The Probable Garden: An Exploration of Algorithm-Driven Cinematic Real-time Spaces

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Abstract

This paper investigates the collaborative artwork "The Probable Garden", which explores the synergy between generative adversarial networks and autonomous cameras in the realm of AI-enhanced art and virtual cinematography. The study delves into the intersection of computer game engines, film language, and algorithmic tools, showcasing alternatives to conventional camera language in digital spatial environments. Housed within a digital recreation of the Enid A. Haupt Conservatory, it emerges as a metaphorical container for algorithm-driven film-making, blurring the boundaries between natural, machinic, and anthropomorphic entities. The paper dissects a sophisticated camera system's role, developed to capture the environment through cinematographic modes, illustrating programmable and probabilistic film-making within a major game engine. Drawing distinctions from machinima, it explores the flexibility of game engines in designing virtual scenes, highlighting the nuanced control over camera behavior and image aesthetics. Examining two cinematic modes, the Indifferent Observer and Frantic Collector, the study conceptually unpacks today's attitudes toward the explosion of generative AI, offering cinematic metaphors for indifference and enthusiasm.

Keywords

Virtual cinematography, virtual environments, generative film-making, generative adversarial networks, game engines

Introduction

The Probable Garden is a collaboration between Lukasz Mirocha and Peter Nelson with sound by Roberto Alonso Trillo that explores how generative adversarial networks generate 3D objects and how autonomous cameras can function as film-makers.

The creative practice of Mirocha focuses on the relationship between computer game engines and the language of film, especially how new algorithmic tools are offering alternatives to the conventional language of the camera, from virtual production studios to automating the filmmaker's gaze. The creative practice of Nelson is driven by a sustained observation of how digital systems intersect with art history and human gestures, engaging questions such as realism in the age of big data, the aesthetics of user-generated content, and how computer game landscapes index contemporary social and economic relationships. Trillo is a musician and researcher. His recent work examines networked hybrid music practices endemic to a world increasingly mediated by AI and machine learning. His multipronged practice-based and -led research spans a post-structuralist reconsideration of musical work hood and authorship.

Together, these artists are interested in observing and experimenting with how automation can intersect with our conventional understanding of real-time digital spatial environments, film and animation, from 3D modeling and asset production to the use of fully automated 3D environments where both the set, the sound, and the gaze of the camera are algorithmically driven.

Reconfigurations of a Botanical Garden

Housed within a digital recreation of the Enid A. Haupt Conservatory in the New York Botanical Garden, this work presents a glade of trees and architectural ruins that have been synthesised using a generative adversarial network (GAN) trained on synthetic datasets of 3D models of trees and ruins. These trees and ruins derive from an investigation into how voxel GANs can be integrated into broader artistic notions of form and figuration. The procedural environment used in this work, based on a digital reconstruction of the Enid A. Haupt Conservatory in the New York Botanical Garden, explores how the botanical garden might function as a metaphorical container for algorithm-driven film-making. Anthropologist Philippe Descole describes the modern concept of 'nature' as a part of a post-industrial dualism with culture, where all that survives is a 'dumb, odour-free and intangible' aesthetic Nature, a 'ventriloquist's dummy of which man could make himself, as it were, the lord and master'. [1] The botanical garden is a historical site where the systematising and rationalising conventions of modernism collide with the spectacle of decontextualised biosystems. The Probable Garden is therefore an exaggerated gesture towards imagining the extreme end of procedurally generated biomes and what Sean Cubitt described as an 'enclosed' nature. [2] It is an experience in which algorithmic interpretations of natural entities (trees) and anthropomorphic

structures (ruins) share a common space and encourage the audience to reflect on possible intersections of the natural, the machinic and the anthropomorphic.

Cinematographic Affordances of Real-time Environments

The sophisticated camera system developed for capturing the environment, following an applied software studies approach [3], [4], [5], employs various cinematographic modes to explore the potential intersection of programmable and probabilistic filmmaking with environments guided by similar logic. Within the context of major commercial game engines such as Unity 3D and Unreal, sophisticated camera-based scene mediation can be seamlessly implemented. This is made possible through the utilization of accessible built-in cinematographic toolkits (i.a. Cinemachine) and the incorporation of real-time rendering and interactivity features. [6] This approach empowers the design of cinematic content with an unparalleled level of control over not only the camera's behavior and image aesthetics but also the precise positioning of objects within the virtual environment. This key feature distinguishes modern game engine-based cinematics from machinima, which relies on existing gaming environments transformed into creative canvases but is constrained by singular game-specific affordances and limited control over the environment and its visual characteristics. Examples of such productions involve i.a. "Red vs. Blue" (2003) based on "Halo: Combat Evolved" (Rooster Teeth Productions, 2003-present) [7] or "The Trashmaster" (2010) utilizing "Grand Theft Auto IV" (Weschler, 2005). [8]

Synergy of the Machinic and the Anthropomorphic

In contrast to virtual film sets employed in machinima, game engines provide a flexible cross-platform system for crafting virtual scenes with meticulous control over every aspect. This includes the orchestration of virtual camera movement and image settings. Notably, game engines encompass parameters that would be unattainable for physical cameras, given their inherent mechanical limitations. Specifically, the system's capacity to process data describing the entire mathematically possible rendering spectrum liberates it from the necessity to conform to values that merely approximate imagery produced by real-life, physical cameras—such as synthetic photorealism.

In essence, the implemented camera modes in the artwork adhere to both anthropomorphic cinematic image aesthetics and behaviors, as well as machinic attempts to conceptualize a cinematic experience. Intriguingly, in this case, the former association leans towards the rationalizing modernist conventions of specific cinematic forms and image settings. Simultaneously, the latter illustrates how open-ended, raw exploration grounded in probability and programmability births novel cinematic modes as the real-time experience unfolds. This nuanced interplay between established cinematic norms and emergent, algorithmically driven modes reflects the dynamic convergence of technological capabilities and artistic creativity within the realm of AI-mediated visual arts.

Indifferent Observer

The inaugural cinematic mode for "The Probable Garden", labeled the Indifferent Observer, draws its conceptual foundation from the Penrose stairs optical illusion—a perpetual loop of stairs famously realized by M.C. Escher in "Ascending and Descending." [9] In the context of the artwork, this mode unfolds as a continuous dolly shot, navigating ceaselessly through all four corridors and halls of the botanical garden, thereby engendering an illusion of an infinite flyby experience throughout the entire building. The camera, meticulously balanced, maintains its fixation on the space directly before it, employing a fixed focal length with no application of dynamic post-processing effects.

Indifferent to both dynamic elements, such as the intermittent appearance of new trees, and static features like positioned ruins within the environment, this mode reinforces associations with systematization and rationalization tendencies emblematic of the modernist vision for botanical gardens. Here, biosystems are portrayed in a way that reinforces their out-of-place placement manner, as they present themselves as a carefully curated gallery of biodiversity. The resulting visual spectacle, designed for the visitor's convenience, induces a sense of indifference to the intricacies of the presented particulars.

Figure 1. A still frame screengrab illustrating the Indifferent Observer mode.

The Frantic Collector

The second cinematic mode for "The Probable Garden" is designated as the Frantic Collector. Aesthetically, it draws inspiration from the found footage technique employing a shaky camera, rapid focal length changes, and abrupt cuts as it directs its focus on specific trees and tree elements while traversing the botanical garden. [10], [11], [12] The camera appears to be engaged in an endeavor to meticulously capture and study every tree and sculpture variant, foregoing opportunities for a more distanced perspective. Such a

perspective would necessitate less chaotic movements, balanced image settings, and wider shots.

Upon initial observation, the behavior of the camera might suggest a scientific inclination, seemingly overwhelmed by the abundance of new samples. However, in reality, it functions as a frantic gatherer of iterations of visually appealing artifacts—namely, trees. These iterations are swiftly overwritten with new variants that seize its attention, contributing to the dynamic and ever-evolving exploration of the botanical garden. This cinematic mode encapsulates a sense of urgency and fervor in its pursuit of capturing diverse visual elements, ultimately contributing to the continual renewal and transformation of its cinematic capture.
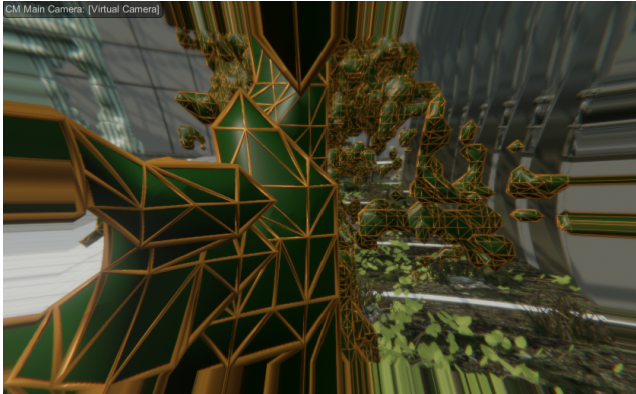

Figure 2. A Still frame screengrab illustrating the Frantic Collector mode.

Cinematic Modes as Metaphors

Conceptually, the two presented camera configurations for the capture (mediation) of the environment, consisting of algorithmic interpretations of natural entities (trees) and anthropomorphic structures (ruins), illuminate two emerging approaches toward the escalating abundance of AI-generated content. As various generative AI tools, fueled by petabytes of both human and machine-originating content, generate derivatives and variants spanning texts, images, videos, sounds, and more, individuals appear to align with one of two overarching approaches. On one hand, early adopters display a fascination with novel tools and services promising "better" and "more creative" outcomes through the implementation of AI techniques in content generation.

Conversely, a not insignificant group appears indifferent to the proliferation of generative AI, exhibiting less enthusiasm and, at times, a reserved stance towards these tools.

The two cinematic camera variants serve as visual allegories of these divergent attitudes, with the Indifferent Observer metaphorically embodying the latter approach and the Frantic Collector representing the former. The Indifferent Observer captures the essence of a reserved and indifferent stance, mirroring the perspective of those who remain dispassionate or circumspect amidst the expansive proliferation of generative AI. On the contrary, the Frantic Collector encapsulates the zealous engagement of early adopters, metaphorically illustrating their relentless pursuit of new tools and services that hold the promise of enhanced creativity in the realm of AI-generated content. This duality, symbolized through the lens of cinematic modes, encapsulates the broader spectrum of responses within the creative community to the transformative impact of generative AI on content creation.

Conclusion

In conclusion, "The Probable Garden" contributes to the technical advancements in AI-enhanced art and virtual cinematography, leveraging the evolving language of film as it is applied in algorithm-driven real-time 3D environments. It also engages in a dialogue about the implications and diverse public responses towards generative AI at large. It prompts the audience to critically reflect on the intersection of technology, human/machine creativity, and the multiplicity of perspectives shaping the future of media arts. Its use of generative adversarial networks, autonomous cameras, and sophisticated cinematographic modes prompts a deeper examination of aesthetic and societal dimensions inherent in the integration of AI within the creative process. As we navigate the complex terrain of AI-driven art, "The Probable Garden" also hopes to encourage the audience to contemplate the societal discourses surrounding generative AI.

Acknowledgements

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