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Development of an Interactive 3D Animation as a Visual Medium for Depicting Student Life Using Frame by Frame Technique

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Abstract

This study aims to design and produce a short 3D animated film that represents the dynamics of student life, with a focus on reinforcing ethical values, social norms, and courtesy within the academic environment. In the context of today's digital technology development, 3D animation is considered a highly effective interactive visual learning medium that can capture the attention of younger generations, especially when addressing topics related to character and morality. Traditional methods of delivering such content are often perceived as monotonous and less engaging, prompting the adoption of frame-by-frame animation techniques as an innovative alternative. This technique allows for the creation of smooth and dynamic motion expressions, supporting the emotional and in-depth delivery of messages. The development process includes story planning, character design, animation production, and the evaluation of its effectiveness. The visual production was carried out using **Blender version 3.6** for 3D animation creation, and **CapCut** was used as a post-production editing tool. Evaluation was conducted through surveys, interviews, and observations involving students aged 18–25, analyzed using a mixed-method approach combining quantitative and qualitative data. The results indicate that this animation medium enhances students' understanding and awareness of the importance of applying ethical values and norms in campus life. Moreover, it is perceived as more attractive and easier to comprehend than traditional learning methods. This study is expected to contribute to the development of educational media based on animation and serve as a reference for the application of visual technologies in higher education

Keywords: 3D Animation, Frame-by-Frame, Student Life, Ethics and Norms, Education.

1. Introduction

University students, as the nation's future generation, play a strategic role in shaping an ethical and dignified future. Therefore, it is essential for students to have a solid understanding of ethics, social norms, and proper conduct in daily life, particularly within academic settings. However, in practice, there are still many instances that reflect a lack of awareness of these values. Phenomena such as plagiarism, lack of discipline, and impolite behavior in campus social interactions indicate that character education still requires significant reinforcement [1]. Efforts to instill ethical values through traditional approaches such as lectures or textbooks often fail to optimally engage students' interest. This highlights the need for more adaptive approaches that align with the demands of the digital era, especially through more communicative and appealing media. One such medium with great potential is 3D animation, which not only offers visually engaging content but also effectively conveys educational messages.

3D animation excels in delivering information through visual and narrative means, enhancing both comprehension and audience retention. In this study, the frame-by-frame animation technique is employed an approach capable of producing smooth and realistic motion making it particularly suitable for conveying moral messages and character education that rely on expressive emphasis and narrative detail [2]. Responding to these challenges and urgencies, this research develops an interactive short 3D animated film that portrays student life within a campus environment. The primary focus of the animation is the internalization of ethical values, social norms, and courtesy. The use of the frame-by-frame technique is expected to enhance the delivery of messages in a more vivid and engaging manner.
In its design process, the animation was developed using **Blender version 3.6** as the main software for 3D animation production, and **CapCut** for the final post-production editing. The main objective of this media development is to create an educational tool that bridges the gap between conventional teaching methods and the learning needs of today's students.

Through this research, it is hoped that a new learning medium will emerge not only capable of presenting ethical values in a more attractive way but also making a tangible contribution to the character development of students. In addition to serving as a learning medium, the animation may also function as an institutional promotional tool, reflecting the university's commitment to instilling noble values in its students. For the researcher, this process provides valuable experience in producing educational visual media, while for students, the animation is expected to deliver moral messages in a manner that is easier to understand and remember.

2. Literature Review

2.1. Animation

Animation is a technique in visual art that creates the illusion of motion by displaying a sequence of images or objects with slight variations in succession. When these images are shown at high speed, the human eye perceives them as smooth movement. This process is based on the principle of *persistence of vision*, in which the human brain retains an image for a brief moment after it has disappeared, thereby connecting rapidly displayed static images into a continuous motion effect [2].

2.2. Frame by Frame

Frame-by-frame animation is a classical technique in which each frame is drawn individually and sequenced to create the illusion of motion. This method is known for producing smooth and detailed movements, making it particularly effective for educational purposes that require high visual accuracy. Although time-consuming compared to automated techniques like tweening, frame-by-frame animation offers greater control over motion elements such as speed, direction, and shape transformation. The process also encourages ethical values such as patience, attention to detail, and dedication among students [4].

2.3. Visual

The use of audio-visual learning media has proven effective in enhancing students' understanding of moral values, particularly politeness. By combining sound and visuals, this media allows students to observe real-life examples of polite behavior, making abstract concepts easier to grasp. It also positively influences student behavior, encouraging them to apply polite manners in daily interactions. Additionally, the engaging and interactive nature of audio-visual media increases students' motivation to learn. Overall, students respond positively, finding it easier to understand and remember the values presented [9].

3. Research Method

3.1. Data Collection Method

The research began with an analysis phase to explore issues related to the representation of student life through interactive 3D animation using the frame-by-frame technique. Data were collected through observation, interviews, and surveys with students, then analyzed to identify relevant themes and moral values.

3.2. Design and Production Process

Based on the data collected, the animation was designed to portray aspects of student life, with a focus on ethical values such as responsibility and courtesy. The storyline was developed to ensure relevance and engagement with the target audience. Character and scene designs were planned with attention to visual clarity and symbolic meaning. A rigging technique was applied to facilitate natural character movement, and storyboards were developed as visual references throughout the animation process.

3.3. Technical Implementation

The animation was produced using Blender 3.6, employing the frame-by-frame technique to create detailed and expressive motion. Visual elements, camera arrangements, and lighting setups were carefully configured to enhance the narrative atmosphere.

3.4. Post-Production

Post-production involved video editing, audio synchronization, and final rendering. These processes ensured that the animation delivered its intended messages clearly and met the desired quality standards for presentation.

4. Research Result

The 3D animated video is titled *"Student Life on the STMIK TIME Campus"* and was created by implementing the frame-by-frame technique in its animation process. The following images show selected scenes from the 3D animation video :

Fig. 1: Selected Scenes from Part 1 of the 3D Animation Video

Fig. 2: Selected Scenes from Part 2 of the 3D Animation Video

An evaluation of the effectiveness of the interactive 3D animation developed using Blender software was conducted through the distribution of questionnaires to respondents from both internal and external campus communities. The objective of this evaluation was to measure how effectively the visual media communicates student life as well as ethical values and norms that are upheld within the academic environment. The assessment focused on visual appeal, message comprehension, audience satisfaction, and its potential as a campus promotional tool.

Respondents answered five items related to the quality and effectiveness of the video. A total of 513 responses were collected. Based on the recapitulation results: 425 responses (82.9%) selected a score of 5 (strongly agree), 55 responses (10.7%) chose a score of 4 (agree), 28 responses (5.5%) gave a score of 3 (neutral), and 3 responses (0.6%) selected a score of 2 (disagree). No respondents chose a score of 1 (strongly disagree). These results indicate a dominant positive perception of the 3D animation in terms of visual presentation, message delivery, and its role as a representation of student life.

Furthermore, this animated video possesses several strengths that support its success. The application of the frame-by-frame technique with a sufficient number of frames produced smooth and expressive character movements. The use of the Cycles rendering engine, although

set at low quality due to hardware limitations, managed to produce more natural lighting effects compared to Eevee. In addition, the incorporation of voice-over narration and background music enhanced the viewing experience and helped clarify the moral messages intended to be conveyed.
However, several technical constraints affected the final video output. GPU memory limitations required the use of low rendering settings, which resulted in less sharp lighting and object details. The number of characters and background settings in the animation was also limited, leading to a lack of variation in campus activities depicted. Moreover, the use of complex materials and textures imposed an additional burden on the hardware, causing some visual elements to appear flat. On the other hand, despite the addition of many frames, some character movements still appeared stiff due to time and manpower constraints during the production process.

Overall, this interactive 3D animation successfully conveyed its intended messages effectively and received positive feedback from the audience. Although technical limitations were present, the results demonstrate significant potential for developing engaging and educational visual media that benefits both students and educational institutions.

5. Conclusion

Based on the design and testing results of the interactive 3D animation video portraying student life, it can be concluded that this visual medium is effective in delivering values related to ethics, norms, and courteous behavior within an academic environment. Through a narrative and educational visual approach, the animation successfully strengthens the delivery of moral messages in a manner that is engaging and easily understood by the audience. The frame by frame animation technique has proven to significantly contribute to enhancing the fluidity of movement and the expressiveness of the characters, resulting in visuals that are communicative and impactful.

However, to achieve more optimal results in the future, several aspects need to be taken into consideration. The production process would be more efficient and yield higher quality outputs if it involved a larger team, both in terms of creative ideas and technical execution. Increasing the number of characters and enriching the scenes could enhance the appeal and narrative diversity of the animation. In addition, the use of high-specification hardware particularly in terms of storage capacity and GPU performance is strongly recommended to ensure a smoother rendering process and more stable animation results.

For future research and development, the focus should not only be on visual quality, but also on expanding the dimensions of the messages conveyed. Values such as academic honesty, responsibility, work ethic, tolerance, collaboration, and integrity should be presented more explicitly to help shape morally upright and competitive students. Moreover, incorporating representations of the negative aspects of campus life is also important to create a more balanced and realistic narrative. By depicting examples of undesirable behaviors such as lack of social awareness, individualism, or violations of academic ethics the animation can encourage critical reflection among viewers and further reinforce its educational purpose as a whole.

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