5 Media and modalities – Computer games

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Computers are the default mode of creating and accessing all kinds of commercial media products today. Computer-assisted design and video-editing programs, digital distribution platforms for film, books and games, and news media are all thoroughly digital. This is because semiotic meaning can be easily broken down into digital bits, as a series of differences in electrical voltage or current pulse represented by 1s and 0s. Meaning is stored in the brain in a similar format, as neurons firing or not firing, processed at breakneck speed.

Intermedial scholars study how meaning travels from person to person, from one brain to another, as humans create signs using different basic media types such as bodies, text, images or computer code. With the help of the microprocessor of a computer these are transformed into other basic media types, such as moving images, text and sound effects that we can interact with more easily via our senses. We access a lot of different qualified media through computers today. Video games are simply the medium of entertainment most associated with the microprocessor.

This chapter discusses video games, also known as computer or digital games, as a distinct form of meaning-making (Egenfeldt-Nielsen et al. 2013). The primary focus of the chapter is the single-player game, but we will touch upon multiplayer games as well. For the purposes of this chapter, we treat video games as a qualified media type, defined in its prototypical format as a piece of entertainment software that is run on specific hardware, operated by user(s) via a technological interface, who exercise agency in a digitally realized virtual environment created by game designer(s) to influence the internal state of that environment in order to derive enjoyment from their actions at little to no risk to themselves. Because of their extreme diversity in form and content, as well as the ease with which they combine with and transform other media types, some scholars consider video games as a set of different media types (see Ruggill and McAllister (2011) and Jørgensen (2020)). There is merit in this approach, since computer games are multimodal integrations that include elements of other media to create memorable experiences. Indeed, our definition is primarily meant to separate computer games from board games (which are designed to be physically manipulated, played on a tabletop in the primary world of our experience, rather than a virtual world), role-playing games (a

collaborative storytelling format, often with elaborate rule systems and elements of randomness, whose virtual worlds are not required to be physically or digitally realized at all) and gambling (games of chance played for the express purpose of gaining extrinsic monetary rewards). Computers, being promiscuous mediators of other media, can obviously implement analogue games, hybridize with them (Booth 2016) and serve as useful accessories and companions to tabletop play, but in these cases the role of the digital device is auxiliary, or at a degree removed from the originally designed experience.

With these caveats in place, we can now begin exploring digital games as a medium with complex capacities for engaging its users and enriching their lives with fun, challenges, success, narratives and even real-life knowledge. We explore the production process of games, accounting for how other media leave their mark on the creation of new games, followed by a survey of the basic media types and their role in generating meaning in games. The qualifying aspects of computer games shed light on how different service models, development stages, player modes and platforms affect their form and reception. The chapter then closes with how the four media modalities can be apprehended in video games, and what each contributes to the joys of gaming.

Video games harness the participatory and procedural capabilities of computing to make the player experience places, processes and emotional transformation (Murray 2017, pp. 68–170). Unlike other media, games can both represent and simulate (see Juul (2005, pp. 170–7) and Karhulahti (2015)). Representations of the material objects of thought, like a particular artwork, such as a sculpture, novel or film, exist as one, shared thing, with a form and content that will be the same for everyone even if we experience them differently. Simulations, however, are variable and dynamic entities that showcase how a system works. They are models that give players agency to create meaningful changes to their story-worlds, functioning as systems of storytelling that are capable of simulating processes with different outcomes each time they are played (Koenitz et al. 2020). A game that simulates how a virus spreads (as in the game *Plague, Inc.* 2012) has built-in principles that can be brought to life by you, the player, and the artwork will change according to your input. Similarly, in games that have stories, the story might change considerably based on the choices you make (Ryan 2001, pp. 242–70). Therefore, you can have a radically different mental representation of the game's simulated world than that of other players.

Typically, games have represented play areas that circumscribe the domain in which the player can take action and to which a game's rules apply. A simple tile-matching game, like *Bejeweled* (2001), 'fits' on a single, discrete screen displaying an abstract plane of jewels and everything else the player needs to know or can act upon. Meanwhile, other games create a sense of 'worldness' (Klastrup 2009), in other words, spatially organized constructs that adhere to some governing logic that makes the space intelligible, discoverable and navigable. *Grand Theft Auto V* (2015), for example, is set in the fictional American state of San Andreas, representing a geography and a built environment that is similar to California.

Because games are a qualified media type that is capable of both the representation and simulation of other media, they have the potential to tell stories, but not all games do (Thabet 2014). *Bejeweled* (2001) doesn't tell a story, as you only have to switch the position of adjacent jewels to play. On the other hand, *Grand Theft Auto V* (2015) has complex narratives that are told and played from multiple viewpoints. The early history of video game scholarship debated the role of narrative in making sense of games, and while games are unique among media in their need for the player's interaction every step of the way, players also re-enact stories via their in-game performance (see Frasca (2013) and Holmes (2013)). As computer games are simulations, we treat them differently from the way we engage with other kinds of media products. All media products have to be manipulated in the material and sensorial modality. A novel needs to be read and a film must be watched to engage with their respective storyworlds. In computer games, the player's agency changes how the semiotically encoded storyworld unfolds, and players can influence the rules of the storyworld as well.

When we talk about 'a game' and its properties, we may be meaning any one of three interrelated aspects of games: the game as a rule-based design (a system), the actual behaviour of the game system when it is being operated (a process), or the experience of playing a session of a particular game (a product) (Koenitz 2010). The system describes what is possible within the simulated world of the game, the process actuates a subset of these possibilities which may interact with one another, and the final product is the mental construct of lived experience unique to the individuals participating in the process. This tripartite model has also been called the Mechanics–Dynamics–Aesthetics (Hunicke et al. 2004), or the Design–Dynamics–Experience model (Walk et al. 2017). To illustrate with a quick example, making this distinction can be useful when talking about LGBT+ issues in a life simulator, such as *The Sims* (2000). Although gay marriage was not implemented within the game system of the original Maxis title (2000), the actual Sims characters are functionally bisexual when the game runs (they can woo and romance both male and female Sims), and indeed some players chose to enact same-sex relationships in their own households even in the original game, producing an LGBT+ experience inside *The Sims* that was programmed into later instalments.

The notion of mechanics is central to understanding games as systems influenced by player action. Mechanics are designed by game developers to translate the players' intended actions into consequences that change the state of the game world. Thus, mechanics are actual, effective procedures put in place to generate played meaning. In a computer role-playing game, for example, the clothes the characters wear might be purely cosmetic (i.e. it might not help or hinder the player from achieving any goals), but in other cases they might give them new abilities. Note that even though cosmetic outfits do not create any gameplay advantages on the level of mechanics, they might influence the players' experience deeply.

Within game studies, useful introductions to game interpretation already exist, covering widely different aspects of the gaming experience (Jones (2008), Egenfeldt-Nielsen et al. (2013) and Upton (2015)). Game analysis covers the aesthetics of visuals, music, sound and haptics as well as user interface design,

the mechanics of gameplay and the narrative details of interactive storytelling. The main insight provided by intermediality theory is that acts of communication can use several different modalities and media to convey a message or tell a story. This insight can be applied to any medium, including video games.

Video games offer players the pleasures of toying with all other technical, basic and qualified media types within the confines of their virtual realms. We might perceive them as ‘immaterial’ because most games simulate the material modality of our primary world to make believable facsimiles. For example, when you play the historical action-adventure game *Assassin’s Creed: Odyssey* (2018), you experience the simulated world of Ancient Greece and the historical event of the Peloponnesian wars. You have paid for the software online, downloaded it via the digital distribution platform Steam and run it on your PC, but the digital artefact, the game, is influenced by artistic and scientific writings on Greece. Maps, architectural models and other media products all contribute to the experience. In the game, your character, Alexios or Cassandra, gets access to an immersive collage of other media types that are woven together to create a sense of worldness. They can attend theatrical performances, see and climb a model of the Acropolis where the Parthenon is, wear period-accurate armour and listen to sea shanties performed in Ancient Greek. Over the course of the game, you meet representations of historical figures such as the philosopher Socrates (ca. 470–399 BCE), the general Cleon (d. 422 BCE) or the writer and historian Herodotus (ca. 484–ca. 425 BCE), fight simulated naval battles and travel to every major island of the Greek archipelago in order to experience a story designed to bring the ancient world to life. Thus, even a mostly ‘immaterial’ medium, a digital game, is thoroughly affected by a wealth of other media that bring a piece of Ancient Greece to the contemporary world.

The technical medium of display

The computer is a technical medium, perhaps the most obviously technical medium in our lives today. It is a medium that not only puts on display different kinds of qualified media but helps to realize them by computing calculations that need to be performed so that the computer screen, loudspeakers and controllers can function as technical media of display. Computer games require expensive machinery to design, run, display and interact with. Very schematically, we talk about hardware (devices that run on electricity), operating systems (programs that define what can happen once the machine is turned on and how we can interact with it), middleware (programs such as drivers and engines that define how code is presented to the user) and software components (pieces of code that are executed to perform a service to the user); all of these aspects work together to deliver an experience. The part of the media product that users buy is the software (and sometimes the controllers), the digital code that has to be run on hardware with operating systems. They can be purchased in various physical data storage formats, but the disc is not necessarily the only means of storage and dissemination.

We use digital media that are based on binary code to access all kinds of qualified media. But while we primarily focus on the screens and loudspeakers

of computers to read e-books, watch films and read news, computer games involve the use of manipulation devices to a greater extent than other media. Controllers come in all shapes and sizes, but most make use of the most agile part of the human body, the hand. Controllers are mostly proprietary, which binds consumers to particular companies. Some games, such as those developed for use with the Nintendo Wii (Jones and Thiruvathukal 2012) or Microsoft Kinect, also involve the whole of your body, so you have to physically jump or slash with your hand rather than just press a button.

Production process: Game design and programming

Crucially, in computer games, the experience is designed to make the player feel certain emotions to entertain them. Although players look for ‘fun’ in games, playing a digital game can involve frustration (Melhárt 2018), failure (Juul 2013), grief (Chittaro and Sioni 2018) and even boredom (Buday et al. 2012) for various aesthetic reasons. An intermedial understanding of computer games must start from an awareness that various media are employed in making the game experience meaningful to the player.

Game design can be the work of a single person or a vast collaborative studio. A game such as *Stardew Valley* (2016), for example, is the creation of one man, Eric Barone, who came up with the idea of the game, wrote its code, drew its visual assets, composed its music and wrote its dialogue on his own. In contrast, *Assassin’s Creed: Odyssey* was made by literally thousands of people, spread across the globe from Montréal to Bucharest, Pune, Kiev and Shanghai; hundreds of coders, designers, voice actors, quality assurance personnel and even its own historians were hired. The end credits run for over thirty minutes. Yet both games can produce similar feelings in players: moments of tenderness in response to a love relationship being represented, moments of tedium as the player does repetitive tasks and moments of excitement as the player unlocks new gameplay features or explores a new storyline. How those experiences are achieved can be studied by paying attention to the cumulative effects of different modalities of media on what is expressed in the program.

Researchers should always be mindful that a digital game is not a fixed media product in the same way as a novel or a film is. It is often said that a game is never finished; designers just stop iterating on a product. Because games are a product of development, the media product changes even past its release. Prior to release, they are often opened up to the playing public for a reduced price to gain insight into ordinary players’ interactions with the game and to secure continued funding for development. After release, a game often receives patches and additional content, such as expansion packs and downloadable content to extend the core media product.

Players, of course, not only vote with their wallets, but they can also be quite vocal in giving feedback when they find some aspects of a program particularly satisfying or frustrating. Such feedback influences the finished product in a myriad of subtle ways. More importantly, some players are technically adept enough to

create modifications (mods) for existing entertainment software, which might alter the appearance or behaviour of the program to redress what the modder(s) felt lacking in the original. These, in turn, might even be re-incorporated into the published games at a later date, an issue that is contentious in the industry, because the unpaid labour of players can then be capitalized upon by canny developers.

Basic media types

If the computing machine (including consoles, smartphones, coin-operated arcade machines and online servers, among others) is the technical medium for delivering the experience, then *code* is its *basic medium* in the production of computer games. Digital code is infinitely reproducible data that suffers no loss of information through copying, unlike analogue data. Digital code is written in a *programming language* that describes how the human conventions of programming define computer behaviour. Code in a programming language must be translated into lower-level code through the use of a *compiler*, either into a code that is written for particular processors (called an assembly language) or directly into *machine code* (which is what the processing unit ‘understands’). These levels are not usually studied in humanities research of computer games (but see Jerz 2007, who does study them). This is because these levels are not directly accessible to the player and the aesthetic experience they have. Nonetheless, all these levels of communication serve as the precondition for experiencing the media product, and their artificiality is often exposed when malfunctions happen. Video games often behave in ways that were not intended by its developers: software bugs, exploits and related phenomena are part and parcel of the gaming experience precisely because its basic medium, code, defines principles of simulation rather than working as a mere representation.

The basic media type of code is processed into other basic media types that the player accesses via the user interface, such as moving images, sound waves and text, which the player interprets as the qualified submedia types of the soundtrack, dialogue, cut-scene, introductory cinematic, and so on (see Chapter 2). These basic media types are integrated and provide the simulation of the game world, mediate narrative events, instruct players on how to interact with the game, establish mood and tone, and reward the players aesthetically for achieving game goals.

Games challenge their players to varying degrees: a game’s difficulty often makes it memorable. Challenges may be related to navigation, speed, collecting objects, conflict, dialogue, the use of logic, tactical decisions and following a strategy. The challenges are often presented multimodally and require thinking across modalities. Puzzles in games like *The Witness* (2016), for example, notoriously depend on the manipulation of perspective for the solution of their puzzles. On the other hand, some games such as *Crypt of the NecroDancer* (2015) rely on the seamless integration of music into their challenges by forcing the player to push control buttons in sync with the game’s soundtrack.

Performing tasks and spending time in the material modality (see Table 5.1) in the simulated game world is an important part of the experience of a video game. In order to analyse a video game, one must engage with it extensively to

Table 5.1 Media and modalities – Computer games

<i>Media types and modalities</i>	<i>Description</i>
Technical devices and media of display	Computing machines (including consoles, smartphones, coin-operated arcade machines and online servers) Production: programming code, engines, authoring tools Dissemination: arcade cabinets (1970s), home computers (1977–, console computers), mobile devices, VR and AR equipment
Basic media types	Programming code (Moving) image, (auditory) text (voiceover dialogue), non-verbal sound (sound effects), organized sound (game soundtrack)
Qualified media type	An entertainment software to exercise agency in a digitally realized virtual environment Technical development's effect on interaction and simulation Contexts: transmedia context, social interaction around games User coordination models: single-player, multiplayer, offline, mobile Genres: adventure game, first-person shooter, real-time strategy, business simulation, etc. Intended reception: entertainment, educational, or serious games Main mechanics and interactions: e.g. navigation, puzzles, collection, combat, dialogue and ethical choices
Material modality	Flat surfaces of screens, sound waves and loudspeakers, interface objects (controllers)
Sensorial modality	Perception: auditory, visual, tactile Cognition: interpretation of game state, prediction of future game states, practical know-how of control
Spatiotemporal modality	Material: length of play. The space needed for computer and equipment Sensorial: the sequentiality of the simulated events Semiotic: the simulated space of the game world, the virtual time of a narrative
Semiotic modality	Image: iconic and symbolic (when used to explain manipulation of the computer and interaction in the game) (Auditory) text: dominantly symbolic (also used to explain the rules of the game, indexical, e.g. in relation to characters' emotions and social identity) Moving images: dominantly iconic and indexical Sound effects: iconic and indexical Organized sound: dominantly iconic and indexical but symbolic as well Basic and qualified media types within the game world are often interpreted as indexical (in relation to solving the tasks)

make well-supported statements about its behaviour and contents. Because games challenge players and reward them with gameplay and story progress, they require significant time commitment and effort on the part of players to experience the game in full: they can be quite hard and failure is always an option. Unlike when engaging with other media, players can get stuck and will fail to see the unfolding of narrative arcs or the growing complexity of gameplay if they give up in frustration or boredom. Games bring in new mechanics, flesh out their stories and crank up the challenge as players progress, which adds layers of complexity that are essential to the enjoyment and critical assessment of the media product. The increased depth of understanding is integrated into the temporality of playing the game.

Qualifying aspects of computer games

What kind of experience we get out of the qualified media type of a computer game depends upon a bewilderingly wide array of cultural contexts. They range from the economic realities of how to make a successful commercial game under capitalism to audience expectations about the game experiences they are in the market for. Scholars might include the decisions about which groups are targeted as the core audience of a media product in their analysis, or the cultural background of various player cohorts. More technically minded interpretation may consider the hardware and software environments available for new designs. Sociocultural studies can highlight the historical contingencies of the evolution of gameplay genres, the media products in other qualified media, and many more. Intermedial scholars of computer games are advised to always consider the relevant social, historical and cultural forces that shape the media product under scrutiny.

Box 5.1 Interpretative frameworks for making sense of games

Since their inception, video games have been analysed from a variety of disciplines and each read games on their own terms. Game studies scholars with a literary background are prone to analyse **games as texts** authored by the designer, with characters, narratives, and the player as an interpreter that 'reads' the game. Scholars with a focus on design or architecture might treat **games as worlds**, paying close attention to how the spatial arrangements of the game's areas, the player's access to them, the background story, and other elements fuse together to create a game world. Scholars who sought to vindicate the uniqueness of computer games and their irreconcilability with other media (a stance that intermedial theories of games should always question) point towards **games as simulations**, highlighting their capabilities of representing complex, rule-based systems, and argue that simulations produce less fixed aesthetic products than the representations produced by traditional art. Scholars informed by the methods and theories of cultural studies tend to interpret **games as cultural artefacts**,

which encode and challenge particular cultural conventions and social identities; these scholars often work on issues such as class, race, religion, gender, sexuality, disability as represented by games and experienced by players (based on Jørgensen 2020, pp. 67–102).

There would be no games without people to play them. Many of the controversies surrounding computer games stem from what players do when gaming, or what effect games have on their players. Different player groups interact with games differently. Single-player games, especially those with a strong narrative thread, tend to constrain player's actions more than multiplayer games, which thrive on player-to-player interaction. Multiplayer games come both in game modes that emphasize cooperation against computer-controlled opponents and in modes that pit players against each other in competitive settings. Several of the most popular multiplayer titles, such as *Counter-Strike* (1999), *League of Legends* (2009) or *Fortnite* (2017), thrive on player conflict and high-level team tactics. This last point highlights another important aspect of multiplayer games: that they also provide a venue for connecting players, enabling them to socialize through games as a media platform, building communities and challenging others to display gaming proficiency. Similarly, massively multiplayer online games also create game mechanics to foster the reliance of players on each other to defeat enemies and other players' teams in combat. Because their representations in games (often called their 'avatars') allow gamers to trade equipment, display their in-game wealth in the form of wearable items and general appearance, there are entire player-run economies, as well as leaderboards, to relate players' performances against each other.

It is precisely because of the competitiveness of these multiplayer games that players who are too emotionally invested in their in-game success at the cost of others' tend to exhibit behaviour that can be characterized as hostile or toxic (see Condis (2018) and Salter and Blodgett (2017, pp. 73–99)), making these venues unpleasant places for players with an expectation of fairness, good sportsmanship, equal treatment and more of a live-and-let-live mentality.

Video games as media products are diverse enough on their own that making general statements about the medium is close to impossible. Single-player, multiplayer and massively multiplayer games elicit very different expectations and provide very different experiences. For example, single-player games can weave complex, dramatic stories with a definite closure; multiplayer games offer a tougher challenge by pitting the player against other humans rather than AI-controlled opponents; Massively Multiplayer Online games are played across the globe in persistent game worlds that evolve and a working market economy that booms and goes bust as time goes on. Many games offer both single-player and multiplayer options, and a lot of content in MMOs can be accessed as a single player.

Offline games have a different business model to online games and software-as-a-service games, which affects the available content and gameplay experience. Notably, offline games are purchased for a flat fee in a game shop or a digital distribution platform, and the player can experience the core content without being connected to the internet. Online games use the internet to enhance the single-player experience, by providing additional purchasable content, connecting players, for example, into collaborative teams that compete against others, or by offering an online trading system that forms an in-game market economy. Software-as-a-service games are purchased as a subscription for a defined period of time, which opens up a play experience that can be expanded by paying additional sums.

Mobile games have a different look, feel, control scheme and target audience from console and PC games. This is due to the technical limitations of the hardware and the conditions of the play environment. So-called ‘casual games’ (Juul 2012) also cater to a different demographic from core gaming audiences, which means that the entire design philosophy changes, especially with regard to the level of difficulty, accessibility, subject material and methods for encouraging player engagement. Casual titles are meant to be learned easily, not to require long play sessions and are designed to tone down challenges in favour of providing a light-hearted atmosphere. The distinction between titles intended for core gaming audiences and casual players are often insidiously couched in gendered terms, with repercussions to which groups of players are considered ‘real’ gamers and have the ‘rightful’ access to the cultural capital associated with gaming (Shaw 2012). Major developers can bring vast open worlds with photorealistic graphics to life, by designing a narrative that spans hundred hours of gameplay, complete with orchestral music and Hollywood voice actors, but they are beholden to shareholders and the profit motive, which entails making risk-averse business decisions. Indie developers, on the contrary, can afford to experiment with radical new game mechanics and unusual visual aesthetics (Juul 2019), but they are much more likely to pursue game design as a hobby rather than a full-time job, and the markets can be fickle with praise and in terms of success. Independent game development is not necessarily synonymous with the ‘indie style’ of games being produced; indeed, many independent games are produced professionally, and cannot be easily subsumed under ‘indie game’ aesthetics (Garda and Grabarczyk 2016).

As for the **intermedial** context of a given media product, it has to be noted that the video game medium is especially receptive to (and generative of) intermedial influences. This capacity undoubtedly owes much to the digital materiality of the medium, its protean capacity to remediate other media types, as well as the sensorially stimulating, viscerally emotional experiences it generates and corporeally involving performances it requires of its players. Many videogames capitalize on the intellectual properties of other media: they are especially keen to adapt sports, board games, films, comic books and novels. In turn, games create new franchises that often make it to the silver screen, the pages of graphic novels, licensed novelizations, not to mention the ubiquitous

merchandizing products that exploit the deep desire of players to possess some tangible and material extension of the virtual worlds they have experiences in. Games themselves are media that have affected the aesthetics of other media, from the emergence of the literary role-playing or ‘LitRPG’ genre of novels to the game-like presentation of certain films (Navarro-Remesal 2019), such as Ilya Naishuller’s *Hardcore Henry* (2015), Tom Tykwer’s *Run, Lola Run*, Christopher Nolan’s *Inception*, and others.

Box 5.2 The paratexts of computer games

The challenges posed by gameplay have led to the burgeoning industry of gaming paratexts, secondary media products that spring up around an original work of art to explain, configure, contextualize or extend the media product, or to make it available for critical scrutiny. They can be as simple as a soundtrack released as a CD or as complex as a Wiki-style knowledge base with 100,000 pages.

Game-specific paratexts include but are not limited to the following: 1) the game manual, usually a printed supplement, explaining in greater detail how to operate the program, 2) technical support media, such as online customer support or – formerly – phone-in services, where users can contact the company if there is a technical malfunction or to request a refund and 3) official communities, such as developer-operated online forums, where players can meet for in-depth discussions of games, or online voiceover protocol services for communicating while gaming.

Additionally, users and third-party service providers create their own paratexts as a labour of love or for profit: two game-specific forms of paratexts are 1) walkthroughs and guides, ranging from detailed step-by-step descriptions of how to complete a game (for more story-driven and linear games) to strategic tips and tricks (for more open-ended, abstract or simulation-based games) that help mitigate the challenge factor of the game, and 2) game retellings (see Eladhari (2018) and Sych (2020)), which narrow the many potential stories of games into one experience. They can take the form of recorded play sessions, ranging from text-based after-action reports of strategy games to ‘Let’s Play!’-style captioned screenshot narratives and video recordings, which add the unique voice and personality of the commentator to a playthrough. These are all valid targets of (inter)medial research, but their secondary status and the problem of the sheer volume in which they are produced present unique methodological challenges to scholarship.

Gaming experience in the four modalities

Digital games make use of all available media modalities to create a gaming experience. How those experiences are achieved can be studied by analysing the cumulative effects of different modalities of media on what is expressed in

the program. The discussion in this section is based on Lars Elleström's typology of media modalities (for an even more nuanced and medium-specific approach, see the ludophile intermedial framework of Jørgensen 2020, pp. 174–84).

Most video games use multiple *material* interfaces, one of which is almost always a screen (some experimental, non-commercial games have tried to forgo them, with limited success). But in order to express your agency within the game, you manipulate certain objects. First, not all games are equally material, but they would not exist if they did not at one point become physical objects. Even though video games are written in code, the machines that run them must be purchased. Storage media that deliver the code, such as magnetic or optical discs, are easy to copy, but suffer from data loss over time, known as 'disc rot', making the preservation of games more problematic than, say, books. Games also involve your body and prompt you to perform certain operations on the machine to influence the game state. Historically, games first appeared for mass consumption in video arcades, where large cabinets were installed. Arcade games usually require you to stand up next to a cabinet, while most PC and console games are played sitting down. Usually, there is some physical interface that translates your actions. Some are more abstract or symbolic, such as joysticks and buttons, while others are more iconic in the Peircean sense, like toy guns, steering wheels and even motorbikes that you can ride. A significant element of gaming's attractiveness is its *sensorial* appeal, whether we are referring to its eye-pleasing visuals, haunting soundscapes or the shock of the controller as it vibrates. The very name 'video games', which was coined in the 1970s, suggests that the display of visual elements (*video* means 'I see' in Latin) in the virtual space provides its main allure when compared to their main competitor in the arcades: pinball machines.

Accordingly, the discussion about what machines can or cannot display became the chief domain of competition between the designers of different games and platforms – a race that continues today. However, as Torben Grodal (2003) notes in the title of his influential article, video games are 'stories for eyes, ears and muscles' at the same time. Interaction with and within the game world is not only facilitated via vision but via other senses as well. Audio cues provide important feedback to the player, affirming that the action they took had an effect in the game world; dialogue lines might be read by recognized voice actors; an original soundtrack sets the mood for scenes and can become memorable in its own right (which is the reason why soundtracks are sold separately, as is the case with feature films); licensed songs bring their previous associations with them to new gaming contexts. Some games also incorporate elements of haptic (touch-based) controls and gameplay. Gestural control is how you interact with touchscreens and Microsoft's Kinect games, and they can mimic in-game motions, such as slicing, jumping or beckoning; modern steering wheels give players so-called 'force feedback' by using motors in the wheel to simulate the real forces experienced by drivers, while some controllers can vibrate to indicate something spooky or hidden in the game world. A few games have even made use of our sense of smell, as they distribute 'scratch and

sniff' cards, which players use to progress through the game or to immerse themselves into the game world (Montfort 2003, p. 159).

Games take *time and place* both literally and figuratively (see Aarseth (2007), Borries et al. (2007) and Zagal and Mateas (2010)). The spatiotemporal modality accounts for the real place and time where and when gaming happens, on the one hand, and the place and time of the game worlds being simulated, on the other. The discrepancy between the simulated time and the experienced time of games in the real world is a fruitful avenue for inquiry. The amount of time people spend video gaming, especially excessive game usage, has been a constant source of consternation in news articles. Early arcade games had play sessions that lasted minutes, similar to some of today's mobile games, while modern open-world games regularly last for between 40 and 60 hours, and online games offer content into which players can sink hundreds of hours. Historically, places where video games were played prior to the home computer revolution, such as video arcades, were thought to be dens of iniquity and listlessness, little better than casinos. With the advent of home computers, people started incorporating dedicated play spaces into their living rooms; and today, motion-controlled and VR consoles require extensive floor space for freedom of movement. Portable and handheld gaming devices (like Game Boy, a cultural icon of the 1990s) brought gaming out into the open, and once smartphones became widespread, location-based gaming gave rise to the whole genre of 'alternate reality games' or ARGs, such as *Harry Potter: Wizards Unite* (2019), which use the location services of phones to extend play into the world at large. Video games, being simulations, can theoretically represent any known real-world location in any time period, as well as literally any range of fictional scenarios, that is, worlds with different physical and behavioural attributes. Nonetheless, the simulationist aspect of the media type offers a fertile ground for adapting games' plots and settings from the tropes of popular franchises and fictional genres: Tolkienian fantasy, military science fiction, horror, swash-buckling adventure, historical and modern warfare, and contemporary sports are perennial favourites. Do note that these are genres based on the spatiotemporal location and the aesthetic presentation of a game's storyworld, not the genre of a game itself. As part of the representational discourse of games, they do not affect the interactional schemata of the games. Video game genres are defined by what sort of challenge they pose to the player, what kind of actions or skills are needed to perform within the game, and which aspects of the world are simulated. In fact, one could argue that video games are so diverse that what the industry calls different genres mean different qualified media types in our terminology. For the purposes of this introduction to the intermediality of computer games, it is more instructive to consider what unites these various forms under one banner.

Finally, digital games are deeply *semiotic* by nature; they depend on the processing and interpretation of signs on several levels. Code is nothing but a series of signs, as anyone who programs or has seen *The Matrix* (1999) will tell you. The game world the player perceives and the interactions the player can

perform are the results of two kinds of sign interpretations: the machine interprets the signs from the user interface, and the player interprets the state of the machine and the player action that is required to perform adequately. The graphical user interface is a set of intermediate signs that facilitate the manipulation of the game world. All computer programs rely heavily on the use of visual icons. Iconic representations are used in interfaces to give visual hints about what a particular portion of the screen does, that is, how it changes the computer's operations when it is interacted with. Iconic/symbolical sounds give feedback about whether an operational action was carried out successfully or not. Finally, when interacting within the game world, the player also interprets the information gained from iconic images and symbolic signs of written or spoken language indexically as traces of what happened or hints about how to proceed and what kind of action to take. This kind of indexical information can come in all forms of basic and qualified media types: gamers activate recorded audio dialogues, see hand-drawn and scanned artwork or digitized filmstrips or follow tutorial arrows pointing to the user interface or the next game goal. And last but not least, symbolic interaction with signs occurs whenever players read or click on text, listen to dialogue, learn the conventions of game genres and come to expect them in the next game of the same sort, or when they decipher codes in certain games (see Chapter 17)

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