the Tangerang city football team, reflecting the players' superiority and solidarity [3]. Therefore, it can be seen how substantial the value of the Cisadane Warrior is as Tangerang's cultural identity.

Unfortunately, not many people in Tangerang today know the story and background of the Cisadane Warrior called Surya, and no one even knows where he is buried [3].

If left unchecked, this folktale will be forgotten, and the nickname of the Cisadane Warrior will lose its value and meaning as Tangerang's cultural identity. Therefore, we need a way to preserve the existence of the Cisadane Warrior story with a more relevant approach today. The potential of virtual reality as a folktale storytelling medium is very worthwhile because of its ability to introduce a variety of experiences that facilitate interactions with the folktale's rich culture and its power to attract users' attention [4, 5]. In addition, theater artist John Dewey emphasized that storytelling with 'experiences' will be more attached to the audience. Therefore, the immersive approach, a 360-degree 'real-life' experience that surrounds the audience, has become very popular among the public [6].

Based on the existing elaboration, the author will design a 360-degree illustration-based virtual reality to build an immersive atmosphere of the Cisadane Warrior folktale.

The illustration was chosen because it is known as a medium used to visualize the atmosphere, setting, and characters of a story. The illustration style used is 3D (3 Dimensional) illustration to enhance the 'real-life' experience of the audience. This research carried out the process of designing the characters, atmosphere, and setting of the Cisadane Warrior folktale in the form of 2D illustrations. It continued to develop the 360-degree 3D (3 Dimensional) illustration with a virtual reality system.

1.1 Folktale

Folktale is a cultural heritage of an area in the form of prose or narrative, both orally and in writing, passed down from generation to generation. An essential factor in folktale is its moral lesson and its essence as a medium of entertainment [1]. As a historical relic, folktale has faced various forms of social reality that have been adapted from time to time in the form of tradition, which can reflect certain cultural phases. Thus, elements of cultural wisdom such as language, philosophy, practice, art, music, dance, manners, and customs that come from the accumulated experience of a particular society will automatically be passed down from generation to generation [7].

1.2 Cultural Identity

The term "Culture" generally refers to the inheritance of social elements from generation to generation through social mechanisms such as family and school. Cultural identity contains identifying characteristics such as location, language, ethnicity, myth, religious culture, nation, history, art, and tradition [7].

1.3   Virtual Reality

Virtual reality is a 3D (3-Dimensional) simulation of an image or a computer-generated environment where the audience can interact with a 'real-life' experience using special electronic devices. Virtual reality can also be interpreted as a digital environment in the form of a replica of the real world or an imaginative world generated by a computer, be it images, recordings, animations, or a combination of the three [8]. Today, this system is seen as a marriage between ancient storytelling traditions and technical innovations that are widely adopted by everyone, from companies and governments to marketing and advertising [5].

1.4   Storytelling

The term storytelling is related to the activity of sharing a story or narrative that has a clear structure and instruments that determine the story. The story contains two determining elements: extrinsic and intrinsic. Intrinsic elements pin on the components that can be discovered in the story itself; four of them are settings, characters, plot, and perspectives. Meanwhile, extrinsic elements focus on components that can not be found within the narrative, in other words, information that surrounds and supports the story, the author's motivation and experiences, and the story's objective [9].

1.5   Illustration

In terms of storytelling, illustration is an image that conveys or communicates a narrative through visualization of the setting, atmosphere, and characters that have emotional emphasis. The illustration styles are divided into two, namely: conceptual and literal illustration. The conceptual style refers to the illustration style that does not depend on the actual or original form of the object and is symbolic. In contrast, the literal type refers to the illustration style that tries to make the object look as similar as possible to the actual or original form. [10, 11].

1.6   Immersivity

Immersion is an approach that prioritizes audience involvement and participation. Virtual reality allows immersiveness to occur, where the audience can feel as if they have entered a virtual world. The audience's immersivity can be supported by elements, some of which include sound, graphics or images, artificial intelligence, and user interfaces [12]. Past studies emphasized that 360-degree illustration supports the concept of immersivity in storytelling, where the audience can rotate, change position, and move their perspective freely while the story unfolds around them [13].

2   Methodology

Overall, two methods are used in the process: the research method (literature review, study existing, and observation) and the design method (developing the story and design executions).

2.1 Research Methodology

The research starts by collecting written sources needed for this research. In this case, it is necessary to find more in-depth information about the Cisadane Warrior folktale to determine the story's content that can be adapted to 360-degree illustration-based virtual reality, as well as the techniques that will be used, especially in operating Quill by Smoothstep. In addition, reference observations are conducted to increase the exploration of the story's relevant illustration styles.

2.2 Design Methodology

This study uses the following design method:

Storytelling. At this stage, the selection and development of the story or narrative are essential [14]. The Cisadane Warrior story chosen for this research was the most well-known story, that is when he had to deal with the Crocodile Demon Queen to defend the villagers around the Cisadane river. The 360-degree illustration-based virtual reality design focuses on the 'conflict' scene, which was developed into a fight scene between the Cisadane Warrior and the Crocodile Demon Queen, generated to be more intense and imaginative to increase the excitement of the story.

The characters' design plays an essential role as it could influence the staging and story perspective, which could help shape the environment [14]. Based on the literature research, The Cisadane Warrior is designed as a man with a sensible, mature, brave, yet humble personality, contrasting with the beautiful, prideful, and menacing Crocodile Demon Queen. Based on these two different types of characterization, two different levels of staging perspective were formed: the position of the Crocodile Demon Queen is given a higher point of view, looking down to Pendekar Cisadane, than the Cisadane Warrior, looking up to the great Queen of the Crocodile Demon (Fig. 1).

View side characters, such as human and crocodile warriors are added to support the narrative.

The environment is a mixture of the original and imaginative look of the Cisadane river society that has Betawi culture.

Fig. 1. Crocodile Demon Queen vs Cisadane Warrior point of view.

Story Atmosphere. This step includes determining the tone that could affect the story's mood. In this stage, it is crucial to consider the audience's preferences [14], which in this case, are children aged 6–11. The past report explained the difference in children's color preferences based on age. Children's perception of color starts between red, blue, and yellow, as well as tend to like brighter and high-purity colors [15]. Therefore, the chosen color palette emphasized using pure value primary colors, composed, and modified to suit an intense conflict scene. Based on reference observations, additional colors such as green, pink, and brown are selected to complement the basic colors.

3   Design Process

The design process starts with creating the 2-Dimensional version into a 3-Dimensional illustration, finalized by adding animations for real-life immersivity.

3.1   Illustration in 2-Dimensional

Asset Design in 2-Dimensional. The fight occurred at the Cisadane river in Tangerang, which has thick Betawi culture and values. Therefore, the villagers' houses are the Kebaya house, a traditional Betawi house with a roof resembling a folded saddle, and Gigi Balang decorations, a striking characteristic of this house.

There are also many vegetations on the Cisadane river's shores that are commonly found, such as mangroves, mango trees, rambutan trees, and durian trees.
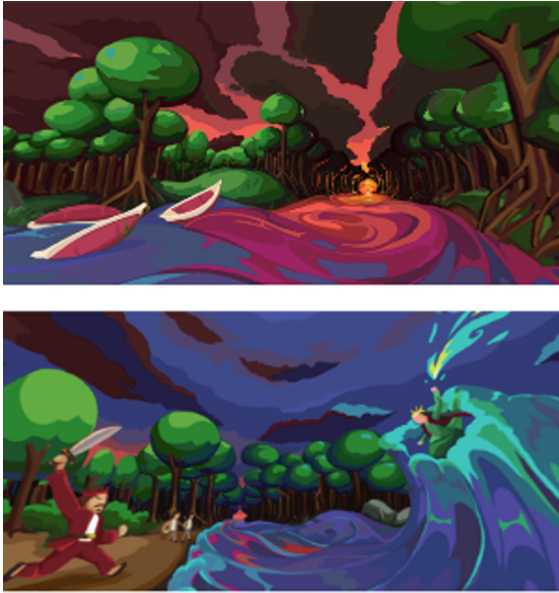
Character Design in 2-Dimensional. The Cisadane Warrior is a figure who has a high sense of responsibility, is brave, assertive, and knows how to use martial arts. His costume uses the Sadaria clothes, traditional clothes of Betawi, as a reference. In contrast, The Crocodile Demon Queen has a cunning and selfish nature, thus feared by all. Crocodile characteristics are added to her design looks, and her costume design is based on Kebaya Encim, the traditional clothes of Betawi. In addition, Cisadane river's villagers who helped Cisadane Warrior in battling the Crocodile Demon Queen and crocodiles are also added as side characters.

Environment Design in 2-Dimensional. 360-degree 2D illustrations of the scene are made to give further visualization of how it will be executed in 3D. The setting will be the Cisadane river during sunset to give a more mysterious and dramatic effect (Fig. 2).

3.2   Illustration in 3-Dimensional

The 3-Dimensional illustration is executed by using Blender and Quill by Smoothstep.

Environment Design in 2-Dimensional. Due to their symmetrical and intricate details, the houses' models are made using Blender and imported to Quill as 3D references, which are painted over and modified in Quill to create the 'painting-like' features. The vegetations around Cisadane river are painted using Quill brushes, a combination of flat-non-dimension brush for the leaves and rounded dimension brush for the trunks.

Fig. 2. Cisadane river's environment illustration (above) & Final Key-Art (below).

Environment Design in 2-Dimensional. The main and side characters are 3D painted in Quill. A rounded dimension brush is used to paint the anatomy and detailing, while the cloth uses flat brushes (Fig. 3).

Environment Design in 3-Dimensional. The environment is broken down into 2D and 3D parts to optimize the work. 2D is for the outer background, while the inner part or center, where the fight scene occurred, is painted in 3D. The process is divided into several stages. First is painting the land base, the ground, and the sky dome, continued by adding designed assets from the outer part of the environment and exporting the 3D painting to an equirectangular image (Fig. 4). After that, this image is imported back to Quill to create a 360-degree image sphere surrounding the work.

Fig. 3. Cisadane Warrior (left) Crocodile Demon Queen (right) 3D model.
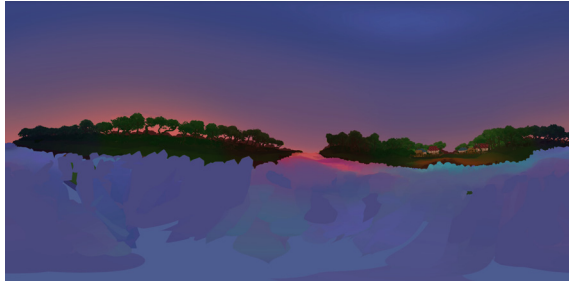
Fig. 4. Equirectangular image of the background illustration.
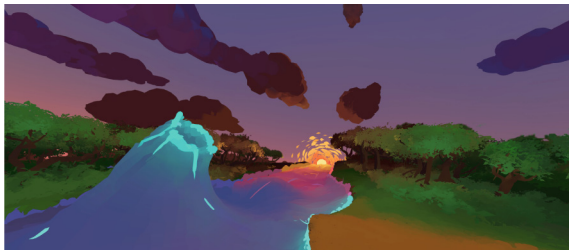
Fig. 5. Environment 3D painting final result.

The second stage is to illustrate the background from the edge of the sphere to the inner part of the work. The closer to the center, the more detailed the 3D illustration is (Fig. 5).

3.3 Animation

Before adding the characters to the environment, each will be animated separately. The animation is a simple looping animation created using keyframe animation and grab tool. After completing the animation of the characters and the environment, the final stage is to import the characters, place them accordingly to the environment file, and touch it up to create a whole environment of the story: A fight between the Cisadane Warrior and the Crocodile Demon Queen (Fig. 6).

Fig. 6. A fight between the Cisadane Warrior and the Crocodile Demon Queen Virtual Reality.

4   User Test

The final product is tested on children aged 6–11 using Oculus Rift S. Based on the observation and interview; the 360-degree illustration-based virtual reality has visuals that are suitable for them and is enjoyable to play with. Most of them tend to find it difficult to operate the tool at first yet are still willing to try and play it again.

5   Findings and Discussion

Based on the user test, this research indicates that the 360-degree illustration-based virtual reality approach is proven to encourage immersive storytelling to introduce and communicate folktales. Although the overall responses are positive, improvements are still needed. The user testing shows that the older the children, aged ten years old and above, the more inquisitive they are, meaning they are more likely to explore. Thus, to enhance the 'real-life' fight scene experience, adding a more interactive approach and supporting sound effects or music is suggested.

The unaccustomed use of the Oculus Rift S is not much of an obstacle. Due to their curiosity and willingness to continue playing, they're getting better at operating the tool as time goes by. The inner-outer approach of the 3D illustration design is also proved to play a part. According to past studies, the difficulty encountered by users due to their inexperience in controlling the technology can be overcome by providing a core experience, a singularly focused and direct viewing experience, so that users can surely familiarize themself with the tool [8].

This paper also highlights several obstacles found during the research's conceptualization. In particular, this paper proposed the consideration of 'work optimization' during 3D painting to ensure its performance, is playable, and is suitable for most devices. Optimization can be done by taking into account the use of triangles per frame and draw calls. Using a low poly modeling approach and considering the types of brushes used in one layer will do the trick.

6   Summary

In conclusion, this research revealed that immersive storytelling using 360-degree illustration-based virtual reality is deemed the new way of relaying cultural heritage carried in folktales, with the audience of the work needing to be considered. In addition, it is vital to consider work optimization to ensure a more successful result.

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