The Comparative Study of Artificial Intelligence Techniques: DeepMotion vs. Autodesk Maya in Enhancing 3D Animation Creation and Learning Experiences

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Abstract—This study investigates the effectiveness of traditional software (Autodesk Maya) versus AI-powered tools (DeepMotion) in the creation of 3D animations, focusing on learner engagement, personalized learning, and performance outcomes. The research employs a quasi-experimental design with a mixed-methods approach, combining action research and surveys. Sixteen purposively selected participants with baseline knowledge in digital arts were assessed using a Knowledge, Attitudes, and Practices (KAP) framework before and after engagement with both tools. The study defines efficiency in terms of time and quality, comparing the ability of Autodesk Maya and DeepMotion to produce high-quality animations efficiently. Results indicate that Autodesk Maya produces higher-quality animations, while DeepMotion significantly reduces time utilization, making it almost ten times more efficient than Maya (efficiency scores of 0.896 vs. 8.609, respectively). Two-sample t-tests reveal statistically significant differences (p < 0.01) in both quality and time efficiency between the two tools. These findings highlight the complementary strengths of each tool—Maya's superior quality versus DeepMotion's time efficiency—suggesting that the choice of software should align with user priorities, whether emphasizing animation detail or production speed.

Keywords—*3D Animation, Artificial Intelligence, Autodesk Maya, DeepMotion, Digital Art, Efficiency, Quality vs. Time, Mixed-Methods Research, KAP Assessment, Animation Tools Comparison.*

I. INTRODUCTION

Efforts in improving learners' engagement, creating personalized learning experiences, and enhancing learner's achievement are very important for the purpose of effective learning. While most subjects have been transformed by technological advances, the most significant shift has been seen in the application of artificial intelligence (AI) in these areas. The use of AI in learning and development has been well documented in previous research [1][2][3][4], but its application in creative industries such as media and design are still in its infancy. Although there is growing amount of research on the application of AI in creative processes and products [5][6], the impact major of focus AI has on been actual on creative theoretical products, models particularly or 3D animation, applications remains and, underdeveloped.

The current industry standard 3D animation software includes Autodesk Maya, which is powerful and offers a wide range of features but at the same time is rather complicated and requires strong skills and training, which can be out of reach for beginners. On the other hand, AI based tools such as DeepMotion try to simplify the process by doing things like rigging and motion capture in a more automated way which may make animation more accessible.

The present study aims to investigate whether AI-based tools can improve the outcomes of generating and learning 3D animations. Focusing on how these tools impact engagement, creativity, and skill development of learners as compared to traditional software used for creating 3D animations as a form of digital art.

Through comparing the effectiveness of conventional tools and AI-based solutions, this research seeks to provide useful information to instructors, curriculum developers, and technology providers. The results will also inform teaching methods and provide suggestions for the integration of AI technologies in learning and work.

II. OBJECTIVE OF THE STUDY

1) To assess how effectively 3D animation can be produced using traditional package software: Autodesk Maya.

2) To assess how effectively 3D animation can be produced using new technologies: DeepMotion based on Artificial Intelligence (AI).

3) To compare the quality of 3D animation products produced with Autodesk Maya and the AI-powered DeepMotion.

III. DEFINITION OF TERMS

1) 3D Animation: Refers to three dimensional animated products created using AI (DeepMotion) and Autodesk Maya, based on video references provided by participants for the study.

2) Video Reference: Refers to a 30 second video created by participants in their own language, of themselves performing a movement that coordinates with a selected musical theatre song.

3) Efficiency in Creating 3D Animation: Refers to how well animations can be produced with good movement and visual quality based on the video references of the participants. This study uses two measures of efficiency: Time Efficiency and Quality Efficiency.

4) Time Efficiency: Refers to the time it takes to create a 3D animation using different tools (AI DeepMotion and Autodesk Maya).

5) Quality Efficiency: Refers to the quality of the 3D animation and overall visual quality of the output for different tools (AI DeepMotion and Autodesk the Maya).

6) 3D Animation Quality: Refers to how the well quality of the lips are synchronized and how well the spine is moving. There are four primary movements of the spine: flexion, extension, rotation, and lateral flexion, all of which involve translation and rotation in the sagittal, coronal, and horizontal planes.

7) Overall Visual Quality: Refers to the quality of the sound, lighting setup, and 3D animation textures used.

8) Roleplay and Acting: Refers to the acting in role that is most closely associated with the musical theatre style of the song chosen for the study.

9) Musical Song: Refers to a list of songs for musical theatre performances for the study.

IV. REVIEW LITERATURE

New research shows that animation techniques are transformed when artificial intelligence (AI) is combined with traditional methods of animation, particularly with the help of Autodesk Maya. From the examination of automation in Maya, Reference [7] established the fundamental understanding of the relationship between human input and software automation, a crucial understanding as the technology to apply AI rapidly emerged.

Technological progression is most apparent in motion-related developments. Reference [8] demonstrated made breakthrough achievements with Video2MR, using DeepMotion enabled by AI to convert 2D videos to interactive 3D experiences. This breakthrough builds upon an earlier work by [9], who described the transition from manual to automated tracking systems based on deep learning tools.

This specific transformation within the animation industry's broader context is explored in [10, 11], who explained how AI has influenced several aspects of animation production, including character creation and motion synthesis. The research also presented potential solutions and challenges in integrating AI tools in the creative process. These findings are further supported by [12], which presented patterns of AI-enhanced Maya workflows based on professional animator surveys.

Recently literature has also focused on educational applications. The integration of AI tools in animation education is crucial, as stated by [13], while reference [14] studied the role of Maya in higher education institutions. Based on the analysis of existing literature, reference [15] proposed a constructivist learning approach to integrating generative AI in art education, which is in line with reference [16] recommendations for project-based learning methodologies in Maya instruction.

Technical integration studies by reference [17] presented advanced character rigging systems in Maya, and reference [18] investigated procedural animation capabilities. AI-assisted animation in real-time preview capabilities for game development applications was emphasized by [19]. Future developments, especially those concerning AI integration and workflow optimization, were projected by [20].

Several consistent themes are evident in literature: the need to coalesce automation with human creativity, the significance of maintaining artistic control while utilizing AI, and the difficulty of implementing educational changes to rapidly changing technology. Additional research directions may consist of improving the integration of AI applications, increasing the use of real-time capabilities, and developing better methods of teaching and learning.

V. RESEARCH METHODOLOGY

To achieve the study's objectives, a quasi-experimental design was chosen, utilizing a mixed-methods approach that included both action research and surveys. Data were collected using self-administered questionnaires designed to evaluate specific criteria related to each variable.

To explore the effectiveness of creating 3D animation using AI (DeepMotion) and traditional software (Autodesk Maya), purposive sampling was employed to select participants willing to engage in the study. Participants were required to have experience with computers, as well as basic knowledge of digital arts design, color and lighting, three-dimensional modeling and animation.

A structured questionnaire was used to assess participants' knowledge, attitudes, and practices (KAP) before and after participating in the study. The action process began with providing participants with knowledge and hands-on practice using both AI (DeepMotion) and Autodesk Maya. Participants were also guided in roleplay acting based on their selected musical theatre song to develop their own video reference, which was then used to create 3D animation products.

The final step involved assessing the 3D animation quality, focusing on aspects like lip synchronization and spine movements, as well as the overall visual quality, including sound, lighting, and texture. Inferential statistical analyses, including t-tests were used to evaluate the data and answer the research objectives.

To provide a clearer understanding and a comprehensive visualization of the research methodology. As shown in Fig. 1, a conceptual flow diagram has been included to illustrate the sequential steps undertaken in this study.
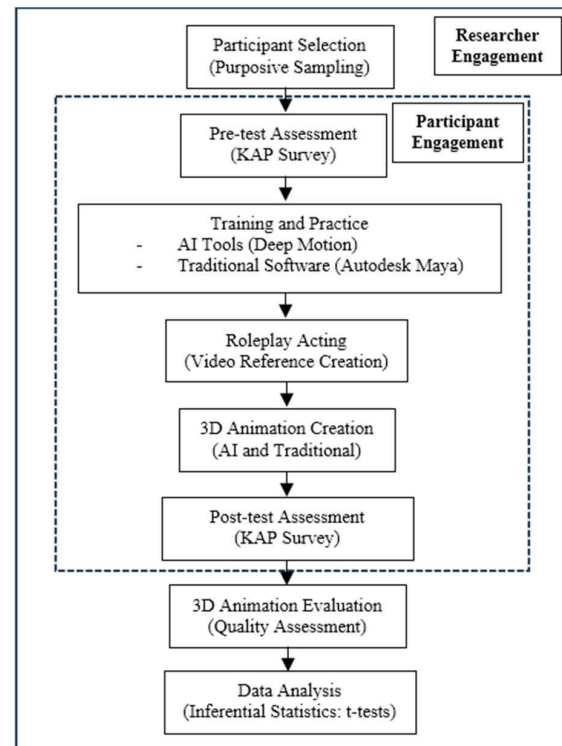

Fig. 1: Overall Research Methodology Block Diagram

VI. THE RESULTS OF THE STUDY

The study followed a mixed-methods approach, combining action research and surveys. It began with an explanation to the purposive sample of 16 participants from College of Arts Media and Technology (CAMT), Chiang Mai University (CMU), who had baseline qualifications as described earlier. The Knowledge, Attitudes, and Practices (KAP) assessment was conducted both before and after the participants engaged in the study. Participants were trained on creating 3D animations using Autodesk Maya and AI DeepMotion, including roleplay acting for video reference creation and learning how to use the tools: Autodesk Maya (software package) and AI DeepMotion. Additionally, the criteria for evaluating the efficiency of the 3D animation products, including both 3D Animation Quality and Overall Visual Quality, were explained prior to the practice sessions.

The results of the study, in line with the three objectives, are presented in the following tables.

TABLE I.   PRE AND POST TEST ON KAP ASSESSMENT

KAP Assessment				
Assessments	Mean	SD	t-value	p-value
Pre-test	19.75	4.61	9.52	0.000*
Post-test	30.88	4.46		

Table 1 shows that the knowledge, attitude, and practice regarding the process of creating 3D animation were assessed before and after the intervention. The average mean score before the intervention was lower compared to after the participants engaged in the study. A t-test analysis revealed a significant difference between the pre- and post-KAP assessment, with $p < 0.01$.

Therefore, we can conclude with strong confidence that there is a statistically significant difference between the pre-test and post-test scores, suggesting that the intervention (or whatever was tested) had a meaningful impact.

To explore Objectives 1 and 2 regarding "the efficiency of creating 3D animation using traditional package software: Autodesk Maya and AI DeepMotion," we define efficiency as the ability to produce animations with high-quality movement and visual appeal. The indicators used to measure efficiency are Time Efficiency and Quality Efficiency. Table 2 illustrates the results of efficiency for each tool.

TABLE II.   EFFICIENCY IN CREATING 3D ANIMATION BETWEEN AUTODESK MAYA AND AI DEEPMOTION

Tools	Mean Quality	Mean Time	Efficiency
Autodesk Maya	35.19	39.25	0.896
AI DeepMotion	30.57	3.50	8.732

Based on the study's definition, although Autodesk Maya has a higher overall mean quality (35.19) compared to AI DeepMotion (30.57), the time spent using Autodesk Maya is over 11 times greater than with AI DeepMotion (39.25 vs. 3.50). Therefore, when efficiency is defined as quality over time, AI DeepMotion proves to be nearly 10 times more efficient than Autodesk Maya (efficiency of 8.732 vs. 0.896, respectively). Thus, Objectives 1 and 2 are successfully addressed and answered.

To compare the quality of 3D animation products created using Autodesk Maya and AI DeepMotion, two independent two-sample t-tests were conducted. These tests were used to compare both the quality and time utilization between Autodesk Maya and AI DeepMotion, as these are the key indicators of efficiency in creating 3D animation. The results are illustrated in Table 3.

TABLE III.   THE COMPARISON OF QUALITY AND TIME EFFICIENCY BETWEEN AUTODESK MAYA AND AI DEEPMOTION USING TWO-SAMPLE T-TEST

Comparison	Autodesk Maya		AI DeepMotion		t-value	p-value
	Mean	SD	Mean	SD		
Quality Efficiency	35.19	3.17	30.57	5.25	3.02	0.005*
Time Efficiency	30.57	44.96	3.50	4.18	3.16	0.004*

The two-sample t-test results reveal significant differences in both quality efficiency and time efficiency between Autodesk Maya and AI DeepMotion ($p < 0.01$):

A. *Quality Efficiency:*
- The comparison of quality efficiency between Autodesk Maya and AI DeepMotion shows a significant difference, with a t-value of 3.02 and a p-value of 0.005 (less than 0.01).
- This indicates that Autodesk Maya produces higher-quality 3D animations than AI DeepMotion, with the observed difference being statistically significant.

B. *Time Efficiency:*
- The comparison of time efficiency also reveals a significant difference, with a t-value of 3.16 and a p-value of 0.004 (less than 0.01).
- AI DeepMotion is significantly more time-efficient than Autodesk Maya in creating 3D animations, as evidenced by the observed difference in time utilization.

Therefore, both quality efficiency and time efficiency demonstrate statistically significant differences between Autodesk Maya and AI DeepMotion. Autodesk Maya excels in producing higher-quality animations, while AI DeepMotion is more efficient in terms of time utilization. These findings suggest that each tool offers distinct advantages in 3D animation creation, depending on the user's priorities—whether prioritizing higher quality or faster production time.

VII. CONCLUSION AND RECOMMENDATIONS

The production process in animation benefits from both Artificial Intelligence (AI) and traditional software like Autodesk Maya. AI can automate certain tasks using advanced algorithms, which saves time and allows animators to focus on more creative aspects of animation that require their unique skills.

However, while AI has the potential to significantly impact the future of the animation industry, it is unlikely to completely replace software like Autodesk Maya. Maya offers the ability to work with intricate details and fine-tune animations, a process that may take more time but results in higher precision and creative control by the animators.

Given that this study employed inferential statistics — in which predictions or conclusions are based on a sample rather than the entire population — the study was conducted with a small group of participants. This method is used when it is impossible or impractical to collect data from the entire population. Future research could be enhanced in the future by increasing the number of participants or choosing people from other groups, including people of different ages, or by increasing the length of the 3D animations production.

In today's rapidly evolving world, efficiency and effectiveness are critical in every innovative and creative process. Therefore, future research comparing emerging technologies should be conducted with a balanced perspective, particularly in areas that merge art and science. This will help ensure that technological advancements enhance rather than diminish the artistic integrity of animation.

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