

CREATING A TAXONOMY FOR VIDEO GAME VISUAL STYLE

by

Katherine K. Hicks

©2020 Katherine K. Hicks

A thesis
submitted in partial fulfillment
of the requirements for
the degree of Master of Arts
(History of Art and Design)
School of Liberal Arts and Sciences
Pratt Institute

May 2020

CREATING A TAXONOMY FOR VIDEO GAME VISUAL STYLE

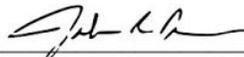
by

Katherine Hicks

Received and approved:

 _____ Date 05/11/2020

Joo Yun Lee, Thesis Advisor

 _____ Date **5/11/2020**

John R. Decker, Department Chair

Acknowledgments

The idea for this thesis was based on a project I did for my Knowledge Organization course in Spring 2018. The instructor for that course was Bree Midavaine, who also served as a second reader for this project. She was not only a wealth of great ideas and references, but also the first person to convince me that video games could be the subject of serious academic study. Thanks Bree!

I would like to thank my advisor, Dr. Joo Yun Lee, who not only provided immeasurably helpful feedback and resources, but much-needed support during incredibly uncertain and stressful times. I would absolutely not have been able to finish this project and keep my sanity without her. Truly, truly, thank you.

Finally, I'm going to be the cheesiest and thank my parents, Brian and Laura, who have always supported and believed in me. Thank you both for pretending to care about video games for the months I was working on this project.

Table of Contents

Acknowledgments	2
Table of Contents	3
Introduction	4
Chapter 1: The Importance of Taxonomies	7
The Importance of Controlled Language in Library and Museum Cataloging	8
Controlled Language for Video Games	11
Controlled Language for Video Game Creators	16
Chapter 2: Creating a User-Focused Taxonomy	20
User-Created Language	22
Library Users	23
Museum Users	28
Academic Users	30
Chapter 3: Creating an Accurate and Specific Taxonomy	33
Video Games and 2D Animation	34
Video Games, Illustration, and Painting	36
Developer's Intentions and Video Game Realism	39
The Technology of Video Games	43
Conclusion	49
Appendix 1	52
Appendix 2	55
Bibliography	58

Introduction

The language used in library and museum curatorial settings to catalog and describe artworks is fundamental to our understanding of that work. The specific terms applied to each work or body of work facilitates further research, and allows connections and comparisons between works, which leads to greater discourse. In essence, having an agreed-upon set of descriptive terms, or a “controlled language” is what codifies a body of work as worth discussing. Controlled languages, or taxonomies, are sets of terms with agreed upon spelling and definitions, as set by an internationally recognized authority institution like the Library of Congress or the Getty Research Institute. Within collecting institutions like libraries and museums, these controlled vocabularies have the added task of classifying, cataloging, and organizing materials so they may be found more easily.

For video games, there has not been a fully realized effort to describe their nature in any meaningful way, and no controlled vocabularies exist for this purpose. There are many aspects of video games which each warrant their own taxonomies, from gameplay mechanics to musical scores, and fully describing them would require the effort of years of careful study and collaboration. The current study concerns the creation of a taxonomy specifically for the visual styles of video games. To this end, this research will identify the necessity of controlled language, summarize the studies which aim to create new taxonomies for visual style, and explore the factors which make up a video game’s visual style.

In order to explore the importance of controlled language for collecting institutions, the first chapter will explain the most relevant cataloging practices. Further, it will explore

current controlled languages and demonstrate their insufficiency in fully describing video games. The absence of controlled terms applies to all aspects of games, from their technical requirements to their mechanics, but is most glaring in regard to visual style and authorship credits. The exclusion of these aspects in particular warrants special consideration, as their absence prevents video games from being considered in art historical discourse.

To begin creating a taxonomy for video games' visual styles, the second chapter will summarize the methods and findings of major studies which have been conducted by both library professionals and art historians. These two groups have wildly diverging audiences and aims for their studies, and so often achieve very different results. By first exploring studies conducted by library and museum professionals, this chapter will analyze the importance of usability, and the need to create taxonomies which are understandable to many different types of users. However, these studies are also helpful in explaining the dangers of over-simplifying terms for the sake of useability and ultimately rendering any taxonomy unhelpful. Through the study conducted by art historians, this chapter will examine the necessity of accuracy and specificity and the need to be comprehensive in the analysis of video game visual style.

Finally, this research will probe the various aspects of a video game's visual style. It will examine game's most common visual styles borrowed and adapted from animation and illustration, explore the use of realism in various games, and explain the role the technology used to create and render their graphics plays in the final look of the game. The most obvious influences of video games have always been animation and illustration, and the final chapter of this research will analyze the most copied styles from both these media. Since many

techniques pioneered by animators and illustrators were directly copied by video game designers in an attempt to create a visual language which would be familiar to their audiences, the terms used to describe those techniques could also apply to video games. It is the innovative use of technology which has allowed video game designers to break away from other media and create their own, unique styles. This research will trace these innovations through a brief history of video game technology, and demonstrate how many of the terms used to describe this technology are ubiquitous with the visual styles they produce.

The creation of a new taxonomy to describe video game visual style has been attempted before by both library science professionals and art historians, but there has so far not been a comprehensive, interdisciplinary study which takes into account the needs of both library patrons and art historical researchers. The suggested taxonomies tend to be polarizing, either too specific or too general, too technical or too simplistic. By critically analyzing the major studies conducted by both types of professionals, and using knowledge of library cataloging and art historical research, the present study will build on these taxonomies and propose new terms to bolster and refine them in a way which is both understandable to library users, and specific enough to be useful for serious art historical research.

Chapter 1: The Importance of Taxonomies

When cataloguing works in library and museum curatorial settings, it is necessary to have controlled language to describe specific things about the work. Controlled languages, or “taxonomies” are any collection of terms for which an internationally recognized “authority institution” like the Library of Congress or the Getty Research Institute, has set a specific definition and spelling. These terms ensure not only that names are consistently spelled correctly, but also that there is a singular term to represent an idea. For example, the historical event World War 1 could understandably be described as “World War 1”, “World War One”, or “The First World War”. But which is accurate? To answer this question, the cataloger could simply search on the Library of Congress’s linked data service and find that the controlled vocabulary is “World War, 1914-1918”. By using this term rather than any of the others, the cataloger ensures that there is consistency in description and spelling across institutions, making them integral for research.

And yet, despite the vital importance of controlled language in the library and museum, and the fact that video games are being collected by these institutions, there has been no taxonomy created specifically for video games. To explain the importance of controlled language in video game cataloging, it is necessary to look at what languages already exist, how they are used, and why they are inadequate for describing video games. The second chapter of this research will summarize studies looking specifically at the language used to describe video games’ visual style, but it is worth first examining the general role of controlled language both in libraries and in museums, and how these

languages influence the ways we organize, describe, and write about video games. This chapter will explain the importance of organizational schemas and controlled language in cataloging practice, examine how this controlled language is currently being used to describe video games, and identify the gaps in this language when it comes to describing important medium-specific video game elements like gameplay mechanics and visual styles. Finally, it will explore the role that game creators play in creating and innovating game styles, and the need to properly credit and catalog these individuals.

The Importance of Controlled Language in Library and Museum Cataloging

The usefulness of controlled vocabularies are numerous for both catalogers and researchers. As mentioned above, they ensure consistency both within and between institutions. These taxonomies also ensure that the cataloger does not need to have an extensive working knowledge of the subject they are cataloging. The dates, spellings, and definitions provided by the Library of Congress have been researched by individuals who are experts in their respective fields. The controlled terms created by these institutions allow all collecting institutions to, in effect, “borrow” the expertise of these catalogers, making them essential for smaller institutions who may not have the resources to hire multiple catalogers who are experts in a variety of fields. This is also why any changes to the controlled schemas are difficult for smaller institutions to adopt, as they would likely lack the resources to re-catalog and re-classify their entire collection. Controlled terms also provide a tertiary function, as they allow users to search for broader concepts such as “documentary films”

rather than just the title or creator of a specific work. This allows users to discover new items in the same genre, or with the same subject, or which utilize the same techniques, etc. In library science, this is called “serendipitous discovery,” and facilitates making connections and generating new ideas.

The two most common taxonomies used in libraries to classify and organize their materials are subject terms and genre terms. For materials like books and films, many institutions use the subject and genre terms approved by the Library of Congress. Subject terms describe what a work is *about*. For non-fictional works, they are used to categorize and specify the subject matter (i.e. “World War, 1914-1918” or “France” in addition to the more general “History”). For fictional works, they are often used to describe key plot points (i.e. “Man-woman relationships” or “Deception--Drama”). Subject terms are generally more specific than genre terms, which describe what a work *is* (i.e. “documentary films” or “fantasy fiction”). Both of these categories of terms allow for consistent spelling and terminology, which makes discovery easier for a user. These terms also make it possible for a patron to browse for similar works based on the subject or genre in which they are interested.

Although libraries almost exclusively rely on established frameworks and Library of Congress subject headings, archives and museums may choose to use approved terms created by the Getty Research Institute. These terms are collectively known as the Art and Architecture Thesaurus (AAT), and are more descriptive of physical objects like artworks than conceptual works like books or films. The Getty divides the AAT into “concepts”, “physical attributes”, “styles and periods”, “agents”, “activities”, “materials”, “objects”, and “brand names”. The most commonly used terms in a library setting are the “materials”

terms, which are defined as “physical substances, whether naturally or synthetically derived, ranging from specific materials (e.g., "lapis lazuli (rock)") to types of material designated by their function (e.g., "colorants"), and from raw materials to those that have been formed or processed into products that are used in fabricating structures or objects.”¹ The other most commonly used taxonomy is the “processes and techniques” subsection of “activities”, which is defined as “terms for actions and methods performed physically on or with materials and objects, and for processes occurring in materials and objects. Included are types of process or technique pertaining to the production and handling of objects or images (e.g., "assembling") or of substances (e.g., "mixing") or relevant to the manipulation and processing of specific materials (e.g., "soldering”).”² These two taxonomies, which are colloquially in the library science field referred to together as “materials and techniques” terms, are an integral part of most image-based library and museum cataloging. In addition to the AAT, the Getty maintains the Union List of Artists’ Names (ULAN), which contains controlled language for names, nationalities, and roles.

The lack of controlled vocabulary to describe video games coincides with the absence of an adopted, standard cataloging schema. Standard schemas for objects such as books, films, and cultural objects provide a framework for what information to collect about an object, and how that information should be organized within a record. With no standard, adopted schema for video games, many institutions with fewer resources are left with incomplete or confusing records. Additionally, it becomes very difficult for users to search

¹ “Materials Facet,” Art & Architecture Thesaurus Online (The Getty Research Institute, 2004), <http://www.getty.edu/vow/AATFullDisplay?find=&logic=AND¬e=&subjectid=300264091>

² “Processes and Techniques (hierarchy name),” Art & Architecture Thesaurus Online (The Getty Research Institute, 2004), <http://www.getty.edu/vow/AATFullDisplay?find=&logic=AND¬e=&subjectid=300053001>

for video games both within a local catalog and between institutions if they have wildly different schemas and language. This lack of structure disproportionately affects smaller institutions who may not have the time or resources to create their own methods of cataloguing, potentially deterring them from collecting video games in the first place.

Controlled Language for Video Games

The subject terms which are currently approved by the Library of Congress to describe books and films are often used by collecting institutions to describe video games. However, since subject terms in general were not intended for this purpose, they are only useful in very specific circumstances, none of which include a game's art or play style.

The first way in which current subject terms may be used is if the game features a very popular game character which has become ubiquitous enough to warrant controlled terms (i.e. "Super Mario brothers (game)", "Sonic Adventure (Game)", "Legend of Zelda (Game)"). These terms are often redundant, as the characters' names usually appear in the title of the game, and these terms are only useful for the oldest and most popular games. Furthermore, they do not allow users to browse for other games which have similar art or play styles. With only these terms, for example, a user would not be able to find a game which is narratively or stylistically similar to *The Legend of Zelda* but made by an independent game designer.

The current terminology may also be applied if the game is about a specific, real world time or place, or has other established, recognizable elements. They are not applicable

to non-narrative games such as the puzzle game *Tetris*, or for games which take place in a fictional world. In addition, these terms do not adequately describe what a game is about in a way which is meaningful to a user. For example, in the 2019 action-adventure role playing game *Assassin's Creed: Odyssey*, the user plays an Ancient Greek assassin trying to infiltrate a cult. This game might have the terms "Cities and towns, Ancient--Greece" or "Greece--History--Peloponnesian War, 431-404 B.C.". It might also use terms like "Assassins--Fiction" or "Cults", both of which are important narrative elements within the game. However useful these terms are, though, the game's narrative is only a small part of why users would want to play it. Subject terms as they currently exist cannot be used to describe other elements which are important to a user, such as the game's art or play styles.

The final circumstance in which current subject terms might be used is to record the console for which a video game was made (i.e "Game Boy video games", "Sony playstation video games", "Xbox video games", "Computer games"). Though these terms highlight the importance of controlling language to maintain consistency, ensuring that "Playstation" is always one word and "Game Boy" is always two, they are inadequate for several reasons. First, most modern games are made available on multiple consoles. *Assassin's Creed: Odyssey* for example, has versions for the Playstation 4, the Xbox One, and the personal computer (PC). Second, consoles are developed in "generations," meaning that every few years, a new, updated version of the console is released. Strictly speaking, the term "Playstation" refers exclusively to the original model of the console released in 1994, to specify a newer model of the console it is necessary to mention the generation number (i.e "Playstation 2", "Playstation 3", etc). This is vital information to include, as games are not

just created for specific consoles, but for specific generations of specific consoles, and newer games will not play on older consoles. With the bafflingly random exceptions of the Xbox One and the Xbox 360, there are no terms which specify the generation of console. Without the generation, knowing the console type is useless. Finally, the console information does not serve the same function as other subject terms, as it provides no indication what the game is *about*. If anything, they serve a similar function to systems requirements, which list the necessary hardware and software to mediate items like films or computer programs.

Within the Library of Congress subject headings, there are a few genre terms which can be used to describe PC games specifically. These terms (i.e. “Computer adventure games” and “Computer war games”) are applicable to a select range of PC games, but not very many, and they are not translatable to console games. Again, since many games are made for different platforms, having that information in the subject and/ or genre fields may not be entirely useful. There are a few non-console specific genre terms, such as “fantasy game”, but these refer specifically and exclusively to tabletop role playing games such as “Dungeons and Dragons”. The only approved genre term which may be applied across consoles is “video game”, which is so vague as to be rendered useless.

To make these terms more useful, it is necessary to think critically about “subjects” and “genres” in video games. For other works of fiction subject terms are used to describe a work’s key plot elements, but this can be challenging when it comes to games. For many games, the narrative could change dramatically depending on a player’s actions, making many possible story outcomes. Many games have no linear narrative at all. However, if the understanding of subject terms were expanded to include basic actions or gameplay

mechanics, these terms could more accurately describe what a game is about using language specific to the medium.

Some basic terms already in common use by video game users and professional game journalists like “karma-based questing”, or “open world exploration” for example, describe both how players might interact with the game, and also how the story will progress. In a similar fashion, genre terms could be used to codify major game types, such as “first person shooter” or “role playing game”. As with books and film, all these terms could be repeatable, meaning more than one term could apply to each game. By describing video games based on their mechanics and play styles, rather than their most famous characters or their recognizable story elements, games which are created by lesser-known developers, or which feature strange and imaginative designs could become more easily found. The following chapter will further explore potential taxonomies for video games, with a particular emphasis on visual style.

The Getty’s AAT has a general “work type” term for “video game”, but also allows for more periphery objects to be individually catalogued (i.e “video game console” and “video game controller”). Like the Library of Congress’ genre terms, these terms are so general that they aren’t really useful for browsing. In addition, the “materials and techniques” terms which can be used to describe the methods of video game creation are not widely used, perhaps because they are somewhat confusing. For example, “raster graphics” is a term which exists in the “processes and techniques” hierarchy, and is treated as a technique for creating computer images, but “pixels” falls under either “objects” when it is being treated as an image component, or “physical attributes” when it is used to measure the

dimensionality of an image. The hierarchies and strict organization of the terms within the AAT can be difficult to parse without library science training, and is one of the reasons why they are so unevenly applied across organizations. Like subject and genre terms, in order for “materials and techniques” terms to describe video games in any meaningful way, the terms “materials” and “techniques” would first need to be recontextualized in a medium-specific way. In doing so, catalogers would know exactly where to find terms to describe specific aspects of a game’s visual style.

In their article “Reverse-Engineering Graphical Innovation: an Introduction to Graphical Regimes,” Canadian art historians Dominic Arsenault and Pierre-Marc Côté outline the unique nature of video games’ stylistic innovation, which combines both technological advancements and artistic creativity. According to them, both are integral for creating a game’s style, though neither are really analyzed in an art historical context.³ One could therefore define a game’s “materials and techniques” as the primary technology used to code the game (materials), and the resulting effects (techniques). Arsenault and Côté give the example of the 1992 game *Wolfenstein 3D*. For this game, the developers innovated the use of id Software, a technology already employed by many other developers, to “raycast,” which creates the illusion of three dimensional space out of two dimensional bitmap planes.⁴ In this case, “id Software” could be treated as a material, and “raycasting” as a technique. Again, these concepts will be more fully explored in subsequent chapters.

Creating a taxonomy for video games according to their graphic materials and technological processes could potentially be useful not only for finding new games, but to

³ Dominic Arsenault and Pierre-Marc Côté, “Reverse-Engineering Graphical Innovation: an Introduction to Graphical Regimes.” *The Italian Journal of Game Studies*, no. 2 (2013): 57–67.

⁴ *ibid.* 59.

facilitate research and discourse about different methods for game creation. As with all academic writing, having agreed-upon terms for something makes discussion and writing easier. As the example of *Wolfenstein 3D* clearly demonstrates, game developers' creativity, both in the use of technology and in artistic style, have an enormous effect on how a game looks, and how users interact with it. Identifying and crediting these designers would help art historians trace a path of game innovation, facilitating the creation of a timeline of visual and play styles. Art historians could also analyze and discuss the specific aesthetics of individual game designers, making it easier to create a language of visual styles. And yet, the Getty ULAN does not include even the most famous game designers, such as Hideo Kojima, who also writes the dialogue for his games, or even Shigeru Miyamoto, the creator of *Super Mario Bros.*, *The Legend of Zelda*, and *Donkey Kong*. Under roles, there are terms for “animators”, “graphic designers”, and most other related occupations, but “game developer” is not considered an artistic role.

Controlled Language for Video Game Creators

The lack of credit given to video game developers is a twofold problem. On the one hand, it creates a perception that video games are not produced by “artists” and are therefore not “art.” On the other hand, video games are credited to companies, which makes them seem more a commercial product than an artistic one. This perception is hardly new, and has been

used to dismiss the artistic nature of games almost since their inception,⁵ despite being an erroneous assertion which conveniently ignores the field of design.

When the Smithsonian exhibited its game collection in 2012, for example, it emulated a game called *Pitfall!*. In the wall text of this game, it is attributed to developer David Crane, but the tombstone information simply reads “1982, Activision.”⁶ In fact, none of the games in the exhibition were attributed to a single artist. This is especially frustrating given artist’s statements like this, for the game *Flower*:

the inspiration for *Flower* comes directly from designer Jenova Chen’s experience moving from his home in Shanghai, China to California... described by Chen as an interactive poem exploring the tension between urbanity and nature, the goal of the game was to allow players.... to bring nature into their home in a manner never before experienced.⁷

Despite this game clearly being the work of a singular artistic vision, if not a singular effort, the game is credited to the company which produced it. The reasons for this may be justifiable, perhaps the Smithsonian was obligated to credit the copyright holder, though for most independent games (like *Flower*) the company is owned and was founded by the primary developer.⁸ This may also be the result of an outdated way of thinking of video games. The earliest video games of the 1970s, such as *Pong*, were not considered by their creators to be artistic. Their developers were computer programmers who were testing the interactive abilities of the new technology.⁹ But the video game industry has always been incredibly fast-moving, and by the 1980s and *Pac-Man*, there were specific, purposeful, and

⁵ Jonathan Jones, “Sorry MoMA, Video Games Are Not Art.” *The Guardian*, November 20, 2012. Accessed November 3, 2019.

⁶ Chris Melissinos and Patrick O’Rourke, *The Art of Video Games: From Pac-Man to Mass Effect*. 20.

⁷ Melissinos and O’Rourke, 212.

⁸ Jenova Chen is the founder and creative director of Thatgamecompany, which also produced the award-winning game *Journey* in 2012.

⁹ Van Burnham, *Superarcade: A Visual History of the Videogame Age, 1971-1984*. 28

artistic decisions being made about a game's character design, color schema, and story narrative.¹⁰ So why, if games have been the product of artistic expression since the 1980s, are game developers not given the same creative credit as, say, the director of an animated film? In both cases, though the end product could not possibly be created by a single person, there is a recognition of the vision of a singular artist.

The failure to credit game developers is even more perplexing in library science circles, where there are repeatable fields for "added authors", making it possible to list as many creators as are known. By simply looking at the credits screen of any video game, cataloguers could find a list of the developer, animators, voice actors, music producers, and programmers whose combined efforts created the game. And yet, just like in their museum counterparts, most libraries with video game collections credit their games solely to a company and list little or no individual's names. The University of Delaware library has some of the most complete and robust video game cataloging, and includes a byline with a role for every entry. For most games, this line is the company which developed the game, such as 2019's *Monster Hunter: World*, which is by Capcom, USA, whose role is "publisher." For a few games, though, an individual is listed. For example, for 2014's *Metal Gear Solid 5* the game's developer, Hideo Kojima, is credited as "creator." This allows users to search on Kojima's name, and find any other games he has helped design, both for Konami Digital Entertainment (the publisher of the *Metal Gear Solid* series) and for his own independent company, Kojima Productions. By allowing users an additional way to search for new games, greater discoverability is possible, and by crediting the creators and designers

¹⁰ Burnham, 210.

of games, more stylistic connections can be observed and discussed. If these terms were further expanded and defined, it would be possible to not only credit the developer or “creator”, but also the animators, designers, and actors who contribute to a game’s visual style.

In their recent study, researchers at the University of Washington Hyerim Cho, Andy Donovan and Jin Ha Lee, cited a 2015 survey in which 53% of participants responded that the visual style of a game was an important factor in choosing a new game.¹¹ Having a controlled vocabulary to describe what Cho, Donovan, and Lee call a game’s “cohesive and unifying visual aesthetic”¹² would not only provide all the same discovery benefits of subject and genre terms, but would also create for video games what other artistic media have had for decades: a consistent, peer-reviewed, and codified method of discussing their visual language.

¹¹ Hyerim Cho, Andy Donovan and Jin Ha Lee, “Art is an Algorithm: A Taxonomy for Visual Game Visual Styles” from *Journal of the Association for Information Science and Technology*, 69(5). 634.

¹² *ibid.*

Chapter 2: Creating a User-Focused Taxonomy

Collecting institutions like libraries and museums have been acquiring video games for decades, but have not had a controlled vocabulary to describe their visual styles. In the past ten years, there have been numerous studies on the problem of video game visual description, and many attempts to create a new controlled language. These proposed taxonomies have varying degrees of specificity, usually determined by the presumed expertise and needs of their users. Typically, these studies are done by either library professionals or art historians, and the two generally have different aims and create taxonomies for different user groups. Studies conducted by librarians tend to have a user focus, and the goal of the taxonomies is above all to be simple and understandable to a wide range of patrons, often at the expense of accuracy and specificity. As such, the taxonomies created tend to lack the specificity which academic researchers would require. Studies conducted by art historians tend to be the opposite, with an emphasis on accuracy and comprehensiveness, but often utilizing very specific and technical jargon which may not be useful to more general library patrons. Creating a truly valuable taxonomy which is useful both for patrons in a library setting and researchers in an art historical setting will require a combination of these goals, and will necessitate both an understanding of user needs and a focus on specificity. By examining studies from multiple disciplines, we can glean the needs of a variety of users, and create language that is both accurate and specific for their myriad research needs.

This chapter will summarize four major studies and extrapolate their user's needs, as well as critically analyze their proposed taxonomies. The first study, "Full Steam Ahead" examines the user-created language of the online video game marketplace Steam. This language was created entirely for and by online computer game users, and as such uses colloquial terms which are often subjective, vague or misapplied. The second study, "Art is an Algorithm" was written by researchers at the University of Washington, who were attempting to create a taxonomy for the library's video game collection. By soliciting feedback from library science students and a student gaming club, they tailored the taxonomy to meet the specific needs of their patrons, and so lacks broad applicability. Some of these researchers also contributed to the third study, "Schema for the Seattle Interactive Media Museum," in which they collaborated with museum professionals to create an organizational schema for the museum's video game collection. Again, the product of this study was created with specific users in mind, and so only addresses a narrow field of discovery needs. The last study, "Framework for the Analysis of Visual Representation (FAVR)" was written by art historians, and is the most comprehensive. The taxonomy created in this study breaks down every aspect that creates a game's visual style in an exhaustive and often very technical way. While this study is fundamental for many of the other studies in this chapter, it was undoubtedly created for an academic, art historical user, and so lacks the broad applicability necessary in a valuable taxonomy.

User-Created Language

In a 2016 study titled “Full Steam Ahead: A Conceptual Analysis of User-Supplied Tags on Steam”, University of Washington librarians Travis Windleharth, Marc Smaltz, and Jin Ha Lee and University of Illinois librarian Jacob Jett addressed the issue of useability and video game descriptive language. In this study, they looked at the online game vendor and platform Steam, which in addition to its own genre terms, allows users to create, apply, and publish their own tags. Browsing by user-generated tags can give great insight into how people describe (and search for) games. There are literally hundreds of these tags, which are sorted by the number of times each have been applied, and include tags to describe everything from genre (i.e. “Action”, “Racing”), to difficulty (i.e. “Casual”, “Difficult”), appropriateness (i.e. “Violent”, “Mature”), and visual styles (i.e. “2D”, “Pixel Graphics”, “Colorful”). For “Full Steam Ahead,” the research team aggregated some 294 tags and attempted to categorize them. The goal was to determine which facets of game description are most important to users, and compare the most popular terms to the previously created Video Game Metadata Schema (VGMS), which will be examined later in this chapter.

By grouping these tags in a meaningful way, they can, in theory, determine which types of information are most important to users, and perhaps evaluate the useability of and add to their own taxonomy. In the end, the researchers sorted the tags into 29 categories, ranging from the most populous, “gameplay genre” (96 tags), to the least populous, “platform” (1 tag).¹³ Fourteen tags were placed in the “visual style” category: “hex grid”,

¹³ Travis Windleharth, Marc Smaltz, Jacob Jett, and Jin Ha Lee, “Full Steam Ahead: A Conceptual Analysis of User-Supplied Tags on Steam” from *Cataloging and Classification Quarterly*, July 2016. 424.

“voxel”, “cinematic”, “hand-drawn”, “gothic”, “colorful”, “retro”, “minimalist”, “cute”, “stylized”, “grid-based movement”, “dark”, “surreal”, and “pixel graphics”. This category had significant overlap with the “mood” category, with 5 of the 14 tags appearing in both.

This overlap, and indeed the nature of the tags in general, show that while user-generated tags are great for illiting feedback directly from users, they lack the consistency necessary to make browsing and discovery possible in a library setting. Most of these terms are subjective, and based on the mood of each individual player rather than an objective reality like form, colors, method of creation, or developer’s stated intent. In addition, many tags are much too general (i.e “cute”, “dark”, “colorful”), or not actually representing a visual style (i.e. “grid-based movement”, which is a mechanic, or “hand-drawn”, which is a technique used to create many different visual styles). Also, since there is no control over the language or stated definitions, there is a chance that any of these tags could be misapplied. While these tags serve many useful functions, many of which are outlined in the study, they also illustrate the need for language to be controlled, ensuring accuracy, specificity, and consistency.

Library Users

In 2018, University of Washington professor Jin Ha Lee, together with PhD candidate Hyerim Cho, and MSLIS student Andy Donovan, conducted a study to create a taxonomy for video game visual style using feedback from students. They begin their study by citing the importance of video games in today’s culture, and note that visual style is an important factor

for many video game users. And yet, there is no controlled language to describe it. One possible explanation the researchers give for this obvious omission is “the difficulty in eliciting consistent judgements about visual style, likely due to subjective interpretations of terminology and a lack of demonstrable testing for coinciding judgements.”¹⁴ In order to reach a consensus of terms and definitions, the researchers compiled a 22-person user study in which participants were asked to assign terms to various video games. The participants were able to select terms from a pre-written list, which had been compiled by the researchers previously.

The list was created by aggregating terms from blogs, game review sites, forums, and previous academic studies, including Aki Järvinen’s “Gran Stylistimo”, which will be examined more in-depth in chapter three of this study. The full process of compiling this list was summarized in the 2013 article “Pretty as a Pixel: Issues and challenges in developing a controlled vocabulary for video game visual styles.” The original taxonomy was divided into three facets:

“Visual style” might be best captured by describing the different aesthetic *facets*, or ways in which a visual look could be perceived. We decided to group our set of terms according to three facets: 1. The artistic style facet, 2. The artistic technique facet, and 3. The artistic dimension facet.¹⁵

They define the first facet as the formal analysis of a video game’s visual style, the second as the technological tools used to achieve that style, and the third as the dimensionality of the final work (i.e 2D, 3D or multiple). In order to have a complete understanding of a game’s

¹⁴ Hyerim Cho, Andy Donovan and Jin Ha Lee, “Art is an Algorithm: A Taxonomy for Visual Game Visual Styles” from *Journal of the Association for Information Science and Technology*, 69(5). 633.

¹⁵ Andy Donovan, Hyrim Cho, Chris Magnifico, and Jin Ha Lee, “Pretty as a pixel: issues and challenges in developing a controlled vocabulary for video game visual styles.” In *Proceedings of the 13th ACM/ IEEE-CS joint conference on Digital libraries*. (2013). 414.

visual style, they argue, it is necessary to discuss both the aesthetics and the techniques used to create the game, and to have vocabulary for both these facets. The result of this study was 10 artistic style terms: “abstract”, “photorealism”, “stylized”, “handicraft”, “illustrative”, “caricature”, “engraving”, “watercolor”, “minimalism”, and “silhouette”. Some of these terms, like caricature, also include sub-categories (“LEGO”, “American Style (comic book)”, “Japanese Style (comic book)”, and “superflat” in the case of caricature).

For the 2018 user-group study, this list was slightly changed. Most notably, they eliminated the techniques facet, which had included nine terms (“cel-shaded”, “cutout”, “full-motion video (FMV)”, “low-poly”, “pixel art”, “rasterized”, “ray traced”, “rotoscoped”, and “wireframe”). However, some of these terms were re-contextualized and added into the list of visual style terms. The reason for this change was an issue of useability. The researchers tested their initial taxonomy on a student group at the University of Washington called GAMER, which was made up of library science students studying video game metadata. The test resulted in “ambiguities and confusion about the terms and the structure of our taxonomy.”¹⁶ They used the feedback from this group to identify the terms which caused the most confusion. The changes resulted in a new list of 13 terms: “abstract”, “black and white”, “bright”, “caricature”, “colorful”, “dark”, “handicraft”, “LEGO”, “maplike”, “minimalism”, “pixel art”, “realism”, and “silhouette”. Again, certain categories (abstract, caricature, and realism) also included sub-categories, though caricature’s sub-categories were altered to “cel-shaded”, “comic book (anime/ manga)”, and “watercolor”. After this list was compiled, it was given to the 22 participants of the new study, who were asked to apply

¹⁶ “Art is an Algorithm” 636.

up to 5 terms from the list to screen shots from 30 different video games. The participants were a variety of ages and ethnicities, and the success of each term was measured by how consistently it was applied. For example, all 22 participants applied the term “psychedelic” (a subcategory of abstract) to the 2012 momentum/ tunnel shooter game *Dyad*, indicating it was a useful term. The degree of agreement was measured using Fliess’ Kappa measurement.

As comprehensive and fundamental as this study is, however, it has some obvious problems. First, the researchers’ decision to exclude the more technical terms based on the library science students’ suggestion precludes the possibility of a variety of users. No doubt the students’ feedback was based on their assumption that the users would be video game players, the type of patron who might be looking for video games in a library for the purpose of entertainment, who would almost certainly find many of the technical terms confusing or unnecessary. However, for a different type of user, say an animation student at a design college, having that level of specificity exist within the catalog record would facilitate the complex research they would be expected to perform. A more useful taxonomy would include both sets of terms, as the researcher’s original 2013 study did. Having different terms to describe different facets of a video game would create multiple points of access, so different types of users would still be able to find what they were looking for.

The second major issue can be seen in the researcher’s analysis of which terms were most frequently used together. One of the observable pairs was “illusionism” and “caricature,” though within the taxonomy these terms have opposite meanings. “Illusionism” is a term borrowed from Aki Järvinen, and is a subcategory of realism in which fantastical characters or environments are depicted with photorealistic lifelikeness, like 2005’s *Shadow*

of the Colossus, while caricature is “an illustrative style emphasizing or distorting distinctive features of a character or object,”¹⁷ like 2006’s *New Super Mario Bros. 2*. The reason these terms were used together so frequently, despite ostensibly being opposites, is that they are too general. Although the participants were told the definitions before the study began, out of context the term “illusionism” does not allude to realism, and a user may easily mistake it for something more abstract or illustrative.

Finally, some of the terms are proprietary, and others are not accurate. For example, “LEGO,” is not a visual style, but a proprietary brand name. Because of this, the only games for which this term could technically be accurate are official LEGO branded games. Not only does this defeat the purpose of controlled language, as this makes it impossible to find games which look *like* LEGO games but, in this specific case the term is also redundant. Most LEGO branded games have the term in the title (e.g. *LEGO Star Wars*, *LEGO Harry Potter*, etc.). In addition, the term “comic book” is parenthetically appended “anime/manga,” though the former refers specifically to the Japanese animation style, and the latter to the Japanese comic book style. Though this difference may seem subtle, it points to the general problem of sacrificing accuracy for simplicity, and that simplicity does not always equal understandability. It is important for terms to be recognizable, but they must also be accurate, specific, and applicable to games with similar visual styles across genres and production teams.

¹⁷ “Art is an Algorithm” 637.

Museum Users

The above studies were designed for a library context, and as such have certain institution-specific organizational methods. To more fully explore the issue of prioritizing useability over accuracy, it is worth briefly looking at different but related institutions: museums.

The Video Game Metadata Schema (VGMS) upon which the “Full Steam Ahead” study built was originally developed for the Seattle Interactive Media Museum (SIMM), in a joint project between library science professors Jin Ha Lee, Joseph Tennis, Rachel Ivy Clarke, GAMER staff advisor Michael Carpenter, and curators at the museum. This research noted that the primary problem with applying already-existing schemas to video games is that they do not allow for video game’s unique aspects, specifically their interactivity.¹⁸ To create categories of terms which describe these medium-specific factors, they performed extensive research into how current users interact with games in order to determine what information is most essential for them.

To do this, they collaborated with curators at SIMM to identify six major video game user groups: players, parents, collectors, academics, game developers, and librarians. Each group was represented by a “persona,” which was determined by the expertise level of each of these groups, and the motivation for each to search for and use the games in SIMM’s collection. It is important to note here that the “academic” persona was given the biographic information of an economics professor interested in teaching about microtransactions and

¹⁸ Jin Ha Lee, Joseph Tennis, Rachel Ivy Clarke, and Michael Carpenter, “Developing a Video Game Metadata Schema for the Seattle Interactive Media Museum ” from *The School of Information Studies: Faculty Scholarship. Paper 169*. 3-5.

in-game economies, and the game developer was given the motivation of “looking for ideas for new games based on themes, mood, and character of older games.”¹⁹ Since none of the personas were students at an art school or art historians, none of the personas would be conducting research on or examining in-depth the visual styles of the games, an omission which is reflected in the final schema’s lack of reference to visual style or technical creation.

Next, the researchers compiled a list of terms from various game review websites and determined for which groups each of those terms would be useful.²⁰ Then, they determined 16 factors which would be useful for multiple groups, and were therefore deemed essential for video game cataloging. These factors included “Title”, “Developer”, “Online Capabilities”, “Genre”, and “Series/Franchise”.²¹ Again, since none of the proposed user groups were considered “experts” in visual style, or were given the motivation to conduct artistic research on the games, little attention was paid to visual style.

Libraries and museums have an understandable, though limiting, focus on a general user's needs and level of expertise. This is why the studies conducted for these institutions often fail to reach the level of specificity and accuracy necessary for a rigorous academic study of a video game’s aesthetics. Studies conducted by and for art historians tend to be much more comprehensive and technical, though they lack the broad understandability of the previous examples.

¹⁹ Lee, Tennis, Clark, and Carpenter 24.

²⁰ *ibid.* 6-7.

²¹ *ibid.*, 8-9.

Academic Users

In one of the most extensive studies on the subject, art historians Dominic Arsenault, Pierre-Marc Côté, and Audrey Larochelle spent three years evaluating the language of video game's visual styles and developed an organization model they called the Framework for the Analysis of Visual Representation (FAVR). It is an extremely complex and comprehensive system, in which the authors divided the visual style of a game into four parameters which were then further subdivided into various components. The language they create within the FAVR framework combines the gameplay mechanics and interactive features of video games while identifying more specific ways to discuss the games' visual styles. Due to the nature and length of this study, it is worth examining in depth.

The primary organizational structure of FAVR is its four components: "Composition", "Ocularization", "Framing Mechanisms", and "Plane Analysis."²² Each of these sections could also be repeated depending on how many different visual sections appeared in the game. The example they give, *Super Mario Bros.* has a "Title" screen, a "Game Over" screen and the "Gameplay" screens, each of which could be fully classified individually. In more modern games, this may also include loading screens, menus, and cut scenes.

For the first parameter, "Composition," the authors looked at the composition of the screen, noting both positive and negative space. The second parameter, "Ocularization", defines visual styles based on camera movements. It differentiates screens which are meant

²² Dominic Arsenault, Pierre-Marc Côté, and Audrey Larochelle. "The Game FAVR: A Framework for the Analysis of Visual Representation in Video Games." *The Journal of the Canadian Game Studies Association* 9, no. 14 (2015): 101-102.

to depict the game world (“tangible ocularization”) from those which are not, such as menu or inventory screens (“intangible ocularization”). These components can also be subdivided again to allow for more complex camera movements, such as game-play depictions which are external from the player (e.g. cut scenes). This section includes language such as “first-person point of view”, “over the shoulder camera”, and “unmarked visual mediation”, for games which allow the user control over the point of view through smooth camera zooms.

While the first two parameters look at the entirety of any given screen, the third, “Framing Mechanisms”, exclusively describes “the player’s visual positioning regarding his access to the implied game environment.”²³ This section includes language such as “unrestrained mobility” for games in which the player controls the way in which the game is framed, “connected mobility” for games in which the framing is dependent upon a specific object (e.g. a car in a racing game), and “authoritarian mobility”, in which the framing is pre-determined by the game (e.g. the side-scrolling in many platforming games).²⁴

The final parameter, “Plane Analysis,” examines the dimensionality of video games. It first asks how many interactive planes a game has, noting that a game may have multiple background layers, creating the illusion of three dimensions, but if the player cannot move *into* this space, it is not considered an interactive plane. Based on this, FAVR divides games into categories of “Two-Dimensional” and “Three-Dimensional.” The dimensionality of a game is also dependent upon the rendering of its graphics, which the authors divide into “real-time polygons”, “pre-rendered polygons”, “raster graphics”, “vector graphics”, and “digitized images.” But the analysis goes even further than this, and also breaks down the

²³ Arsenault, 109.

²⁴ *ibid.* 110-111.

gyroscopic nature of the camera, categorizing terms “orthogonal projection”, “axonometric projection”, “oblique projection”, and “linear projection.”²⁵

The language which was codified in this study is useful in discussing the complexity of what makes up the visual nature of video games, and they include many important technical factors which were taken out of “Art is an Algorithm.” However, many of the terms used are hyper-specific, making them unhelpful or confusing for many users, with some terms replacing those in common parlance unnecessarily (e.g “pre-rendered polygons” replacing terms like “pre-rendered graphics” “cut scenes” or “pre-recorded video”). Furthermore, following this study would involve a prohibitive amount of research in order to catalog an entire collection with FAVR’s level of specificity. Although FAVR is incredibly useful for a specific level of art historical research, it does not have the broad applicability of the studies done by librarians and could therefore never become a universal standard.

Creating a truly valuable taxonomy would require the consideration of many different user groups, with many different research goals. In order to avoid being a niche and discipline-specific model which would have to be changed to fit every researcher’s unique needs, it would need to have broad appeal and be understandable to a variety of users. However, the taxonomy will also not be useful if it is not accurate or specific. The following chapter will explore the nature of accuracy and specificity within video game visual style, but will also consider the issue of usability.

²⁵ Arsenault, 114.

Chapter 3: Creating an Accurate and Specific Taxonomy

When discussing the creation of a taxonomy to describe video games' visual style, two of the most important factors must be accuracy and specificity. Without these, the controlled language cannot fulfill its purpose as a useful research and discovery tool. But, the question of "accuracy" and "specificity" can mean something different depending on the game being discussed. Any complete taxonomy of visual style provides language for the three most important factors in determining a game's visual style: influences from other media, the mood the developers wished to convey, and the technology used to create it.

Many video games were created with specific stylistic influences in mind. The most prominent influences for video games have historically been other media, such as 2D animation and illustration. For this reason, it is important to study the history and development of these other media, their distinct visual styles, and the techniques used to create them. By examining the language used to describe the styles and techniques of these media, it becomes clear that in many cases these terms could also apply to the video games which they inspired.

In addition, this chapter will interrogate the distinct visual style of realistic video games. Many modern games are created with such well-rendered graphics that they appear real, but the term "realism" is often misapplied, or so overly applied as to lack specificity. There are, in fact, many levels of realism, and video game designers often utilize realistic graphics in different ways and to create different moods or aesthetics. So while games who

borrow their visual style from other media can often borrow descriptive terms from those media, games with a realistic visual style must be differentiated from each other based on the developer's intentions. This chapter will explore different stylistic types of "realistic" games, and how the designer's intentionality affects the final visual aesthetic.

One major way in which designers use the same stylistic influences but achieve different visual aesthetics is through the innovative use of different technologies. This chapter will examine the hardware and software of video game creation, and some commonly used techniques which developers utilize to diversify their visual style. It will also show how the terms used to describe these technologies and techniques are often synonymous with the resulting visual styles.

Video Games and 2D Animation

In his book *Video Game Art*, art historian Nic Kelman examines the influences of other media on the visual style and narrative structure of modern video games. In particular, he discusses the influence of animation and illustration, especially in Japanese anime and manga. Kelman notes,

In Japanese games... we see a variety of stylistic hallmarks of manga and anime translated into

the video game format. Characters with large, rounded eyes, long legs, and spiky hair, or weapons and vehicles that appear to have been built from military blueprints are just some of the more obvious ways in which the conventions of these more traditional media have been carried over into the game format.²⁶

²⁶ Nic Kelman, *Video Game Art*, New York: Assouline Pub, 2015. 194.

Kelman further notes that in the West, game styles are heavily influenced by familiar animation, such as the colorful, rounded shapes often seen in Disney films or Marvel comic books. The relationship between video games, animation, and illustration is so pronounced that it is worth examining their direct influence on each other. Thus, many stylistic terms used for animation and illustration can also accurately describe video games.

One of the most common animation terms associated with video games is “cel-shading”, a technique originally used in two-dimensional animation in which black lines separate blocks of color. According to Kelman, game designers like those for the 2002-2013 *Sly Cooper* series used cel-shading intentionally to make their games look more like traditional animation, and thus feel more familiar to the user, but innovated the technique for use in a three-dimensional virtual environment.²⁷ Cel-shaded games are often labeled “cartoon” or “cartoony” as they are on the Steam marketplace. However, although they often take stylistic clues from cartoons, there is great visual diversity both within cartoons and in the games inspired by them.

In his 2002 article “Gran stylissimo: The audiovisual elements and styles in computer and video games,” Aki Järvinen described these games as “carictusim”²⁸ and defines the style as one which “simulates environments and characters familiar from cartoons and comics.”²⁹ He goes on to describe the style as simplified, as taking only the most characteristic elements of a familiar form, and which “simulate the world created in cartoons”, and gives the examples of 1996’s *Crash Bandicoot* and 1998’s *Legend of Zelda: Ocarina of Time*.³⁰ Again,

²⁷ Kelman. 195.

²⁸ Aki Järvinen, “Gran stylissimo: The audiovisual elements and styles in computer and video games.” In *Proceedings of Computer Games and Digital Cultures Conference*, (2002): 114.

²⁹ *ibid.* 121.

³⁰ *ibid.* 123.

this term is not specific enough, and fails to differentiate between types of cartoons. Game developers take inspiration from a wide variety of cartoons, and the visual styles are very different. The 2017 game *Cuphead*, for example, famously took inspiration from the “rubber-hose” style of animation which was popularized by cartoons like *Popeye* and *Felix the Cat* in the 1930s. By assigning this more accurate term, not only would users be able to find other games based on this specific and unique style, but researchers could more easily compare and contrast these games, investigate the designer’s individual creativity, and investigate the history and lasting legacy of this style.

With so many styles of animation, it would be impossible to create terms for all of them within the present study, but it is clear that terms like “cartoon” or “characterism” are inadequate to describe these games in any meaningful way. These terms are also problematic given that they not only refer to many styles of animation, but to static drawings as well, which also serve as a major source of inspiration for video game designers.

Video Games, Illustration, and Painting

For his book, Kelman interviewed one of the designers of 1987’s *Sid Meier’s Pirates!* about the influences of illustration in the character design of their protagonists. The developer named artist N.C. Wyeth, who illustrated Scribner’s Classics 1911 edition of *Treasure Island* “for his solid figures and palette but also (unexpectedly) for the extreme simplicity of form he employs.”³¹ Game designers also look to printing for inspiration, like the 2018 puzzle game *Apocalipsis*, which was made in the style of 15th century woodcut

³¹ Kellman, 198.

engravings by adding lines which emulate hatching, using muted sepia colors, and shortening the depth of the overall image. Similarly, the 2016 puzzle game *The Bridge* was inspired by lithographs. The hatching lines in *Apocalipsis* give it a similar look to games in the style of Tim Burton or Edward Gorey, whose aesthetics are often used for inspiration. Games like 2013's survival sim *Don't Starve* and the 2020 puzzle game *Luna: The Shadow Dust* use muted color palettes and include short, visible dark lines meant to simulate pen and ink drawings. While there is no term to describe these games, beyond "hand-drawn" or "dark," as they are labeled on Steam, they share a similar visual aesthetic which can be used to more accurately and specifically label them. Taking inspiration from the styles on which they are based, they could be called "pen and ink" games, for example.

In addition to illustration, many games also draw inspiration from paintings. In a recent video essay, game review website *Polygon* examined the influence of the Hudson River School and Luminism in the landscape and lighting design of 2018's cowboy role-playing game *Red Dead Redemption 2*.³² In particular, the essay points out how these paintings use light to create a sense of depth, and how dramatic shadows and weather are used to mirror the sublime and create an immersive experience, all of which can be seen in the landscapes of *Red Dead 2*. The term "luminist" could accurately describe the visual style of the landscapes in this game, though it may not be a term familiar to many outside the art historical field. It might also be described as simply "painterly," specifically referring to games which draw inspiration from Western oil painting.

³² "How Red Dead Redemption 2's Landscapes are Connected to 19th Century Art", Youtube video 8:25, directed by Clayton Ashley, produced by *Polygon*. December 14, 2018. <https://www.youtube.com/watch?v=A0XbWUEv0Ho>

Since the 1990s, there has been an increase in games which draw inspiration from more urban painting styles, like graffiti and street art. Järvinen classifies these games as the “fashionable side” of caricatures, and gives the examples of 1997’s rhythm game *PaRappa the Rapper* and 2000’s *Jet Set Radio*, in which the user plays as a roller skating youth, traveling around an urban environment spray painting graffiti.³³ A more recent example is 2017’s *Splatoon 2*, a third-person shooter in which the player’s objective is to coat an urban setting with brightly colored paint. Kellman also takes special notice of the influence of graffiti art in *Jet Grind Radio* (the North American title of the Japanese *Jet Set Radio*), though he sees this game more of a stylistic exception than an example of a larger genre.³⁴ Again, there is a lack of specificity in the language used to describe the visual style of these games, and this lack illuminates the need for more controlled language. Game designers take inspiration from an incredibly wide range of sources, and it would be impossible for any cataloger to recognize and properly name them all. By creating a controlled list of terms, with definitions and examples compiled by individuals with the time and expertise necessary, video game visual style could be better interpreted. This level of accuracy is necessary for all games, not just ones which take inspiration from other visual media, but specificity looks entirely different in regard to the final major design style: realism.

³³ Järvinen, 123.

³⁴ Kellman, 196.

Developer's Intentions and Video Game Realism

Any discussion of video game visual style must include the topic of “realism,” a term which generally (and often erroneously) applies to a wide swatch of games. So-called “realistic” games, although drawing inspiration from the same source, can have a wide range of visual styles, each of which should be described with greater specificity. However, differentiating between types of realism is a different process than identifying different cartoon styles. Rather than identifying one particular artist or time period, as in a description of games based on other visual media, for realism it is necessary to look at the intentionality of the realistic graphics, and analyze if, when, and how the artists choose to abandon it.

As Kellman notes, most modern sports games are intended to look as “real” as possible. Because of their illusionary aesthetics, these games are often labeled with the terms like “hyper-realistic” or “photorealistic.” Games like 2019’s *Madden NFL 20*, in which everything from the grass on the fields to the player’s movements are modeled off of real-world examples, is an example of this style. Kellman defined these games as ones in which “the artistry ... can typically be judged on how close it comes to convincing us that what we’re seeing might just be real.”³⁵ Järvinen categorizes these games as “televisualsim,” which he defines as “the pursuit of life-likeness.”³⁶ The goal of these games is to create the illusion of reality. Since these games depict real people and activities, the life-likeness creates a greater sense of immersion.

³⁵ Kellman, 290.

³⁶ Järvinen, 122.

But it is worth noting that even within these “realistic” games, there is great diversity, and for many games, the inclusion of fantastic elements makes for a more immersive experience. Järvinen has a term for these games as well; “illusionism,” which he defines as “imaginary things... represented with photo-realistic life-likeness.”³⁷ Take, for example, 2019’s *Marvel’s Spider-Man*, an action-adventure game developed by Insomniac Games in which the player navigates a realistic New York City as the titular superhero. As the superhero, the player is able to do some very unrealistic, comic-book inspired things, like leap from the top of the Empire State Building and swing on webs through Midtown. Unlike *Madden NFL 20*, this game combines elements of hyper-realism with other more, fantastic elements. The aim for this game’s visual style is therefore not necessarily to create the illusion of reality, and so the terms “hyper-realistic” or “photorealistic” may not apply.

For games like *Spider-Man*, Kellman uses the term “military or crime-action sim”, in which “game designers and artists interpret and manipulate real sources to create a ‘realistic’ experience that is still a gameplay experience.”³⁸ He includes in this category games like the *Grand Theft Auto* and *Call of Duty* series, in which players navigate urban environments, committing crimes and evading police or role-playing as a soldier in various military environments. Like with *Spider-Man*, games in the *Grand Theft Auto* series combine realistic forms with fantastic situations and physics. One of the best examples of this combination is the upcoming game *Cyberpunk 2077*, in which players role-play as a criminal mercenary in a futuristic city in which citizens have modified their bodies using technology to become

³⁷ Järvinen, 122.

³⁸ Kellman, 302.

stronger. In this game, the design of everything from the people to the setting combines very realistic forms with fantastic, speculative design to make the gameplay unique and exciting.

There are, however, some pitfalls to both Kellman's and Järvinen's terms. "Military or crime-action sim" actually describes the games' play style, rather than its visual style. While a game's genre will often be reflected in its visual style, they are not always the same thing. Take for example, 2019's *Jedi: Fallen Order*, a *Star Wars* game in which players role-play as a Jedi navigating alien planets. Although just about everything in this game is fantastic, from the settings to the plot, the proportions and movements of the human protagonist are realistic. In fact, the movements were created by an actor in a motion-capture suit.³⁹ And yet, *Jedi* could only be defined as "military or crime action" by the very thinnest interpretation, in that any game with combat must necessarily have some kind of crime or military action. And while Järvinen's term "illusionism" is technically accurate, it is also very vague. Out of context, a user may not even understand what aspect of the game this term is describing. The terms used to describe visual style need to be both accurate and specific, especially when dealing with a very broad category of games like "realism."

Both terms also fail to distinguish a third type of "realism," which was popularized in 2012 with the narrative game *Dear Esther*. In this game, the player's only objective is to explore a deserted island town and find fragments of a letter that an anonymous narrator has written to his deceased wife. The game's spiritual successor, 2015's *Everybody's Gone to the Rapture* has a similar mechanic, whereby the player's only object is to explore a village in the English countryside that was suddenly abandoned, and discover what happened to all the

³⁹ Matt Cabral, "Inside the Cinematic Storytelling and Thoughtful Combat of *Star Wars Jedi: Fallen Order*," *Star Wars* (blog), November 15, 2019, <https://www.starwars.com/news/inside-star-wars-jedi-fallen-order-interview>)

people. Both of these games feature photo-realistic settings which are based on real places, yet they also feature subtle fantastic elements. In *Everybody's Gone to the Rapture*, the player follows a glowing, golden thread, which hangs in the air and guides the player through the game. In another of these games, 2017's *What Remains of Edith Finch*, the user plays as Edith, the last surviving member of her family. As Edith, the player moves through a photo-realistic family home, and whenever they touch an object associated with a memory, they are transported back in time to a dream-like remembering of that moment. Unlike *Jedi* or *Cyberpunk*, the fantastic elements of these games are not meant to evoke a speculative world, but to add a haunting, otherworldly element to this one. Both genres combine realistic and fantastic elements, but result in wildly different visual styles.

To differentiate between different types of realism, the language and definitions used should include both the general style and the intentionality of the design. In this way, the terms will be neither too broad nor too specific. For example, whereas “photorealistic” games are designed with the intention of creating the illusion of reality, “imagined realism” games are designed with the intention of creating a grounded, yet speculative world. Furthermore, “pseudo-realistic” games are designed to create a familiar world but with added, ethereal elements to create an atmospheric aesthetic. In addition to being more accurate and specific, using terms which include the intentionality of the game's design would allow them to be described in ways more akin to other visual media such as drawing and painting, as well as draw more attention to the creators and their artistic choices. While the intentionality and aesthetic choices behind realistic games are what specify what type of realism is created,

another important factor in differentiating between these games' visual style is the different ways in which they use technology.

The Technology of Video Games

Two games mentioned above, *Jedi: Fallen Order* and *Cyberpunk 2077* are similar in their visual style not only because they are both imagined realism games, but because they both featured motion-capture technology, creating hyper-realistic faces and movement for some of the principal characters. Motion capture was also used for Hideo Kojima's *Death Stranding*, a 2019 open-world survival and exploration game. Despite these games being in three different gameplay genres, they all have a similar visual style because their developers had similar aesthetic goals in mind *and* they were created using some of the same technologies. Although the Getty Institute's Art and Architecture Thesaurus (AAT) largely omits the materials and techniques used for video game creation, it is clear that they play an important role in a game's ultimate look and feel. Because of this, any discussion of a game's visual style must include at least a mention of its hardware and software.

The materials and techniques of video games can, for the most part, be broken down into two categories: the graphics method (hardware) and the graphics engine (software). Many games utilize a third category of technologies in conjunction with the first two to diversify the look of the game, like the addition of motion capture in the above examples. All three of these categories will be explored more in-depth, but the broadest taxonomies for

video game graphics must first include the hardware graphics method, of which there are only a few used with any regularity.

The earliest method, popular from the 1960s through the 1980s, was the use of vector graphics. These graphics were often created for cathode ray tube (CRT) screens, most commonly found in older televisions, computers, and arcade machines. CRT devices utilize an electron gun, which fires a narrow beam of electrons towards the screen through a glass funnel. En route, the electrons are deflected, so that when they hit the screen, they fluoresce either red, blue, or green. Vector graphics “are made up of points and straight line segments, which are stored as coordinates in a set of display commands.”⁴⁰

Raster graphics replaced vector graphics as the most popular method of game creation in the 1980s and ‘90s, and remain popular among small, independent games today. Raster graphics are created in a similar way to television, with scan lines passing back and forth across the screen, generating 30 images a second, and their compatibility with television contributed to their popularity in early console games.⁴¹ Raster graphics are sometimes called “bitmap” graphics, because they are created using pixels arranged in grids. The pixels allow for greater color gradience, resulting in sharper, and more detailed graphics.

The above examples were all produced primarily for arcade machines, computers, or consoles, all of which utilize CRT screens. For handheld devices, such as the Game Boy, which have liquid crystal display (LCD) screens, different graphic techniques are used. LCD screens render graphics by polarizing light, which is then beamed through the crystals in the

⁴⁰ Mark P. Wolf, “Imaging Technologies” from *The Video Game Explosion: A History from Pong to Playstation and Beyond* ed. Mark P. Wolf (2008). 9.

⁴¹ *ibid.*

screen, creating a light square, or de-polarizing the light, creating a dark square.⁴² The result was a boxy (or “pixelated”), two-tone display, like that of 1989’s *Super Mario Land*. Color LCD screens were introduced in the 1990s, and many modern hand-held gaming devices still use them, including the 2018 Nintendo Switch.

Due to the two-tone display, early LCD games are sometimes erroneously labeled “black and white”, though this term is not wholly accurate, and should perhaps be classified as “two-tone LCD.” Like the conflation of gameplay style and visual style, the conflation of visual style and materials and techniques ultimately obscures both. Instead, if a game’s gameplay mechanics, visual style, and materials and techniques were all treated as different things which combine to make up the game’s look, catalogers and users would be able to differentiate between a game that is “black and white” due to technological limitations, and a game that was purposefully rendered in black and white for stylistic purposes, like 2017’s *Armed With Wings: Rearmed*.

Although the hardware used to create the game plays an important role, it relies heavily on the software used to run it. Arcade and early console games relied exclusively on its hardware to make it run, and as such was very limited in what it could accomplish. Game styles and mechanics were bound by what could be hard-coded into them. Beginning in the mid-1990s, however, developers began to run their computer code through a game engine, which then rendered the graphics and applied the collision and physics models.⁴³ The game’s engine is, in many ways, the most important piece of software, and plays a major role in creating the visual style. Modern game engines allow designers to use a vast array of

⁴² Wolf, 10.

⁴³ Jason Gregory, *Game Engine Architecture*, 3rd ed. (Boca Raton, FL: CRC Press, Taylor & Francis Group (2019).

graphics techniques, including 3D modeling, wireframing, and digital sculpting. The computing power of the engine determines how many polygons can be rendered at one time, which affects how clear the image is and how many elements can be animated within a single frame. In addition, the sophistication of the collision and physics engine is what determines how accurate both these things are within a virtual environment. A game with a relatively weak engine, may, for example, allow players to walk through or get stuck inside solid objects or get hung up on objects which should be passable. A more sophisticated collision and physics engine will also allow for more robust particle effects, which create, among other things, more realistic-looking weather.

Game engines are often developed for a single game, and can be created in-house by the game's production team, or they can be created by a third party. In either case, the engine can then be licensed for modification and used in other games. For example, in 2013 the Guerilla Game Company created an engine called Decima for their open-world adventure game *Horizon Zero Dawn*, and later licensed the engine to Kojima Productions for *Death Stranding*. Although the two games look somewhat different because they were designed by two different companies, the fact that they use the same game engine gives them similar particle effects. The Decima engine was also created with artificially intelligent lighting, which automatically adjusts depending on the lighting source.⁴⁴

Massive, expensive game engines like Decima are not the only ones on the market, however. In recent years, many small, independent and open-source game engines like Bitsy have been created and freely shared on the internet. Bisty is a relatively simplistic engine and

⁴⁴ Jasmine Henry, "Death Stranding Uses Horizon: Zero Dawn Graphics Engine," Game Rant (blog), December 4, 2016, <https://gamerant.com/death-stranding-decima-engine/>

can only be used to create small games with text and raster graphics. Engines like Bisty and the similar Game Maker are important precisely because of their simplicity, which allows traditionally under-represented people to make and distribute games regardless of their experience level, creating an entirely new genre of micro, self-published, and often radical games.⁴⁵

In addition to hardware and software, game developers often employ a variety of techniques to make certain aspects of the game look different. For example, full-motion video (FMV) games, which were popular in the 1980s and 1990s, often used raster graphics for the majority of the playable content, but also inserted pre-recorded video which was stored on a laserdisc or CD-ROM. The FMV would appear on the screen after the completion of certain tasks, similar to modern cut scenes. The scenes would often be short videos with a live-action cast, as in 1993's *The 7th Guest*, or 1997's *Zork: Return to Zork*. In modern cut-scenes, certain specific scenes are often rendered in a completely different way to the rest of the game, giving them a different look.

If the “materials and techniques” section of a video game schema were repeatable, games like *Death Stranding* could list “polygon modeling”, the technique used to create the 3D images, “Decima”, the engine used to render the physics, and “motion-capture”, a technique used to render some of the movements. Elsewhere in the schema, the game’s visual style could be recorded as “imagined realism,” and the gameplay mechanics could be recorded still elsewhere. Assigning all these terms to one game would create many points of

⁴⁵ Anna Anthropy, *Rise of the Videogame Zinesters: How Freaks, Normals, Amateurs, Artists, Dreamers, Dropouts, Queers, Housewives, and People like You Are Taking Back an Art Form*. New York: Seven Stories Press, (2012).

access, allowing users to find new games based on any aspect of the previous game they enjoyed.

Any controlled language must be accurate and specific in order to be useful for either catalogers or users, but accuracy and specificity can mean different things depending upon the media being described. Video games' visual styles are made up of stylistic influences, specific design intentionality, and the hardware and software used to render the game. In order for a taxonomy of video games' visual style to be specific and accurate, it must address all of these things in some way.

Conclusion

Controlled language plays a critically important role in how information objects like books, films, and journals are organized within collecting institutions. This language also informs the ways in which we search for, discover, research and discuss these works, and in many ways give them and their creators legitimacy within academic discourse. It is vital that a set of taxonomies be created to describe the many unique aspects of video games, not only so that more institutions can collect games, but also so that more comprehensive research can be done on their natures and styles. Although there are a few terms approved by the Library of Congress and the Getty Research Institute which can be used to describe video games in certain contexts, they are nowhere near comprehensive enough to allow researchers to discuss and study video games in depth. In addition, these institutions have failed to properly credit video game designers, creating the perception within the art historical world that these people are not artists, despite the immeasurable cultural impact their work has had.

The studies currently being done by both library professionals and art historians to develop new taxonomies are invaluable, and provide essential knowledge and advice for this research. Library professionals at the University of Washington have created user-centered taxonomies which simplify key concepts and make games simpler to organize and discover. But, there are many instances in which the terms have been so simplified that they become redundant, subjective, and incorrect. Conversely, art historians have conducted intense, comprehensive studies of video game's visual styles, and have created a complex system to describe every aspect of a game's aesthetics, from its graphical rendering to its camera

movements. But, to classify more than a handful of games using this level of specificity would be prohibitively time consuming, and much of the information collected would be superfluous to many users. The most important lessons these studies can teach are the fundamental necessities of any valuable taxonomy: usefulness, accuracy, and specificity, and most importantly, that sacrificing one for the others ultimately diminishes the whole.

In order for a taxonomy of video game visual style to be comprehensive, accurate, and specific, it must describe all of their component parts, including stylistic influences, developer's intentions, and the materials and techniques used to create the game. Through an examination of the language used to describe certain styles and techniques used in 2D animation and illustration, it becomes clear that many video games can and should be described using the same language. In doing so, not only would catalogers have more descriptive terms at their disposal, but video games could be placed within a greater art historical context, and their visual styles compared and contrasted with other media.

Another important consideration in this regard is the developer's intended aesthetic. While this is important in games of all styles, it is most apparent for realistic games. Instead of labeling these games with the catch-all term "realistic", a careful examination of when and why developers choose to use (or abandon) realism will provide a much more accurate representation of a game's aesthetic. This will also have the added benefit of treating game developers as artists, who make intentional design decisions.

The final consideration in creating a comprehensive taxonomy is the technology used to create video games. The types of hardware and software, in addition to the various techniques and programs used to create games have a vital impact on how games ultimately

look. By organizing and defining these graphical styles and techniques, art historians will be able to more accurately and comprehensively trace the development and evolution of video game visual style, and researchers and patrons will be able to compare and contrast games which use similar graphics, game engines, and techniques, but in vastly different ways.

The appendices following this study provide a sampling of terms, some collected from a variety of sources discussed in this thesis, and others created by the author. In the future, this study may be expanded upon to include many more unique aspects of video games, from gameplay mechanics to sound engineering, in the hopes that one day art historians may discuss video games with the criticalness and complexity they deserve.

Appendix 1

Term	Area of Description	Description	Examples
Anvil	Material	A proprietary game engine developed by Ubisoft Montreal.	<i>Assassin's Creed: Odyssey</i> (2018) <i>Assassin's Creed III</i> (2012)
Bitsy	Material	An open-source game editor used for creating small raster graphic and text narrative games.	<i>The World Had Been Sad Since Tuesday</i> (2019)
Camera Mapping	Technique	A technique used to transform a 2-dimensional image into a "2.5-dimensional" space by altering the image properties and making it translucent and mapping the different areas of dimensionality (i.e. foreground, horizon, etc.). A virtual camera then shines a virtual light through the image, and the resulting "projection" creates the illusions of 3 dimensions in a 2-dimensional image. Most commonly used in concept art, or for map or inventory screens.	<i>Assassin's Creed: Odyssey</i> (2018) (map screen)
Cel-Shading	Technique	A technique by which blocks of color are separated by solid black lines.	<i>Sly Cooper</i> series (2002-2013)
Color Liquid Color Display (LCD)	Material	A full-color screen used in many modern hand-held video game devices which use light beamed through crystals.	<i>Pokemon Ruby and Sapphire</i> (2002)
Creation Engine	Material	A proprietary game engine developed by Bethesda Game Studios.	<i>Fallout 76</i> (2018) <i>The Elder Scrolls V: Skyrim</i> (2011)
CryEngine	Material	A proprietary game engine developed by Crytech.	<i>Everybody's Gone to the Rapture</i> (2015)

			<i>Monster Hunter: Online</i> (2013)
Decima	Material	A proprietary game engine released in 2017 capable of producing artificially intelligent lighting and physics.	<i>Death Stranding</i> (2019) <i>Horizon Zero Dawn</i> (2018)
Full-Motion Video (FMV)	Technique	A technique popular in the 1980s and 1990s, in which pre-recorded video scenes stored on a laserdisc or CD-ROM was interspersed within the game.	<i>Zork: Return to Zork</i> (1997) <i>The 7th Guest</i> (1993)
idTech	Material	A proprietary game engine developed by idTech.	<i>Doom series</i> (1993-2020) <i>Wolfenstein series</i> (1992-2017)
Motion-Capture	Technique	A process by which an actor's movements are recorded and then rendered into computer graphics. Used to create more true-to-life facial features, movements, action, and/ or physics.	<i>Cyberpunk: 2077</i> (anticipated 2020) <i>Star Wars: Jedi Fallen Order</i> (2019)
Ray-Tracing	Technique	A technique used to create dynamic lighting. It simulates the way rays of light move, bounce off of objects, and dissipate, so shadows and reflections move realistically with the lit object.	<i>Control</i> (2019)
Raster graphics	Material	Graphics created using pixels arranged into 2-dimensional grids. Most commonly seen in arcade and console games from their invention in 1985 to the development of game engines in the mid-1990s.	<i>Star Fox</i> (1993) <i>Tempest</i> (1987)
Stop-Motion	Technique	An animation technique in which objects are photographed after small, incremental movements, and the series of photographs are then played in a sequence. Most commonly seen in "arts and crafts" games in which the objects appear to be made of paper, clay, or other crafting materials.	<i>Knights and Bikes</i> (2019) <i>Tearaway Unfolded</i> (2015)

Twine	Material	An open-source game engine released in 2009 for creating text-based narrative games in web pages.	<i>Please Answer Carefully</i> (2019) <i>You Are Jeff Bezos</i> (2018) <i>Queers in Love at the End of the World</i> (2013)
Two-Tone Liquid Color Display (LCD)	Material	A monochrome screen used in many early hand-held video game devices which use light polarized beamed through crystals.	<i>Super Mario Land</i> (1989)
Vector Graphics	Material	Graphics created using electron beams, creating millions of tiny lines and curves. Most commonly seen in arcade games from the 1960s-1980s.	<i>Asteroids</i> (1979) <i>Lunar Lander</i> (1979)
Voxel Graphics	Material	Graphics which utilize 3-dimensional "pixel" cubes. Similar to "bitmapped" raster graphics, but 3-dimensional.	<i>Cubeworld</i> (2019) <i>Stardew Valley</i> (2016)
Wireframe Graphics	Material	3-Dimensional graphics created by connecting hundreds of points together with a virtual wire mesh, allowing each point to be animated separately. Colors and textures are then added to the mesh.	<i>Wolfenstein II: The New Colossus</i> (2017)

Appendix 2

Term	Area of Description	Definition	Examples
American-style Cartoon	Style	Cartoons characterized by their bright, saturated colors and simplified, rounded forms.	<i>LEGO</i> series (2001-2020) <i>Spyro the Dragon</i> series (1998-2016) <i>Crash Bandicoot</i> series (1996-2019)
Anime	Style	In the style of Japanese animation. Usually characterized by exaggerated forms (i.e large eyes, long legs, etc.).	<i>Final Fantasy</i> series (1987-2019) <i>Nier: Automata</i> (2017)
Engraving	Style	Styled after intaglio prints or woodcuts. This style "tends to have shallow depth of field and bold, hewn outlines"- Andy Donovan, Hyrim Cho, Chris Magnifico, and Jin Ha Lee, "Pretty as a pixel"	<i>Apocolypsis</i> (2018) <i>Incredipede</i> (2012)
Geometric	Style	Games in which every element is represented in simple, geometric forms.	<i>Yankai's Triangle</i> (2016) <i>Tetris</i> (1984)
Imagined Realism	Style	Games with mostly realistic forms, lighting, and physics, but with added fantastic elements. These elements are often seen in non-playable characters and/or environments and are intended to evoke a fantastic world which could almost be real, such as a speculative future reality, or a plausible alien world.	<i>Cyberpunk 2077</i> (anticipated 2020) <i>Star Wars: Jedi Fallen Order</i> (2019) <i>Detroit: Become Human</i> (2018)
Ink and Wash	Style	Games created using watercolor paint or ink wash. Color blocks are bound by obvious, sometimes thick black lines.	<i>Candle</i> (2016) <i>Ōkami</i> (2006)
Monochrome	Style	Games which utilize only one color due to stylistic choice, not technological limitations.	<i>Armed With Wings: Rearmed</i> (2017) <i>Suits: A Business RPG</i> (2016)

Neon	Style	Games which utilize neon colors and abstract forms, often in conjunction with electronic dance music. Typically rhythm and/or puzzle games.	<i>Lovers in a Dangerous Spacetime</i> (2016) <i>Fantasia: Music Evolved</i> (2014) <i>Flywrench</i> (2015)
Paper Cut-Out	Style	Games featuring 2-dimensional protagonists in a 3-dimensional world, giving the protagonists the look of paper, or stickers which are floating on top of their backgrounds.	<i>Paper Mario</i> (2000) <i>PaRappa the Rapper</i> (1996)
Pen Drawing	Style	This style looks hand-drawn, with obvious "pen" lines and muted or unsaturated colors. Often, these games are dark, creepy, and spooky, but also whimsical and cartoonish, in the style of artists Tim Burton or Edward Gorey.	<i>Luna: The Shadow Dust</i> (2020) <i>Don't Starve series</i> (2013-2014) <i>The Yawg</i> (2013)
Photorealistic	Style	Games in which every aspect (form, setting, physics, ability, etc.) are true-to-life. Games created with the intention of creating the illusion of reality. Typically they are sports games, which feature the licensed images of real people and teams.	<i>Madden NFL series</i> (1988-2019) <i>FIFA World Cup series</i> (1986-2016)
Pixel Revival	Style	Games with pixelated graphics that were created intentionally and using modern materials and techniques to evoke the visual style of older raster graphic games.	<i>Cyleste</i> (2018) <i>The Deer God</i> (2015)
Pixelated	Style	Games created using raster graphics which give it a boxy look.	<i>Super Mario Bros.</i> (1985)
Pseudo-Realistic	Style	Games with realistic forms and physics, but added, fantastic elements. Unlike imagined reality games, these added elements are often subtle, and intended to add a haunting, otherworldly affect to the game. Usually seen in walking simulators with minimal game mechanics.	<i>Everybody's Gone to the Rapture</i> (2016) <i>Gone Home</i> (2016) <i>The Vanishing of Ethan Carter</i> (2014) <i>Dear Esther</i> (2012)

Rounded Cartoons	Style	Similar to American-style cartoons, these games have saturated colors and simplified forms, but tend to be even more soft and rounded. Usually seen in games with simplified exploration or crafting mechanics, and a relaxing mood, often described as "cute" or "peaceful".	<i>Animal Crossing: New Horizons</i> (2020) <i>A Short Hike</i> (2019)
Rubber Hose Revival	Style	Games meant to invoke the rubber hose style of animation, popularized by American cartoons in the 1930s.	<i>Bendy and the Ink Machine</i> series (2017-2018) <i>Cuphead</i> (2017)
Simplified Rag Doll	Style	This style is characterized by its simplified forms and color palettes. It is most often seen in physics-based games, where humanoid figures flail around with "rag doll" movements.	<i>Gang Beasts</i> (2017) <i>Human: Fall Flat</i> (2016)
Text	Style	Games which are entirely composed of text, in which the player navigates by answering prompts.	<i>You Are Jeff Bezos</i> (2018) <i>Choice of the Deathless</i> (2013)
Watercolor	Style	A style which is based on Western watercolor painting. Unlike ink and wash style, this style does not have black outlines, allowing the colors to flow and mix with a fluid-like quality.	<i>Gris</i> (2018) <i>Beyond Eyes</i> (2015)
Wild Style	Style	Games whose aesthetic is reminiscent of the wild style graffiti artists of the 1980s and '90s. This aesthetic is achieved through the use of bold colors, an urban setting, and often through the use of hip-hop music. Unlike graffiti influenced games, wild style games include human protagonists and a realistic environment, though often in a cartoon format.	<i>Tony Hawk Pro Skater 5</i> (2015) <i>Sunset Overdrive</i> (2014) <i>Jet Set Radio</i> (2000)

Bibliography

- Anthropy, Anna. *Rise of the Videogame Zinesters: How Freaks, Normals, Amateurs, Artists, Dreamers, Dropouts, Queers, Housewives, and People like You Are Taking Back an Art Form*. New York: Seven Stories Press, 2012.
- Antonelli, Paola. "Video Games: 14 in the Collection, For Starters." *Inside/ Out* (blog). MoMA, November 29, 2012. Accessed November 3, 2019.
https://www.moma.org/explore/inside_out/2012/11/29/video-games-14-in-the-collection-for-starters/.
- Arsenault, Dominic, and Pierre-Marc Côté. "Reverse-Engineering Graphical Innovation: an Introduction to Graphical Regimes." *The Italian Journal of Game Studies*, no. 2 (2013): 57–67.
<https://www.gamejournal.it/reverse-engineering-graphical-innovation-an-introduction-to-graphical-regimes/>.
- Arsenault, Dominic, Pierre-Marc Côté , and Audrey Larochelle. "The Game FAVR: A Framework for the Analysis of Visual Representation in Video Games." *The Journal of the Canadian Game Studies Association* 9, no. 14 (2015): 88-123.
<http://journals.sfu.ca/loading/index.php/loading/article/view/155>.
- Burnham, Van. *Supercade: a Visual History of the Videogame Age 1971-1984*. Cambridge, MA: MIT Press, 2003.
- Cabral, Matt. "Inside the Cinematic Storytelling and Thoughtful Combat of *Star Wars Jedi: Fallen Order*," *Star Wars* (blog), November 15, 2019.
<https://www.starwars.com/news/inside-star-wars-jedi-fallen-order-interview>

- Cho, Hyerim, Andy Donovan, and Jin Ha Lee. “Art in an Algorithm: A Taxonomy for Describing Video Game Visual Styles.” *Journal of the Association for Information Science and Technology* 69, no. 5 (August 2018): 633–46.
<https://doi.org/10.1002/asi.23988>.
- Crawford, Chris. *The Art of Computer Game Design*. Berkeley, Calif.: Osborne/McGraw-Hill, 1984.
- Donovan, Andy, Hyrim Cho, Chris Magnifico, and Jin Ha Lee. “Pretty as a pixel: issues and challenges in developing a controlled vocabulary for video game visual styles.” *Proceedings of the 13th ACM/ IEEE-CS joint conference on Digital libraries*, (2013): 413-414.
- Gregory, Jason. *Game Engine Architecture*. 3rd ed. Boca Raton, FL: CRC Press, Taylor & Francis Group, 2019.
- Henry, Jasmine. “Death Stranding Uses Horizon: Zero Dawn Graphics Engine.” Game Rant (blog), December 4, 2016. <https://gamerant.com/death-stranding-decima-engine/>
- “How Red Dead Redemption 2’s Landscapes are Connected to 19th Century Art”, Youtube video 8:25, directed by Clayton Ashley, produced by *Polygon*. December 14, 2018.
<https://www.youtube.com/watch?v=A0XbWUEv0Ho>
- Järvinen, Aki. “Gran stylissimo: The audiovisual elements and styles in computer and video games.” *Proceedings of Computer Games and Digital Cultures Conference*, (2002): 113-128.
- Jones, Jonathan. “Sorry MoMA, Video Games Are Not Art.” *The Guardian*, November 20,

2012. Accessed November 3, 2019.

<https://www.theguardian.com/artanddesign/jonathanjonesblog/2012/nov/30/moma-video-games-art>.

Kelman, Nic. *Video game art*. New York: Assouline Pub, 2015

Melissinos, Chris, and Patrick ORourke. *The Art of Video Games: from Pac-Man to Mass Effect*. New York: Welcome Books, 2013.

Windleharth, Travis, Jacob Jett, Marc Schmalz & Jin Ha Lee. "Full Steam Ahead: A Conceptual Analysis of User-Supplied Tags on Steam," *Cataloging & Classification Quarterly*, 54 no. 7 (2016): 418-441. <https://doi.org/10.1080/01639374.2016.1190951>

Wolf, Mark J. P. *The Video Game Explosion: a History from Pong to Playstation and Beyond*. Westport, Conn: Greenwood Press, 2008.