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3D Game Visual Art Styles Classification: A Framework for Aesthetic Categorisation and Analysis

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Abstract

Visual art styles in 3D games play an important role in aesthetic interaction, player immersion, and narrative development. As games evolve beyond entertainment into expressive and cultural media, the need to systematize visual style understanding becomes increasingly significant. Despite the abundance of artistic experimentation in current game development, a clear academic framework for categorizing 3D game visual art genres has yet to emerge. In this paper, we develop a theoretical and analytical framework for categorizing 3D game visual art styles in existing literature as derived from aesthetic theory, art history, and visual semiotics. We examine sixty unique 3D games produced in the years 2010–2024, using qualitative visual coding methods informed by semiotic interpretation. Our inquiry identifies seven main art style categories: Photorealistic, Stylized Realism, Cel-Shaded, Minimalist, Abstract, Hand-Painted, and Hybrid Experimental. Each of the seven art style categories are characterized by distinct formal, chromatic, and atmospheric aspects. The proposed framework provides a standard vocabulary for game studies, pedagogy, and aesthetic valuation as a model of comparative analysis and scholarly discussion.

Keywords - 3D video game, Game art styles, Visual aesthetics, Graphic styles, Digital visual art

1. Introduction

Today, video games are clearly a leading form of culture, and the use of visual styles to engage audiences represents one of the most important visual entry points for audiences to engage in interactive spaces. Approximately 70% of our information processing occurs through visual channels, making the visual aspect of gaming critical for how players develop meaning, read space, and develop emotional relationships to interactive worlds through visual means (Masuch & Röber, 2005). From the visual and cinematic realism evident in The Last of Us Part II to the ethereal stylization found in Journey, visual art style serves at once as a form of "communicative code" as formulated by James Paul Gee, while also exemplifying this philosophy of design in games. Design and research scholars recognise that visual can convey so much more than surface decoration; they mediate gameplay experience, create narrative tone, and affect cultural perceptions (Wolf & Perron, 2014).

The advancement of 3D game art has a history beginning with early arcade games such as Battlezone (1980) and Star Wars (1983), which introduced polygonal 3D modeling and rendering (Sepúlveda, 2020). The shift from 2D to 3D rendered graphics in the 1990s is one of the key developments in the history of video games, integrating advancements in graphical technologies with the ability to depict three-dimensional game worlds. Cel shading emerged as an important style

innovation in games such as Jet Set Radio (2000) and The Legend of Zelda: Wind Waker (2002), demonstrating that game visuals could be verging on beautiful and striking without the constraints of imitating the real (Agerbeek, 2021). The second half of the 2010s saw a wider adoption of photorealism from advancements in rendering technologies, motion capture performance, and games such as The Last of Us (2013) and Red Dead Redemption 2 (2018). Nevertheless, games such as Cuphead (2017) and Breath of the Wild (2017) demonstrated that creative expression can be no less engaging than. Contemporary 3D game art now includes a broad range of visual modalities and styles as well as the hyperrealism, realistic simulation, stylistic approaches with different aesthetic and functional implications.

Figure 1: Tomb Raider Evolution of Lara Croft | Source: https://www.youtube.com/watch?v=D-P-smim5gQ

Selecting and using 3D art styles strongly affects how players experience a game, understand its story, and connect emotionally. Visual styles help to share information about the game world, set the mood, and show what players can do (Hemraj, 2024). When the art style matches the story and gameplay, it makes the game more immersive and the story more powerful. If the visuals do not fit, it can break the sense of unity and weaken emotional impact. Karmakar's (2021) research shows that art style shapes the mood and meaning of a story, making it a key part of storytelling, not just decoration. Elements like color, lighting, model detail, and rendering all help show what the game world is like, even beyond what the story says directly. Visual style also matters when players look for new games, as many choose games based on how they look (Cho et al., 2018). Because of this, it is important to have strong systems for organizing games in libraries, digital stores, and research. With the progression of 3D rendering technologies, the distinction between art and simulation becomes blurred. The rise of physically based rendering (PBR), procedural texturing, and AI-enhanced stylization has led to a level of aesthetic diversity that surpasses earlier periods in digital art. However, scholarly studies on 3D game art styles frequently suffer from unclear terminology and a lack of standardised classification systems, which poses difficulties for developers, researchers, and information specialists.

In the previous works, game graphic styles were classified and explained. A survey on useful information visual style showed that 53.4 percent out of 671 participants were satisfied users of visual style classification information (Cho et al., 2018). Existing research focuses on aesthetic perception (Tractinsky et al., 2006) or stylistic classifications in 2D visual, but limited efforts have been made to create a structural taxonomy for 3D visual aesthetics in gaming. Arsenault et al. (2015) indicate in their Game FAVR framework that the discussion surrounding video game graphics has often relied on "a mixture of borrowed terms from art history, film, and animation," leading to a vocabulary that is inconsistent and does not adequately reflect the medium's distinct interactive

and technical characteristics. Although visual style is crucial in game design and player engagement, the area lacks a uniform taxonomy for categorizing 3D game art styles, posing difficulties for developers, researchers, and information specialists.

Our research develops a comprehensive taxonomy of 3D game art styles by systematically examining the formal, technical, and aesthetic characteristics grounded in art theory and supported by systematic visual analysis that distinguish different approaches to three-dimensional game graphics. Drawing on game studies, computer graphics research, and information science, the taxonomy provides a structured framework for Artists, developers, researchers, and information professionals to better understand how visual style functions as a meaningful dimension of game design.

The framework serves three primary objectives:

1. To identify and define dominant art style categories in 3D games.
2. To outline aesthetic dimensions that cut across categories.
3. To contextualise these classifications within broader aesthetic theory.

By doing so, the paper seeks to enhance both theoretical insight and practical discussion in digital aesthetics and interactive media design

2. Literature Review

This literature review examines current research on visual art style classification in 3D video games, encompassing taxonomy development, computational approaches, technical implementation, and the role of visual aesthetics in game development.

2.1 Visual Aesthetics and Game Experience

The graphic that game players can see in the game was judged from the overall display graphic in the game, it was called "graphic style (Wattanasoontorn et al., 2019). Aesthetics in interactive media represent the intersection of perception, emotion, and cognition. Norman's emotional design theory (2004) and Tractinsky et al.'s research into immediate aesthetic perception (2018) highlight how visual stimuli powerfully influence satisfaction with a product. In the context of games, this influence goes further by affecting affective immersion or the emotional and psychological connection that players establish with virtual spaces through cohesive visual design (Niedenthal, 2009).

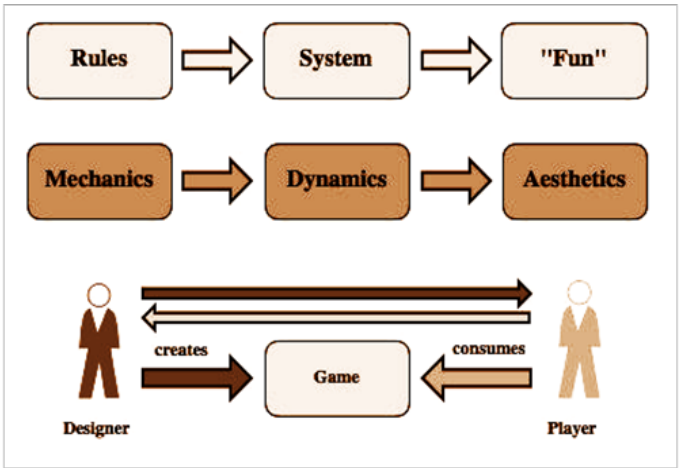

Figure 2: The MDA Framework (Adapted from Hunicke et al. (2004)) | Source: Jorge Simoes

The MDA framework by Hunicke, LeBlanc, and Zubek (2004) referred to the interplay between visual style and gameplay systems with narrative as complementary parts of a complete interactive experience. Aesthetics also play an important part in attaining believability. According to Schell (2014), the believability of a game world becomes less about realism and more about internal consistency: how the materials, lighting, and color choices align with player expectation and the

internal logic of the game.

The selection and execution of 3D art styles within this framework directly affect player experience, narrative comprehension, and emotional engagement. Visual design, in itself, is actually a communicative system that informs about the world, sets tone, and even signals interaction possibilities (Hemraj, 2024). When the visual style works in concert with the game's story and mechanics, it reinforces feelings of immersion and cohesive storytelling. Conversely, a mismatch of style and content can disrupt emotional resonance and player connection.

In support, the empirical research of Hölttä (2018) indicates that art style enhances not just player perception of narrative mood but also deepens overall engagement. Such findings confirm that art style is more than decoration; it is integral to meaning-making in games. By deliberate use of color, lighting, model complexity, and rendering, developers build visual languages that speak to the core of their created worlds, often well beyond explicit narrative cues.

2.2 Art Style Categorisation in Existing Game Studies

Researchers have long noted the lack of standardised metadata for defining visual styles in video games, leading to various efforts to establish thorough classification systems. The simplest taxonomy categorises 3D art styles into three main groups: abstract, stylized, and realistic (Keating et al., 2017).

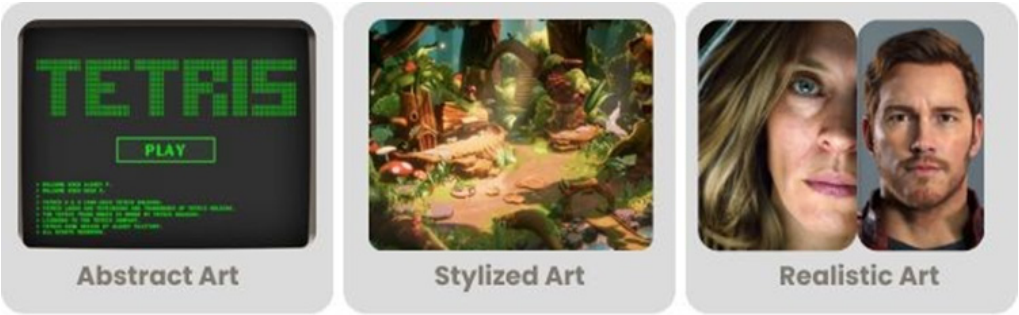

Figure 3: Abstract, stylized, and realistic (Keating et al., 2017) | Source: Wikipedia, Unreal Engine & duniqueboy124

In a similar vein, Järvinen (2002) referred to photorealism, caricaturism, and abstractionism to illustrate this same conceptual range. Acknowledging the shortcomings of such three-part frameworks, later scholars have pursued more detailed methods. For example, Hemraj (2024) broadened these classifications by distinguishing between photorealistic, stylized, and simplified art styles, defined by factors like lighting, shading, proportions, and model complexity.

Later frameworks have progressed from basic categorical divisions to multidimensional taxonomies. Keating et al. (2017) suggested classifying visual styles based on five essential dimensions: visual appearance, mood, representation of gameplay mechanics, visual techniques, and visual motifs. This method recognises that a game's visual identity cannot be encapsulated by a single descriptive term but instead requires examination across various visual and conceptual dimensions. Wattanasoontorn et al. (2019) further developed this concept with a hierarchical model that allows for different levels of abstraction, facilitating finer distinctions among similar styles. In a related study, Cho et al. (2018) carried out an empirical user-based experiment with 22 participants to create and validate a taxonomy for video game visual styles, discovering moderate to strong agreement (assessed by Fleiss' Kappa) among participants regarding the application of specific stylistic terms.

Art style terminology has also emerged organically through industry and fan communities. Wolf

and Perron (2014) identified realism, abstraction, and hybrid stylization as recurring categories within production and audience discourse. More recent computational studies, such as those by Takahashi et al. (2021), have attempted automated recognition of visual styles using algorithmic analysis. However, such methods often reduce style to superficial visual patterns, neglecting its aesthetic and interpretive dimensions. Design theorists have instead emphasized contextual and semiotic interpretations. Lankoski and Björk (2015) associate visual coherence with gameplay affordances, while Salen and Zimmerman (2004) frame visual style as a semiotic system that encodes meaning, tone, and cultural values. Despite these contributions, current classification models still fall short of addressing the specific complexities of 3D media, which involve volumetric form, spatial lighting, and materiality as key factors in shaping visual perception and emotional impact. A more refined taxonomy, therefore, must integrate both formal-visual parameters and perceptual-semantic layers, bridging technical characteristics with the interpretive dimensions that inform player experience.

2.3 Aesthetic and Theoretical Context

Aesthetic theory provides foundations for systematic classification. From Kantian disinterested pleasure to Dewey's experiential aesthetics, art has been understood as an encounter between perception and emotion. Gestalt principles such as unity, similarity, contrast, and closure explain how visual composition promotes coherence. In-game art, these principles manifest through proportion, symmetry, and visual rhythm.

Additionally, semiotic theory (Barthes, 1977) sheds light on how visual signs convey meaning. Texture, lighting, and colour become signifiers of realism, fantasy, or abstraction. Integrating semiotic analysis with art historical categories enables a structured yet flexible framework adaptable to digital expression.

3. Methodology

The research employed a qualitative content analysis with interpretive coding. This design allowed for subjective yet systematic identification of aesthetic characteristics across a curated corpus of sixty 3D games spanning multiple genres such as action-adventure, role-playing, simulation, and indie, etc. The selection covered titles released between 2010 and 2024 to capture both technological evolution and stylistic diversification.

To conduct this research, we gathered primary data from the following sources:

1. High-resolution screenshots and promotional stills.
2. Gameplay video sequences analyzed at fixed time intervals.
3. Official concept art and artbooks.

We evaluated each visual sample using a coding sheet structured around four primary parameters:

S.No.	Parameters	Visual samples
1	Form Treatment	Level of geometric detail, character stylization, and environmental complexity.
2	Surface & Texture	Material realism, texture mapping techniques, and visible brushwork.
3	Lighting & Colour	Palette temperature, contrast, dynamic range, and saturation.
4	Atmospheric Expression	Mood, narrative tone, and symbolic use of light or hue.

Table 1: Coding Sheet Visual Samples with Parameters

The analysis followed Braun and Clarke's thematic coding approach from 2006, where visual attributes were grouped through repeated comparison until clear stylistic patterns emerged, which were then mapped across aesthetic dimensions like representation level and chromatic philosophy. To address potential subjectivity, two independent coders assessed a subset of fifteen games and reached 87% agreement, with additional expert review ensuring theoretical soundness. While this qualitative method is inherently interpretive, it fits within established aesthetic research traditions that emphasize perceptual understanding and meaning rather than statistical generalization, and a methodological flowchart illustrated the progression from data collection through coding, thematic clustering, theoretical interpretation, and finally to classification outcomes.

4. Findings

4.1 Taxonomic Framework of 3D Visual Art Styles

The analysis yielded seven dominant categories, each defined by formal and expressive characteristics.

Category	Formal Characteristics	Aesthetic Intent	Representative Titles
Photorealistic	High polygonal fidelity, PBR materials, volumetric lighting	Mimetic realism; immersion through accuracy	Call of Duty: Modern Warfare II, Red Dead Redemption 2
Stylized Realism	Mid poly mesh, soft exaggeration, saturated hues	Expressive believability; emotional realism	Horizon Forbidden West, God of War: Ragnarök
Cel-Shaded	Flat color regions, dark outlines, limited gradient	Graphic clarity; comic or anime aesthetic	Borderlands 3, Genshin Impact
Minimalist	Low poly geometry, restrained palette, negative space	Symbolic abstraction; focus on emotion or concept	Journey, Inside
Abstract	Non-representational form, motion emphasis, surreal color	Experiential abstraction; synesthetic engagement	Rez Infinite, Bound
Hand-Painted	Textured brushwork, visible strokes, warm palette	Artisan sensibility; illustrative charm	Sea of Thieves, World of Warcraft
Hybrid Experimental	Dynamic blending of multiple styles, AI or procedural techniques	Aesthetic innovation; self-referentiality	Control, No Man's Sky

Table 2: Classification of 3D Video Game Art Styles

4.2 Cross-Cutting Aesthetic Dimensions

The analysis reveals four fundamental aesthetic dimensions that function as sliding scales rather than fixed categories. The first one, Representation Level, describes how artists move between objective realism, showing things as they actually appear in the world, and symbolic abstraction, where forms become simplified signs or conceptual ideas that go beyond literal depiction. This spectrum affects not just what we see, but how meaning gets communicated through visual language. Form Treatment deals with how artists approach shape and structure. On one end is anatomical naturalism, where careful attention is paid to realistic proportions, muscle structure, and the unique details of natural forms. On the other end is geometric simplification, where complex organic shapes get broken down into basic forms like cylinders, spheres, and cubes. This choice reflects whether an artist finds truth in nature's intricate details or in the underlying patterns that organise everything. Colour and Lighting Philosophy spans the range between natural light simulation, recreating how light actually behaves, with warm sunlight, cool shadows, and atmospheric effects, and emotional colour scripting, where colors are chosen for their psychological impact and symbolic meaning rather than realistic accuracy. This dimension reveals whether artists see color

as a tool for describing reality or for expressing feelings and ideas. Finally, Materiality versus Immateriality measures how much depicted surfaces feel physically real and touchable versus ethereal and weightless. Material emphasis brings out texture, solidity, and substance, you can almost feel the objects. Immaterial approaches create luminous, transparent, or atmospheric effects where solid forms seem to dissolve into light and air. Together, these four intersecting dimensions create a framework for understanding any artwork and how individual creative choices connect to larger questions about what we see, what's real, and how we represent the world.

4.3 Interpretations

The Photorealistic style aligns with Western mimetic tradition, pursuing verisimilitude through detailed simulation. Yet as Baudrillard suggests, this realism often creates hyperreality, a heightened version of truth optimized for emotional drama and cinematic immersion rather than mere accuracy. Stylized Realism represents a contemporary compromise between visual richness and artistic expression, using selective exaggeration and controlled palettes to bridge emotional readability with material credibility, what Arnheim (1974) called "expressive distortion" that enhances perceptual meaning.

Cel-Shading draws from print and animation aesthetics, employing bold outlines and flat colors for symbolic clarity that aids gameplay readability. Its graphic codification functions as metacommentary on mediated vision, creating worlds that self-consciously declare their artificiality. Minimalist and Abstract approaches embody philosophical modernism by stripping away material excess to invite phenomenological reflection. Their subdued palettes and geometric restraint evoke the Japanese concept of ma, meaningful emptiness that creates emotional resonance through space rather than detail.

Finally, Hand-Painted and Hybrid styles reflect dual movements: nostalgia for handcrafted authenticity and postmodern experimentation with algorithmic art, AI stylization, and procedural generation. These approaches signal an aesthetic of multiplicity where visual identity becomes fluid, self-referential, and resistant to singular classification.

5. Discussion

The framework brings together formalist, expressionist, and semiotic perspectives into one unified system that treats 3D visual style as having three connected parts: Form (the visual structure), Technique (the materials and technology used), and Meaning (how we interpret it). This approach follows Danto's (1981) "artworld" theory, which argues that interpretation is essential to understanding art categories. Visual style becomes both an aesthetic creation and a way of communicating ideas within design culture. For art and design students, this taxonomy works as a teaching tool that helps them analyse visual choices through these dimensions, encouraging thoughtful discussions about how style supports storytelling and tone. Using case studies across the seven categories helps students develop stronger analytical skills in 3D visual communication. The framework also opens doors for future research: machine learning could use this taxonomy to automatically identify different 3D styles, while psychological studies could explore how these aesthetic categories affect players' emotions and experiences. This bridges both computational methods and humanistic approaches to studying visual art in games.

6. Limitations

This study relies on qualitative interpretation, which naturally involves some subjectivity, and while the collection of games examined is diverse, it can't capture every emerging visual style

out there. Technology is evolving rapidly, with advances like neural rendering and real-time ray tracing constantly changing what's possible, and these innovations will keep blurring the lines between different styles. Because of this, the taxonomy shouldn't be seen as fixed or final, but rather as a living framework that can be updated and refined as new styles emerge and visual techniques continue to develop.

7. Conclusion

This research advances the discourse on digital aesthetics by proposing a comprehensive classification of 3D game visual art styles rooted in aesthetic theory and visual analysis. The seven identified categories, Photorealistic, Stylized Realism, Cel-Shaded, Minimalist, Abstract, Hand-Painted, and Hybrid Experimental, represent both historical continuity and technological innovation in digital art. By mapping these categories along cross-cutting dimensions of representation, form, colour, and materiality, the study provides a structured vocabulary for describing and comparing game aesthetics. Beyond academic analysis, the framework supports visual development, art direction, and design pedagogy.

Future research may combine this theoretical foundation with computational visual analysis, enabling hybrid methods that quantify aesthetic parameters while preserving interpretive depth. As game worlds increasingly merge art, technology, and emotion, the systematic study of visual style remains essential to understanding how interactive media communicate beauty, meaning, and experience.

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