Matte Painting and First-Person View Drones

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In terms of the teaching process of matte painting, it is essential for students to develop a sound understanding of the relationship between virtual and physical environments. First-person view (FPV) drones are applied to matte painting courses. This provides students with a better learning environment using a digital education system. It indicates that the flow experience, learning interest, and continuous learning intention of students who use FPV drones in matte painting are significantly greater than those of students who only utilize traditional teaching methods.

matte painting | first-person view drones | interaction learning | continuous learning intention

1. Introduction

The film industry is closely related to technology. The development of industry trends and the improvement of audience aesthetics have led to an increasing number of filmmakers using digital special effects in their films. Digital special effects help films tell stories more effectively through technology innovation (Tong et al. 2021). The visual effects have a significant influence on the viewers' evaluation of the film. With the aid of technology, movies can directly bring to the audience a sense of beauty by using visual effects (Bramley et al. 2018). Matte painting plays an important role in post-production special effects in film production (Ramdhan and Nugraha 2020). This method allows the addition of a virtual scene to an actual filmed scene, and thus enhances the visual impact of the film. The development of the technology in film and television has made matte painting one of the most important required courses for college students in the design field.

Matte painting courses may be improved by using interactive learning methods. There have been several studies that examine the benefits of interactive design applications in education. For instance, a spherical video-based immersive virtual reality learning system is used in courses regarding landscape design. Students benefit from this technique by generating more positive learning achievements, learning attitude, and self-regulation (Wu et al. 2021). In addition to the learning environment, interactive learning cases may also contribute to the overall learning experience. Utilizing augmented reality in basic design courses to assist students in understanding the shape of objects can create positive flow experiences and continuous learning intention (Hsu et al. 2021), and utilizing eye-tracking games can enhance students' interest in learning about game design (Gu et al. 2022a). The use of innovative methods of human-computer interaction (HCI) can enhance the learning experience. When students participate in interactive learning, students' desire for continuous learning increases (Chen et al. 2021).

With first-person view (FPV) drones, traditional classrooms are no longer bound by physical limitations, and can benefit from improved two-way communication between teachers and students. An FPV drone can convert photos into 3D models to aid students in visualizing the area of interest (Bolick et al. 2022). In addition, using the real-time footage of the FPV drones, students gain a different perspective from real-world experience in the matte painting course. And this perspective happens to be similar to that of a matte painting or modeling program. Even though interactive learning has attracted a lot of attention from researchers, there is currently no study evaluating the effects of FPV drones on the teaching of matte painting courses. Matte painting is a post-production course for film and television which teaches students to depict scenes virtually in a near-real-life manner. According to the matte painting syllabus, a primary focus of the course is effectively improving the perception of the real environment by the students. Developing this ability will help students draw more realistic and vivid virtual scenes.

2. FPV Drones Applied to Matte Painting Courses

Drones operation modes include first-person and third-person view. When using the third-person view, the user can observe the drone's overall flight and the relationship between it and the surrounding environment. On the other hand, when using the first-person view to maneuver the drone, users are able to experience the sensation of flying a drone from the drone cockpit. There are different technical solutions for realizing control of FPV drones. For example, drones can be attached to stereo cameras to provide a 3D FPV view through a VR head-mounted display (Smolyanskiy and Gonzalez-Franco 2017). FPV drones can also be used in conjunction with mixed reality technology to achieve real-time interaction and coexistence of real and virtual objects (Kim et al. 2020). In the interactive system by the mixed reality environment mode, the user can control the drone by interacting with the system in order to achieve visual flight (Ai et al. 2016).

Matte painting is a technique widely used in filmmaking (Fan et al. 2014; Snider 2020). The design process needs to consider the light, color and texture of the environment. Mastering the relationship between camera motion and matte painting enhances the comprehension of filmmaking (Ramdhan and Nugraha 2020). In order to create images that are not obtrusive but also shocking to the audience, the fusion of virtual and real scenes is very important. Hence, this is a creative process that imitates the way the eye perceives an environment and scene (Hamus-Vallée 2015). The specific operation process requires the designer to replace a part of the real shooting scene with a virtual drawing image. Considering that the background of a video is relatively insignificant to the audience's visual experience, some of the matte painting designers try to replace the original picture with a flat image (Yip 2020). A high-quality matte painting can be seamlessly integrated with the shot. The most common types of computer applications used in matte painting are 2D, 2.5D, and 3D (Eisenmann and Parent 2010). Using 2D technology, it is possible to generate backgrounds such as grand mountains or skies by arranging digital images on a flat surface (del Blanco García and García Ríos 2017). With 2.5D technology, multiple images are layered at multiple depths in a picture, creating an enhanced image. Matte painting using 3D technology has become a mainstream activity. Based on 3D modeling techniques, this method calculates the depth of a picture (Dallas 2011). When using this method for matte painting design and part of the original shooting scene is preserved, the rest is composed of virtual models.

The matte painting course focuses on improving the students' perception of the environment and their ability to create virtual scenes that are realistic (Çakir et al. 2019). In the learning process, students' observation and understanding of the real environment is especially important. In this context, using an FPV drone to observe the environment may help to address the focus and difficulty of the matte painting course. Meanwhile, the perception and perspectives of students as they use FPV drones are similar to the camera movement that needs to be considered in matte painting production. Therefore, this entry attempts to add an HCI factor to the matte painting course through the use of FPV drones to observe and experience the natural environment that needs to be painted.

3. Perceived Interactivity (PI)

Perceived interactivity is defined as the degree to which users are able to participate in changing the form and content of the HCI environment in real time (Kim et al. 2019). Users will generate corresponding evaluation of the man-machine interaction experience when they use different machines. Interactivity is the psychological experience a person has after experiencing a system (Newhagen et al. 1995). It is one of the primary determinants of user behavior (Reeves 1997). The student's assessment of the interactive properties of the machines employed in the course is reflected in the interactivity of the learning process. Most users evaluate the perceived interactivity of the system through three dimensions, including control, responsiveness, and communication (Lu et al. 2019a). According to educational research using HCI functions, these dimensions reflect the opinions of students regarding the interaction process. The assessment consists of three components: the students' perceptions of their abilities to control and understand the machine; whether the machine is capable of capturing their input and of providing timely and accurate responses; and whether the machine assists in promoting two-way communication in the course.

4. Perceived Vividness (PV)

Perceived vividness refers to how well the technology is used to create the sensory media environment (Bae et al. 2020). This rating represents the degree of similarity between the interactive or virtual environment created by the technology and the real environment. The perception of liveliness contributes to the enjoyment and immersion of the user (Deng et al. 2019). According to educational research, the perceived vividness of an interactive learning environment is closely related to the learning experience of the student. Vividness is one of the core elements of media richness (Lee 2022). The richer the design details of the media, the more vivid the learning environment for students. User searches and sharing behavior are positively influenced by the vividness of HCI (Zeng et al. 2022). Given the frequency of system iterations and usage cycles and habits in the course, the HCI learning style may therefore help students achieve a more active state of learning.

5. Novel Experience (NE)

The novel experience refers to the uniqueness and originality of the product in comparison with the user's existing experience with other products after conducting a dedicated analysis on the product (Luan and Kim 2022). This is when users understand or use the new product and use the old product as a reference to evaluate the degree of change. Additionally, some studies have noted that novelty refers to the comprehensive evaluation results of interactive products as well as new, unique, and differentiated features (Yuan et al. 2021). Therefore, a novel experience in educational research refers to the comparisons between uniqueness and differentiation of a current educational method and the experience of the previous class. Researchers have found that users may feel strong emotions after experiencing a novel technology (Yim et al. 2017). This makes it possible to solve educational problems from a technical perspective. The ability to experience high levels of arousal and focus on current content is enhanced when new experiences are influencing stable cognition (Kim and Han 2014). Innovation in learning styles may influence students' subsequent behavior and responses. It is for this reason that novelty in interactive education needs to be considered and evaluated.

6. The Flow Experience (FL)

The flow experience is a state in which a person is fully immersed in an ongoing process (da Silva deMatos et al. 2021). An individual in a flow state focuses on the difficulty and progress of the task. It was originally defined as the overall sensation people feel when they are fully engaged in action (Csikszentmihalyi 2014). The difficulty of the task is within the range of the user's estimate of his ability. The status facilitates more focused learning and is therefore noted in the educational field (Wang et al. 2020). When the flow experience is triggered, people feel energized, engaged, and enjoy it (Huang et al. 2022). In order to achieve a flow experience in learning, teachers must pay attention to the behaviors and experiences of students during the interactive process. Flow is affected by three main factors, the perceived challenges and the user's capabilities, the ability of the user to identify clear short-term goals, and feedback that is exact and immediate (Kushlev et al. 2020).

7. Trust (TR)

There is a strong correlation between students' trust in teachers and motivation to learn (Mieziene et al. 2022). This suggests that trust seems to be an important prerequisite for helping students achieve a more positive state of learning. Researchers have attempted to test the relationship between trust and learning experiences in a number of studies. In previous studies, it has been shown that students' trust in teachers is crucial for a positive learning environment (Zamora-Antuñano et al. 2021). Trust plays a significant role in ensuring an efficient learning process. A conversational learning environment requires trust between teachers and students, but trust can be undermined by misunderstandings, particularly during cross-cultural communication (Kandiko Howson et al. 2022). Thus, it is important to discuss effective methods of building trust in education and the effect of trust on the learning state.

8. Learning Interest (LI)

A person's interest can be defined as the tendency to return to a particular category of objects, events, or ideas over a period of time (Tsai et al. 2018). An interest in the study will help the student to achieve a more willing-to-learn mentality. Interest is one of the key components of intellectual behavior (Murayama et al. 2019). Disinterested learning is passive and less efficient. The primary objective of education is to increase students' interest in learning (Harackiewicz et al. 2012). The enhancement of students' interest in learning contributes to more effective teaching. Research has shown that the adoption of innovative interactive technologies in educational settings affects students' interest in learning (Chang et al. 2019). Therefore, when evaluating the use of FPV drones in curriculum design, students' interest in learning in HCI environment should be carefully considered.

9. Continuous Learning Intention (CLI)

The learner's continuous learning intention is based on their continuance intentions for the course. Guo et al. (2022) believed that a continuous learning intention was determined by a student's willingness to participate continuously in the course. Continuous learning intention refers to a student's judgment on whether to continue learning after course learning. This concept comes from Bhattacherjee, who proposed expectation confirmation theory (ECT), and who asserts that continued interest in information systems is similar to repeat purchases in consumption (Bhattacherjee 2001). The ECT model is a widely accepted method for predicting user-continuous behavior (Wang et al. 2021). In the field of pedagogy, this persistent behavior toward the system is often used to predict a learner's continuous learning intention. Learners' continuance intentions are a vital component of educational development (Li et al. 2021). In the research on promoting education digitization, continuous learning intention has received more attention because HCI experience has been added to the learning process. For example, previous studies have shown that, after completion of a blended online course, online interaction significantly impacts students' willingness to further online learning (Zhu et al. 2020). Thus, the intention of students to engage in continuous learning is closely tied to the design and effect evaluation of their courses.

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