A Brief Analysis of Animation Ontology in the Context of Artificial Intelligence

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Abstract. Artificial intelligence has moved from a peripheral aid to a structuring force in parts of animation production. Rather than merely accelerating existing tasks, AI tools prompt a reconsideration of what constitutes the animated work, authorship, and process. This article examines how current applications of AI—across commonly discussed production stages—interact with the ontology of animation, identifying where core assumptions are extended, constrained, or redefined. Drawing on recent practice examples reported in the field, we analyze the opportunities and frictions introduced by AI and clarify their implications for theory and production workflows. Our goal is to offer a concise framework that situates technical change within ontological debate and provides practical guidance for creators.

Keywords: Artificial Intelligence, Animation Ontology, Animation Innovation

1. Introduction

From its earliest experiments, animation has absorbed successive technical shifts; AI is the latest and, in several respects, a qualitatively different inflection. Beyond speed or scale, contemporary AI systems mediate decisions about image generation, motion, and style in ways that reopen ontological questions: What counts as an animated object or performance? How is authorship distributed across tools and makers? And how do these choices shape reception in specific viewing contexts? This paper re-examines the ontology of animation under conditions of AI-enabled production. We focus on essential attributes (e.g., the status of the animated artifact and its making), on expressive forms that emerge under AI-augmented workflows, and on the evolving relations among the work, audiences, and social settings. By organizing these issues into a tractable analytic frame, we aim to clarify where AI extends established practice and where it reconfigures foundational assumptions.

2. Overview of artificial intelligence and animation technology

2.1. Overview of artificial intelligence

Artificial intelligence is best understood as a bundle of methods for approximating aspects of human reasoning and perception. AI systems learn patterns from data and use them to make predictions or choose actions under constraints. Within this umbrella, machine learning denotes algorithms that adjust parameters from examples rather than from hand-coded rules. Subfields relevant to creative production include computer vision, natural language processing, speech technologies, and robotics; each decomposes tasks such as recognition, generation, and control. In this paper, we use “AI” to

refer to data-driven techniques that support decision-making or content generation within production pipelines, noting that performance depends on training data, model design, and usage context.

2.2. Overview of animation technology

Animation produces the experience of motion by sequencing discrete images, while production methods vary. Traditional hand-drawn practice relies on key poses and in-betweens; stop-motion animates physical puppets or objects frame by frame, yielding a distinctive material presence. Live-action compositing integrates photographed footage with animated elements through matte extraction and layered assembly. CG pipelines organize assets, rigging, layout, rendering, and compositing within software environments. By distribution or use case, animation includes theatrical and television works as well as advertising and educational pieces. In contemporary projects these techniques are often combined to balance aesthetics, cost, and schedule.

2.3. The relationship between artificial intelligence and animation technology

AI engages the animation workflow at multiple points. Creatively, generative tools can suggest alternatives for story beats, character silhouettes, or style studies; their outputs remain exploratory and rely on careful prompting and curation. In production, learning-based systems assist with motion generation, cleanup, and scene layout, reducing repetitive tasks while still requiring animator oversight to preserve timing and intent. For look development, models can inform lighting, textures, and rendering choices through learned approximations, with corresponding concerns about cross-shot consistency. AI-driven interaction also enables characters that respond to viewers in constrained scenarios, which can raise engagement when the interaction model is clearly scoped. Across these uses, potential gains in speed or variety must be weighed against control, authorship, and reproducibility.

3. The impact of artificial intelligence on the ontology of animation

3.1. Innovation in the creative process

AI modifies several creative steps rather than replacing authorship. Learning-based tools can propose meshes or rigging assists, suggest in-betweens via keyframe interpolation, or pre-light shots with learned heuristics; these outputs reduce repetitive work when asset scope is constrained and supervision is tight. Time saved tends to shift toward staging, timing, and style. On the ideation side, model-driven exploration surfaces alternatives for story beats or character silhouettes. Its contribution is curatorial: teams sift, combine, or discard machine proposals to preserve cohesion and intent.

3.2. Diversification and refinement of content expression

Facial and emotional nuance can be augmented through pipelines that combine performance capture, facial blendshapes, and learning-based retargeting. Results are most reliable for expressions represented in the training distribution and weaken on unusual faces or stylizations. In look development, models assist with denoising, texture upscaling, and path-traced lighting approximations, which speed iteration but can introduce cross-shot inconsistencies. Artistic direction remains the anchor; supervisors adjust curves, timing, and shading so performances stay legible and the visual language stable.

3.3. Transformation of dissemination and interaction

Data-informed audience modeling supports distribution by matching works to likely viewers within privacy and platform constraints, trading reach for relevance and raising questions about diversity of exposure. AI-driven interaction enables characters that respond to inputs in scoped scenarios—such as installations, educational apps, or promotional shorts—where behavior trees and generative components are bounded to maintain tone and safety. Immersion improves when interaction rules are clear and latency is low; otherwise the illusion fractures quickly.

3.4. Integration of art and technology

Creative Tools for Artistic Production: As an advanced technological tool, AI provides powerful support for animation art creation. It enables animators to more efficiently realize their ideas and imagination, thus driving the advancement and innovation of animation art.

Expansion of Artistic Expression: As AI technology continues to evolve, the forms and methods of artistic expression in animation are also expanding. AI brings greater creative potential and expressive diversity, allowing animation art to present more nuanced and sophisticated effects.

3.5. Profound and significant influence of AI on the animation production process

3.5.1. Pre-production and concept design

Scriptwriting: Based on a large database of story material and audience preference data, AI can assist or automatically generate scripts through natural language processing and machine learning algorithms. For example, certain AI tools can quickly generate multiple versions of a script from a storyline outline or set of keywords, offering creators a range of options for further refinement.

Character and Scene Design: AI can generate diverse character designs and scene sketches by analyzing large datasets of design layouts. These outputs not only boost creative efficiency but also provide creators with a wider array of inspirational choices.

3.5.2. Production

Model building and animation generation. Learning-based tools can draft meshes, assist retopology, or infer missing detail from scans; in animation they propose in-betweens, support motion retargeting, and help tune IK/FK blends. These outputs reduce repetitive work when asset scope is constrained and art direction is explicit. Artist passes for topology, UV unwrapping, and deformation tests remain necessary to keep rigs stable under performance.

Rendering and effects. Models can guide sampling and denoising, suggest lighting starting points, or approximate costly shaders, shortening iteration. Path-traced looks still depend on shot context—materials, scale, and noise budget—and learned denoisers may smear fine motion or grain. Particle systems and volumetrics benefit from AI-assisted parameter search, while supervisors balance spectacle against continuity across shots.

3.5.3. Post-production and sound design

Editing and compositing. Cut suggestions based on beat or saliency analysis can accelerate assembly, particularly for dialogue-heavy scenes, but editors re-time for performance, adjust A/B roll, and manage continuity. In compositing, learned mattes and edge refinements reduce roto labor; artists still control AOVs, color pipelines, and final balances.

Voices and sound. Voice synthesis supplies temp or stylized lines within defined character notes. Expressivity is strongest when references match the role, so ADR or actor passes remain the standard

for nuance. Procedural sound and learned Foley extend palettes, but the mix anchors perspective and space.

3.5.4. Personalized customization and interactive experience

Personalization. Variant delivery—character options, palette shifts, or branchable beats—works in scoped campaigns but expands QA and continuity costs; guardrails on tone and canon help prevent drift.

Interaction. In VR/AR settings, AI-driven characters respond within behavior trees, with generative components providing surface variety. Immersion improves when latency is low and interaction rules are clear; otherwise the illusion fractures.

AI reshapes parts of animation practice while leaving judgment and finishing in human hands. Understanding the conditions under which tools help—alongside their costs—makes it easier to integrate them where they extend craft and to set new conventions where they change it.

4. New connotations of animation ontology in the context of artificial intelligence

4.1. Understanding animation ontology

The term "ontology" refers to an ultimate existence, representing the fundamental attributes, qualitative determinacy, and origin of things. Ontology is the theoretical system that describes the essence of this ultimate existence [1]. Animation ontology, broadly speaking, explores the essence, characteristics, value, and mode of existence of animation as an art form. In traditional views, animation is created by capturing static images frame by frame and playing them in sequence to create dynamic images. Its ontology encompasses multiple aspects, such as images, sound, and narrative. As a unique art form, animation is highly hypothetical, exaggerated, and expressive, capable of transcending the constraints of the real world to create a virtual world filled with imagination and creativity. The essence of animation is the symbolic reproduction and symbolic transformation of the real or imagined world by humans [2].

4.2. New connotations of animation ontology in the context of artificial intelligence

4.2.1. Fusion of technology and art

The application of AI technology has brought technology and art in animation creation closer together. Artists can use AI technology as a creative aid, while AI can leverage its unique advantages under the guidance of the artist, collaboratively producing innovative and artistic animation works.

4.2.2. Enhanced audience participation

AI technology can also facilitate audience interaction and participation with animation works. AI-based augmented reality animation scene design and presentation methods can effectively generate augmented reality animation scenes that are both realistic and captivating [3].

4.3. Interdisciplinary integration

AI-era animation is shaped by sustained exchanges with other fields rather than by art practice alone. Collaborations with computer science, psychology, and sociology provide methods and constraints that reframe ontological questions—what constitutes the animated object, how authorship is distributed across tools and teams, and how audiences interpret the work. In digital production, AI-assisted techniques make certain motions or transformations that are labor-intensive by hand more

tractable and allow elastic treatments of time and space (for example, non-linear temporality or impossible camera moves), so long as narrative legibility and stylistic coherence are preserved. Interdisciplinarity, in this sense, operates as a design condition for contemporary animation [4].

5. Case analysis

5.1. AI-generated animation *Poems of Timeless Acclaim*

With the rapid development of technology, the application of AI (artificial intelligence) in the film and entertainment industry has become increasingly widespread. Especially with the advent of AI creative technology, it has injected new vitality into the innovation of film and television arts. *Poems of Timeless Acclaim* is a series of animated films produced by CCTV, supported by China's independent AIGC (AI-generated content) technology. It officially premiered on CCTV-1 channel on February 26, 2024. The film utilizes AI technology to transform poems from the national standardized Chinese language textbooks into beautiful traditional Chinese-style animations. This is the first domestic AI-generated animation film based on text-to-video technology, marking a new breakthrough for AI technology in the field of animation production. *Poems of Timeless Acclaim* used AIGC for assistance in everything from art design to motion effect generation, and even post-production.

Currently, AI technology in video generation is still limited by resources such as data and computational power, which causes *Poems of Timeless Acclaim* to have certain gaps in video generation capabilities, duration, and quality when compared to some advanced international technologies. As a preliminary attempt at applying AI technology in animation production, *Poems of Timeless Acclaim* still requires improvements in the maturity of its technical application. For example, there is significant room for improvement in the naturalness of character expressions and movements, as well as in the lighting and shadow effects of scenes. Throughout its development, the "poetry animation" genre has been heavily influenced by Soviet poetic cinema theory and has incorporated traditional Chinese ink animation techniques; with the iterative development of AIGC, "poetry animation" has continuously made groundbreaking advancements in creative efficiency, forms of expression, and emotional communication [5].

5.2. AI-generated animation *The Dog and the Boy*

The Dog and the Boy is an animated short film jointly produced by Netflix Japan, WIT STUDIO Japan, and Microsoft's Japanese division (Rinna). The film uses AIGC (artificial intelligence-generated content) technology, which greatly reduces production costs and time, while simultaneously improving the visual quality of the work. AIGC can save time in animation background creation, helping animators achieve their creative ideas more efficiently and accelerate the production of more refined and high-quality works [6].

The film employs a custom system called "Primitive AI" for background creation. By training on the background art dataset of Netflix's original production company, Production I.G, animators provide prompts and layouts to the AI system, which generates the corresponding images. These are then adjusted by the animators and integrated with other elements. Although the main characters, such as the boy and the robotic dog, were hand-drawn, AI technology played a significant role in assisting character design, motion capture, and expression generation. In terms of background music, an AI code called "M" was used to generate multiple theme options by analyzing a large number of musical works. These options were then refined by human composers to create cohesive and compelling theme music.

The success of *The Dog and the Boy* demonstrates the potential of AIGC technology in animation production, particularly in background creation and music composition. This work, which combines

AI with traditional animation production techniques, not only enhances production efficiency but also reduces costs, bringing a new creative model to the animation industry. In the future development of AIGC+ animation, it is important to clearly define the role of designers as the primary intelligent assistants while also considering deeper integration of AIGC technology with animation production processes [7].

6. Problems and solutions

6.1. Problems encountered

Although AI technology has brought many conveniences and innovations to animation creation, it also faces several challenges and issues. For example, how can the uniqueness and innovation of AI-generated animation works be ensured? How can the relationship between technology and art be balanced? How can the privacy and rights of the audience be protected? These questions require ongoing exploration and resolution in future research and practice. Meanwhile, the animation ontology in the context of artificial intelligence also presents unprecedented opportunities. With the continuous advancement of technology and the deepening of its application, it is reasonable to believe that future animation creation will become more diverse, innovative, and artistic.

6.2. Solutions

(a) Preserve authorship and distinctiveness

AI functions best as a guided assistant rather than a generator of finished shots. Creative direction should be set by humans—theme, tone, and story beats—while models propose drafts for scenes, character motion, or variants that teams then curate. To reduce style drift, pipelines can anchor outputs to style bibles, shot look-dev references, and prompt/constraint sets maintained per sequence. Dataset choices matter: using diverse but provenance-clear material (styles, genres, periods) helps broaden variation while keeping lawful and aesthetic bounds. Where exploration is desired, controlled stochasticity (e.g., adjustable temperature or constrained search; genetics- or RL-style policies when fit for purpose) should be scoped so that novelty does not eclipse continuity [8].

(b) Bridge technology and art in the workflow

Interdisciplinarity is most effective when translated into routines, not slogans. Useful practices include:

Co-owned reviews: joint dailies where art and engineering sign off on timing, silhouette, and technical debt.

Co-located sprints: short cycles to prototype tools against real shots, with explicit exit criteria (quality bars, render budgets).

Aesthetic literacy for engineers / tool literacy for artists: targeted sessions on staging, legibility, and color pipelines for one side; on data, inference limits, and failure modes for the other.

Iterative optimization: treat AI assists as hypotheses; run limited A/B screenings, collect notes, and fold results into the show bible before scaling. The emerging model blends AI-generated drafts with traditional passes so that craft remains legible while throughput improves [8].

(c) Privacy, transparency, and audience rights

Where audience data are used (recommendation, personalization, interaction), adopt data minimization and purpose limitation by default. Storage and transfer should be encrypted and access-controlled; logs record what was used and why. Process transparency can be conveyed in plain terms—what data are collected, retention windows, opt-out options—so that viewers' rights to know and to choose are respected. For interactive pieces, publish a short model/data card that states behavioral guardrails and known limitations.

(d) Putting it together

A workable strategy balances speed and variety against control, authorship, and continuity. In practice this means: human-set creative intent; curated AI drafts; provenance-aware datasets; short, review-heavy iterations; and clear privacy/transparency practices. Framed this way, technology extends established craft where it helps and motivates new conventions where it changes expectations, enabling projects to advance toward more diverse and coherent animation rather than merely more automated outputs.

7. Conclusion

AI reshapes parts of animation's ontology unevenly across tasks. Gains in speed or variety appear alongside trade-offs in control, authorship, and cross-shot consistency, which keeps human judgment central to finishing. Rather than asking whether AI helps in general, the practical question is where it extends established craft and where it requires new conventions for data, tools, and review. Looking ahead, progress depends less on wholesale replacement than on disciplined integration: human-set intent, curated AI drafts, provenance-aware datasets, and short, review-heavy iterations. Framed this way, AI supports animation practice without dissolving its core commitments to legibility, style, and audience understanding.

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