

Supporting Creative Design for 3D Cinematic Composition with Generative Artificial Intelligence

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195–200

#filmmaking

#generative ai

#cinematic composition

#creativity support tool

Cinematic composition plays a pivotal role in creating compelling visual storytelling and evoking emotional impact in filmmaking. With the emergence of game-engine-based filmmaking, directors can now explore and evaluate cinematic designs within a real-time 3D virtual environment. However, achieving creative outcomes remains a challenging task, as filmmakers must navigate vast 3D spaces and carefully manipulate virtual cameras to achieve their vision. Existing automated systems often fall short, producing either context-insensitive results or overly conventional designs that fail to inspire creativity.

In response to these challenges, my PhD study introduces *Cinemassist*, a generative AI-based creativity support tool (CST) designed to facilitate creative cinematic composition in game-engine-based filmmaking (He et al., 2024a). Informed by a formative study conducted with professional filmmakers, the system provides a diverse range of real-time cinematic composition suggestions that transcend conventional paradigms. These suggestions operate at two levels of storytelling granularity: the frame level (the smallest unit of film production and display) and the scene level (a continuous sequence of frames depicting a single story event within a film). By offering design possibilities across these levels, *Cinemassist* empowers filmmakers to explore and experiment with innovative cinematic compositions. Figure 1 illustrates the user interface of the CST system.

Despite the potential of assistive tools, present rule-based and generative AI-based applications were often implemented as *black boxes* and struggled to adapt to the unique needs of creative cinematic design tasks. As such, this research explored the technical affordances of existing AI techniques—as design materials—and developed a technically viable solution, ensuring the technical feasibility of the system’s functionality and interaction design. Particularly, a machine learning model was constructed by integrating multiple

AI techniques appropriately (He et al., 2024b). The model was trained on a diverse dataset of real film footage spanning various genres and emotional contexts. This approach enables the system to generate camera poses and sequences conditioned on animations and input semantics, affording the core functionality of the *Cinemassist* system.

A summative user study evaluated the effectiveness of the CST system and its impact on filmmakers’ creative thinking. This led to the development of the novel *AISEE* (pronounced “I see”) model, shown in Figure 2. The *AISEE* model introduces a novel creative thinking workflow assisted by AI that emphasizes user performance, system feedback, and previously unidentified needs in AI-assisted filmmaking. It also offers three key design implications for generative AI-based CST systems: (1) addressing the domain knowledge disparity between users of different expertise levels through *coach mode* and *assistant mode*, (2) enabling communication of vague design requirements through multi-modal inputs, and (3) supporting divergent exploration by allowing users to refine AI suggestions within a real-time spatial adjustment space.



Figure 1. The interface of *Cinemassist* features three main panels: (a) the control panel, which allows users to configure input 3D animations and define high-level semantics such as the movie genre and intended emotional tone; (b) the design panel, which supports frame-level cinematic composition design by enabling users to capture, refine, and evaluate cinematic composition design options at different keyframes; and (c) the storyboard panel, which facilitates scene-level exploration by generating and visualizing sequences of cinematic compositions. Additionally, the

interface includes supplementary components such as the scene view for real-time visualization of 3D animations and camera poses, the cinema view for previewing 2D compositions from specific camera perspectives, and the animation timeline for efficient keyframe selection and navigation. Together, these components provide a comprehensive and interactive environment tailored to streamline game-engine-based filmmaking workflows.

Source: author. Originally published in He et al. (2024b).



Cinemassist

Camera:
Default Camera (Camera)

Targeting Objects:
male_focus (Transform)
zombie3_focus (Transform)

Timeline:
My Animation (Playable Director)

Genre Type: Action
Intended Emotion: Angry

+ Frame To Storyboard Save Clear

KEY FRAME-15
time(sec): 55.86666
[update] [remove]
 new shot

KEY FRAME-16
time(sec): 65.71667
[apply] [review] [remove]
 new shot

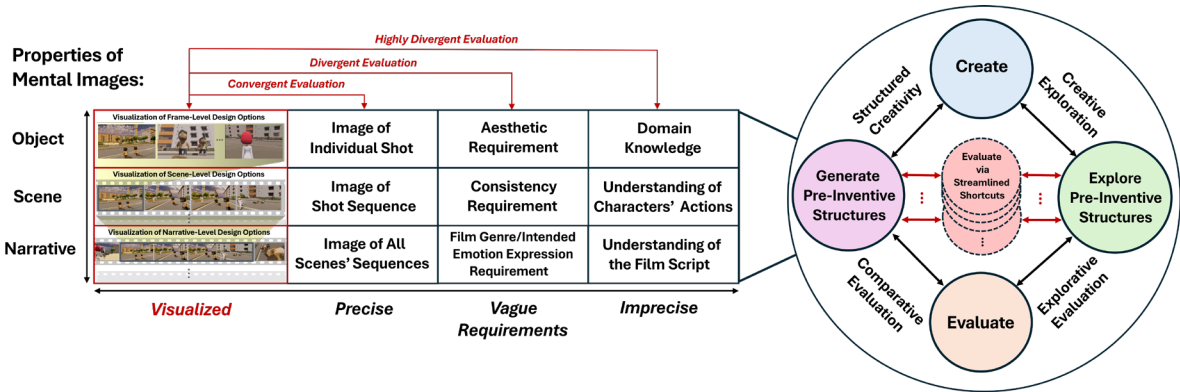


Figure 2: This study introduces a novel AI-supported Simultaneous Evaluative & Exploratory creative thinking process model (AISEE), which characterizes the creative thinking process of game-engine-based filmmakers in cinematic composition design when the generative-AI-based creativity support tool, *Cinmassist*, intervenes in their workflows. Particularly, this model was built on top of Davis et al.'s model (Davis et al., 2011), which originally features the creative thinking workflow of game-engine-based film makers when AI support was unavailable.

Bibliography

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Bio

Rui He is a multidisciplinary researcher and PhD candidate at the School of Design, The Hong Kong Polytechnic University, supervised by Dr. Huaxin Wei. His research focuses on Human-Computer Interaction (HCI), generative AI-based creativity support tools, and game-engine-based filmmaking. He bridges design research and computer science by tailoring AI techniques as design materials to create practical solutions that meet and validate specific user needs and design requirements. Adopting a research-through-design (RtD) approach, Rui's PhD work develops AI-based creativity support tools to drive change toward a preferred state while generating actionable knowledge for design creativity, CSCW, and HCI research communities. His contributions have been recognized by top-tier HCI conferences, including CHI and UIST. Rui holds a bachelor's degree in computer science from Beijing Jiaotong University and a master's degree in computer science (with distinction) from The University of Hong Kong. Before his PhD study, he worked as a Senior Game Engineer at NetEase Games, contributing to flagship titles like Tang Dynasty Warriors. He developed features such as a cinematic cut-scene editor, rendering pipelines, and dynamic weather systems, enhancing both technical performance and user experience. This industry experience also prepared him with industry production-grade engineering expertise for his research.