# From Video Games to Virtual Reality (and Back). Introducing HACS (Historical-Analytical Comparative System) for the Documentation of Experiential Configurations in Gaming History

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## ABSTRACT

This paper introduces a comparative analytical system that seeks to document the evolution of the game experience in the history of video games. Following an overview of formal and ontological inspections of games, ten interactive figures – domains of human agency typically modelled by game systems – are presented. The study of figures in art history traces the emergence and resurgence of different types of characters, poses or scenes, and indeed this is the meaning that is ascribed to the term here; games propose different "roles" depending on the specific ways they model this agency. These concepts are ideal to segment any game experience, and each of these segments are then analyzed with four conceptual categories: three layers of interface (the manipulation, mapping and feedback layers), and the ludic modes of engagement associated with each figure. The presentation of the system is encapsulated in an argument about the recurring fascination for VR technology in the world of video game; the analytical system will be able to document the actual integration of such elements along with other important parts of the ludic mediation.

## Keywords

Video game history, game ontology, formal analysis, player experience, interface design

## 1 INTRODUCTION

> When (and if) [VR] systems ever become consumer items, the possibilities for game play are incredible. No longer would role-players have to settle for a one-dimensional perspective of that fantasy environment. Instead, they would explore three-dimensional dungeons and castles. Science fiction gamers can take on the size, girth and attributes of an alien being and see the entire drama of the game unfold from the proper visual perspective. Wargamers can command an American Civil War gun battery from a three-dimensional ridge and experience the blinding confusion of counter-battery fire from a first person perspective. […] Consumerdom is probably more than a decade away on these products, but the possibilities are tantalizing enough that gamers can dream. (Wilson, 1990, p. 78)

In August 2015, *Time* magazine declared that virtual reality was about to change the world; its infamous cover featured Palmer Luckey floating on a beach wearing the Oculus Rift headset. 2016 has already been proclaimed the year of VR by a choir of techno-enthusiasts, marketing departments and many journalists. "The Year of VR" is the very title of a *Game informer* special issue from January 2016. In March 2016, the respected *Kill Screen* magazine launched a side project dedicated entirely to VR coverage; "Versions is the essential guide to virtual reality and beyond. It investigates the rapidly deteriorating boundary between the real world and the one behind the screen." The opening quote from *Computer Gaming World* makes it clear: VR has been on the mind of the gaming community for a long time. It is easy to find previous instances of the natural

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interface fascination in the history of the medium, from the insistence on first-person point of view in marketing, to the proliferation of vehicular interfaces and the widespread integration of "drag and drop" controls in adventure games (Therrien, 2015).

One of the first VR systems was engineered at MIT by Ivan Sutherland throughout the end of the 1960s. The "Sword of Damocles" was a "relatively crude system" by Sutherland's own admission, but it allowed users to move somewhat naturally in actual space; as he noted in his presentation of the system at the Fall Joint Computer Conference in 1968, "the three dimensional illusion was real. Users naturally moved to positions appropriate for the particular views they desired" (1968: 763). While the HTC Vive and the Oculus are also able to capture the movements of the body to some extent, one might notice that our fascination with VR focuses on head-mounted displays to a large extent. In order to move us beyond the limits of our living room, these embodied experiences have no choice but to significantly alter the way we navigate spaces: the user's legs are handled (literally) via joysticks or other generic devices. Many walking interfaces are currently in development or being refined, such as VirtuSphere or Wizdish. However, it is difficult to imagine the giant hamster ball or even the mini skating rink becoming generic interfaces for everyday gaming.

How can game historians account for the actual progression of VR technology, and actual integration in game design? Are the game genres evoked by Wilson in the opening quote really adapting to the ideal of the natural interface? Or are we facing evermore convoluted game configurations as these elements are actually integrated? In the confusing context of constant technological supersession and the naturalization of hyperbole in video games marketing when it comes to natural interfaces and immersive gameplay, how can a game scholar navigate historical traces without fear of getting lost in complexity?

The analytical model introduced in this paper was designed to answer these types of questions and concerns. The goal of such a tool is to provide stable comparative ground for the incredible diversity of gameplay configurations. In later phases of development, it will be used to encode hundreds of games into a database in order to document the emergence and crystallisation of specific configurations. Such a system must not account solely for the integration of more natural interfaces or design elements, but for the large variety of gameplay configurations that have emerged in the history of video games. Creating a universal and unbiased system is practically impossible, but as this paper intends to demonstrate, it is possible to settle for a functional comparative tool, and such a tool will be useful to document the historical prevalence of specific videoludic experiences. In the elaboration of this conceptual tool, striking the right balance between the complexity of the objects to analyze and the comprehensive nature of the system represents the biggest challenge.

In this paper, the fundamental concepts and intricacies of the analytical system will be introduced. The main purpose of this system is to document which domains of human agency are modelled in ludic systems. It relies on five categories of concepts: the domains of human agency in themselves (or "interactive figures"), the interface used for input, the mapping between actual manipulations and depicted virtual actions, the feedback provided to users, and finally the challenges faced by players for each of the figures. As we will see, it is through proper segmentation and the synergy of the concepts that one can encode very specifically some of the key aspects of the interactive encounter proposed by a given game. As each part of the system is introduced, we will review

relevant literature on formal aspects of games, the interface and the experience of gameplay. Some of the underlying problems emerging from this literature and methodological concerns specific to the comparative study of gameplay configurations in the history of games will also be discussed throughout the paper.

In terms of methods, the analytical tool builds upon elements that were defined in the course of research projects on smaller corpuses. While some concepts are still present in the current system, many categories were tailor-made for these projects and cannot account for the variety of interactive situations encountered in a broader corpus. Following an initial version of the analytical system based on these previous contributions, categories and concepts were confronted with different games, thanks to the cumulative gaming experience of the researchers involved. The principal investigator could rely on more than 30 years of experience with adventure games, computer RPGs, first-person shooters and racing games, while five research assistants brought in their knowledge of other genres such as RPGs and strategy games to the table. Difficulties emerged rapidly, along with the necessity to integrate newer dimensions that would better reflect the interactive encounter. An extensive literature review was conducted in order to find more concepts and categories that could be combined into a functional, yet specific comparative system. As we will see in the next section, the main difficulty didn't come from the scarcity but rather from the proliferation of relevant concepts.

## 2 VIDEO GAMES, IN ESSENCE(S)

How can we define the video game experience? According to Stephen Kline, Nick Dyer-Witheford and Greig de Peuter, one can only fully understand such an experience by studying the interactions between three concomitant circuits in the history of the medium: technology, marketing and culture (2003). At the heart of the cultural circuit lies the notion of gameplay and the various shapes taken by this activity. What is, in essence, gameplay? The notion is commonly taken for granted in game studies; as game players and scholars, we believe that we instinctively know what gameplay is all about. In a recent effort on gameworld interfaces, Kristine Jørgensen stresses the importance of a gameplay sensitive approach, and defines the notion in order to highlight the interplay between designers and users:

> Gameplay is an emergent system that is constituted in the interaction between the player and the game […] it is not something one can design explicitly, but designers can facilitate a specific kind of gameplay through designing specific kinds of game mechanisms and the context in which they occur (2013:33)

In the short lifespan of game studies, many general concepts have been introduced in order to dissect and categorize the interactive experience. One might readily think of Jesper Juul's distinction between games of emergence – towards which Jørgensen's definition of gameplay seem to be leaning – and games of progression (2002), or Marie-Laure Ryan's compass of interactivity, where cardinal directions are defined according to the combinations of two dyads (internal / external perspectives, and ontological / exploratory agency; 2006: 107-116). The heuristic value of these concepts is undeniable. However, such distinctions are too broad for the purpose of this project (i.e. comparative historical analysis). Most games feature elements of emergence and progression, with specific segments affording more agency and proximity to the action than others. Consequently, each category would likely be coded for every single game under scrutiny, making any specific historical observations impossible. If we are to make significant distinctions in the experience of gameplay, it is necessary to move closer to the game mechanisms that Jørgensen evokes in her definition.

At the other end of the spectrum, the formal inspection of video games stresses the importance of acknowledging very specific details about the ludic instruments. One of the first major contributions in this sense has been Staffan Björk and Jussi Holopainen's *Patterns in Game Designs* published in 2004. The original edition contains more than 200 patterns. In a more recent contribution entitled "Formal analysis of gameplay" (2015), Björk and Petri Lankowski propose an even more fine-grained approach. The authors suggest that a game can be analyzed by listing all the relevant information for categories such as "components", "component actions", "player actions" and "goals". In *Space Invaders*, for instance, "player actions are move left, move right and shoot" (2015:25). The reliance on such a classic game in order to exemplify categories is symptomatic of the limitations of this formal analysis, limitations which the authors acknowledge explicitly: "Many contemporary games are too big to be described fully" (2015:27). As a matter of fact, even the analysis of *Plants vs. Zombies* – a relatively simple game – appears daunting with this method. More recently, Juul has proposed to build similar systems for historical inspection, organizing the patterns in a "genre-specific ontology" (2016:10). The acuity of his historical analysis for a relatively simple genre – tile matching games – is remarkable, but rely on dozens of specific patterns.

Such minute listing of all the potential actions and design elements makes it difficult to attain interoperability in the context of a comparative system for historical analysis. Again, Björk and Lankowski are fully aware of these limitations:

> Although one can imagine a vocabulary that is sufficiently large and expressive to be able to be used for all types of games […], it would be difficult to have a comprehensive overview of such a vocabulary. Furthermore, applying it consistently would likely require much superfluous work" (2015:24).

Another approach was proposed around the same time by the GAMER group at Washington University: adopting the vast but commonly understood genre vernacular developed by the gaming community (Lee & al., 2014). This leads to a list of over 60 generic tags associated with six broader terms: Action, Puzzle, Role-playing, Simulation, Shooter and Traditional. While the sub-genres bring some level of precision, many of these terms are notoriously fuzzy and the intended meaning is still highly dependent on previous knowledge / experience with the objects. The fuzziness is made obvious by some of the associations that would likely be debated within the community; for instance, adventure is associated with the broader tag of action, while shooting subgenres get assembled in a distinct category. Still, the heuristic nature of genre vocabulary is undeniable; these common tags will be used throughout the paper in order to quickly exemplify the gameplay components targeted by the analytical system.

In order to create a system that is both specific and synthetic enough to accommodate decades of different game designs, a set of essential components that sit in-between the two extremes presented above would be ideal. Many intermediate attempts have been made and are often presented in terms of gameplay bricks, primitives, or as a ludic ontology. As we can see in the "Game classification" website created by Ludoscience (Alvarez *et al.*, 2007), striking the right balance is a difficult task. The authors propose a series of ten bricks, split between goals (avoid, match, destroy) and means/constraints to reach these goals (create, manage, move, random, select, shoot, write). The porosity of the system emerges clearly when specific examples are given. For instance, "avoid" is illustrated with the racing game *Need for Speed*, in which "the player must avoid to hit walls and obstacles with his car" (2007). Similarly, "destroy" encompasses the notion of killing every alien in *Space Invaders* and the idea of collecting items and of passing a certain marker in space ("the dots eaten by Pacman can be considered as 'destroyed', so

can the checkpoints in a racing game", 2007). The fuzziness of the categories would make this system inconvenient for a comparative historical analysis; here again, most games under scrutiny would be encoded with most of the bricks.

In 2005, José P. Zagal, Michael Mateas, Clara Fernández-Vara, Brian Hochhalter and Nolan Lichti laid out the premises for the Game Ontology Project. The original segmentation echoes many of the categories introduced in other systems presented above, such as interface, rules, goals, entity, etc. (2005). The interesting intellectual move in this project comes from a clear willingness to organize and synthesize similar game mechanics. For instance, consider the suggested organization for "to own" (figure 1):

**Table 1: Example Ontology Entry - "To Own"**

| | |
|---|---|
| **Name** | To Own |
| **Parent** | Entity Manipulation |
| **Children** | To Capture, To Possess, To Exchange |

**Figure 1. Example from the Game Ontology Project (Zagal et al., 2005)**

Similar regroupings have been conducted in order to create the system presented in this paper. In doing so, comparative analysis and encoding becomes more comprehensive, at the cost of precision. While Björk and Lankowski's method would distinguish between multiple navigation mechanics (left, right, slide, climb, roll, walk slowly, run, etc.), it would be impossible to create a vocabulary that remains consistent across hundreds of games, and nearly impossible for research assistants to encode properly all this information for every game. The current system takes for granted that the important information to encode is the integration of an interactive figure – a domain of human agency – in the game experience, namely "navigation" in this specific case. The study of "figures" in art history traces the emergence and resurgence of different types of characters, poses or scenes, and indeed this is the meaning that is ascribed to the term here; games propose different "roles" depending on the partial and cumulative integration of specific aspects of human interaction. Another advantage of such consolidation is that the resulting interactive figures can act as a foundation to segment the experience. Referring to the "navigation" or "neutralisation" component of a game is far more intuitive than listing abstract rules. Other conceptual categories can then be superposed to each figure in order to bring back acuity to the analysis of gameplay; the later parts of this paper will introduce such categories. At this point, the list of essential interactive figures integrated in the system has to be introduced.

## 3 THE HISTORICAL-ANALYTICAL COMPARATIVE SYSTEM

### 3.1 Interactive figures

In *La sémantique structurale* (1966), Algirdas Julien Greimas proposed a method of textual analysis in a quest to find the underlying structures of semantic organization in human cultures. For instance, he used Vladimir Propp's 31 typical plot points in Russian Folktales and demonstrated that such a model could be synthesized even more (1966). Such structures are expressed through linguistic manifestations, but Greimas sought to go "below" the textual occurrences under scrutiny (as any self-respecting structuralist would do). Similarly, the list of interactive figures introduced in this section was partially created through the inspection of many linguistic manifestations, in the games themselves or in peritextual elements such as manuals and packages. Consider, for instance, page 3 from the *Ultima* reference card (Apple II edition, 1981). Some semantic pairings intuitively emerge for any English speaking individual: "Attack" and "Fire" refer to

violent confrontations, “Cast”, “Get” and “Drop” all suppose some sort of management of tools or resources, and “Enter” echo the basic navigation commands presented on another page (the typical N/S/E/W). Most games present their mechanics verbally to the player, within game tutorials or on peripheral elements such as game manuals or instructions printed directly on arcade cabinets. The question then becomes: which semantic pairings would be ideal in order to conceptually reduce the number of mechanics to analyze, while maintaining a granularity that still reflects the specific configurations introduced by certain games and mimicked by others? Some difficult decisions had to be made in order to settle on ten interactive figures (figure 2).

| Figure | Associated mechanics and challenges |
|---|---|
| Activation | triggering status change(s) in the environment / of elements in the environment |
| Agent management | directing the behavior of partially autonomous agents |
| Apprehension | seeking information through perceptual or cognitive exploration |
| Communication | expressing verbal or corporeal messages that seeks to engage or maintain a social exchange between two entities |
| Development | constructing spatial, technological or character proficiency structures through pairings, modifications or additions |
| Instrument | manipulating a ludic instrument that cannot be connected directly with other figures / that stands out from the game world |
| Navigation | moving an entity in the virtual space |
| Neutralisation | pacifying, diminishing or annihilating an active threat |
| Preservation | managing a physical, psychological, social or technological integrity through avoidance, status change, healing or repairing |
| Resource management | acquiring and activating items, tools, currency or agents |

**Figure 2. Interactive figures**

The arbitrary nature of these pairings / segmentations cannot be overstressed; many decisions were taken in order to keep the overall balance or to account for specific parts of video game history as it is already represented in the minds of the researchers. Following our general premise of semantic pairing, it would have been possible to reach a more synthetic system. According to Greimas, one of the most fundamental types of pairings occurs with direct semic opposites. In this regard, “neutralisation” and “preservation”, defined as opposite attitudes towards an active threat, could have been united into a single concept (“threat handling” for instance). However, the existence of a specific genre in gaming culture (“stealth games”) and the prevalence of stealth mechanics in contemporary games created an incentive to single out the concept of preservation, in order to monitor its evolution through time. On the other hand, it would have been possible to divide incrementally the figure of “resource management” to refer more specifically to resource collection and spending, and to distinguish between tools and symbolic exchange currencies; after all, specific games and genres appear to have been designed with a clear emphasis on each of these elements. However, such granularity about resource handling would unbalance the system, and one would naturally be inclined to bring the same level of segmentation to other figures such as “navigation”.

Again, this analytical system was not designed with any intention to produce strong ontological claims. As we will see later in this paper, the current segmentation is able to account for the specificity of a great variety of game genres, and so it can at least claim to be somewhat balanced. However, in order to produce a truly specific portrayal of the diversity of interactive encounters, other categories of concepts need to be introduced and used in conjunction with this initial segmentation.

## 3.2 Systemic implementation: interface layers

With a basic segmentation of a given game experience based on the interactive figures presented in the previous section, it is possible to indicate which realms of human agency are modelled in a more lifelike manner in the ludic system. One could try, for instance, to monitor the progressive integration – or lack thereof – of the natural agency associated with VR in the history of games for specific figures such as navigation and communication. In this section, we seek to introduce concepts that can help us understand the degree of realization (and/or abstraction) of the various figures in the ludic system, more specifically at the level of the interface.

Kristin Jørgensen's contribution on video game interfaces is one of few dedicated efforts that can provide guidance in order to define relevant categories. One of the main theses defended by Jørgensen seeks to problematize the ideal of VR as it was presented at the beginning of this paper. Building on Katie Salen and Eric Zimmerman's notion of immersive fallacy (2004:451), the author presents a critique of the common ideal of transparent interface design; as Jørgensen notes, "Creating the impression that interacting with the game is an unmediated activity is neither desired nor achievable if one wants the experience to remain a ludic experience" (2013:35). The design paradigm put forth by Jørgensen could be named "functionalist" by virtue of its insistence on the efficient nature of the feedback provided to users (2013:6, 21, 36). Nonetheless, this critique of the "transparency fallacy" provides an essential guideline in the elaboration of a balanced analytical system.

### 3.2.1 *Manipulation interface layer*

For the sake of efficiency and clarity, Jørgensen purposely leaves the actual manipulation interfaces out of her account in order to focus on the feedback provided to users. Indeed, integrating this material layer complicates matters a great deal, considering the variety of technologies and props that have been used in this short history of video game design. However, many of the general concepts are readily available in her account, and some similar categories can be found in genre-specific literature such as Clara Fernández-Vara's work on adventures games (2008). These concepts can be integrated in a continuum taken from Torben Grogal and Andreas Gregersen's classic paper on interface and embodiment, in-between the poles of motor isomorphism and symbolic manipulation (2009:70). In the context of this analytical system, four broad interface categories have been defined: corporeal, techno-mimetic, generic and screen-augmented (figure 3).

| Isomorphism… | | | …Symbolism |
|---|---|---|---|
| **Corporeal** | **Techno-mimetic** | **Generic** | **Screen-augmented** |
| Detection of body movements | Imitation of specific technology or tool to focus interaction | Transitive implementation of non-evocative actual manipulations | Implementation of manipulation through visually encoded props |

**Figure 3. Typology of manipulation interfaces**

In themselves, these categories would be unable to yield anything but trivial results in a comparative system; any game released on the Nintendo Wii, for instance, would be encoded with "corporeal interface". It is important to understand that they should always be used to make observations about the nature of the material interface *in relation with* specific interactive figures. For instance, "corporeal interface" would be relevant to note for the neutralisation figure if actual sword-wielding gestures need to be performed in order to overcome enemies. Current VR systems, as evoked in the introduction, cannot

fully integrate the figure of navigation through corporeal interfaces and have to rely on more classic screen-augmented or generic configurations. On the other hand, a seemingly techno-mimetic interface such as a gun can be used as a generic interface (and filed as such), for instance to make a decision about spatial navigation. The category "screen-augmented" might appear redundant with "generic", as Windows/Icons/Menus/Pointers have become customary and hence somewhat generic in game design. The decision to integrate it here seeks to highlight a game system's unwillingness to model agency within the scope afforded by handheld interfaces / through the body of the user. In this view, on-screen WIMP elements don't simply add "buttons" to a material interface; they necessitate visual decoding on top of the motor investment and thus complicate the experience of gameplay.

Even if a figure is realized through a corporeal or techno-mimetic interface, not every design is equal in terms of motor isomorphism. At the height of the fascination for "motion controls" triggered by the Nintendo Wii, the community realized that many of the games could be handled adequately with miniature gestures, and such handling might actually be beneficial to the performance of players (Klevjer, 2006:163; Grodal & Gregersen, 2009:73). In light of these observations, it became obvious that the first layer was unable to account for many interesting game design choices; a typology of interface mappings was created to highlight this complexity and its impact on the game experience.

### 3.2.2 *Mapping layer*

Building on Grodal and Gregersen's basic definition of mapping, each type defined in the context of the analytical system refers to a specific design rationale that associates primitive manipulations (P-actions) with represented or virtual actions (V-actions; 2009). As the authors note,

> Action mappings are often arbitrary in that you push buttons with your thumb to virtually jump or swing your arm […] But they can also be said to provide a minimum of natural mapping in so far that the application of force in P-action may correspond to application of force in the virtual environment (2009:71).

The representation of high intensity action in a game system creates a logical incentive for designers to maximize the motor involvement of players. But nothing forces such design choices, and indeed intense action may be triggered by relatively minute physical involvement from the player. Six common mapping situations have been singled out in order to refine our analysis of gameplay; they can all be defined by their relative position in the same isomorphism-symbolism continuum, and by noting the basic relationship between P-actions and virtual actions (figure 4).

| Isomorphism (maximal action)… | | | | | …Symbolism (minimal action) |
|---|---|---|---|---|---|
| **Symbiotic** | **Metonymic** | **Tangible** | **Cumulative** | **Punctual** | **Synthetic** |
| Relationship between P-action and V-action | | | | | |
| Equivalent (=) | Miniature P-action (<) | Synchronicity | Addition of P-actions | Automation of V-action (<<) | Contraction of V-actions (<<<) |

**Figure 4. Typology of mapping design**

The first two concepts can be useful to distinguish between systems that make full use of a corporeal interface, and those in which miniature gestures are functionally integrated. The relative disappearance of motion controls in contemporary game design seems indicative of a certain bias towards miniature gestures in the history of the medium. Many technological innovations associated with VR currently seek to integrate fully isomorphic visual apprehension in video games. It will be interesting to see if game designers

embrace symbiotic mapping for this figure. However, it is essential to note that this type of isomorphic mapping has been integrated in game design a long time before the development of motion controls with the Wiimote, Kinect and Oculus touch controllers. If one considers the figure of resource management, the introduction of "drag and drop" mouse-based controls to manipulate items in adventure games such as *Déjà Vu* (Icoms, 1985) and *Maniac Mansion* (Lucasfilm, 1987) unquestionably appears as a progress towards isomorphism. At the same time, it proposed a clear restriction in terms of the manipulation space (the 2D surface) which confers an abstract quality to the gesture. Such reduction of gestural breadth can be associated with metonymic mapping.

The third concept in the continuum moves further away from the pole of motor isomorphism. Tangible mappings refer to one of the most common interactive designs in video games: the realization of V-actions is synched to the actual manipulations of the player on the interface, but bears no direct resemblance with these P-actions. In spite of the symbolic association, this concomitant form of mapping is still able to simulate a tangible experience according to Rune Klevjer, and is central to his definition of the avatar as a prosthetic extension of the user's body: "the avatarial relationship is by definition a tangible and real-time relationship. Like a mouse cursor, the avatar enables us to make direct and continuous movements across the divide of the screen" (2006: 124). In the context of action games, triggering punches or kicks can be perceived in a tangible manner by players, considering the fast on-screen execution of such moves and the uninterrupted flow of the action. This synchronicity played a decisive role in the fascination created by video games early on; it is closely linked to the vague notion of "real time" that emphasized a system's ability to quickly update the audiovisual feedback. The concept of cumulative mapping is also characterized by a strong temporal relationship; it refers more specifically to a carefully sequenced streak of P-actions that need to be completed in order to trigger a virtual action. This design can be very taxing in terms of motor activation, for instance in the case of sports game that ask players to rapidly waggle a joystick back and forth in order to improve the virtual running speed. Miguel Sicart (2008) discusses this mapping design in his paper on game mechanics, pointing out that it is typically used in fighting games (evoked through the idea of special moves or combos).

Klevjer opposes prosthetic avatar relationship to the notion of playable character and indirect control, citing point-and-click situations. As we've noted above, point-and-click mouse controls have been used to model resource management within the logic of motor isomorphism. But indeed, most of the figures integrated in adventure games loosen the experiential ties between P-action and V-action. Communication, navigation or activation of elements in space are triggered by the player, but these actions end up being completed automatically with no further input. A single P-action is tied to a V-action or a string of V-actions only for a brief moment in time; there is a perceived loss of agency, and in this sense the actual mapping can be said to be very "punctual". On top of "point and click" and "turn-based" solutions seen in adventure games or strategy games, such mappings are now also commonly used in fighting games and beat 'em ups; in so-called Quick Time Events segments, a single button press can trigger incredible action sequences in the ludic system. Here the discrepancy between player effort vs. depicted effort is the most evident and thus we clearly move towards the symbolic end of the continuum. However, symbolism in action modelling goes much further. In synthetic mappings, players understand that a single P-action subsumes a sequence of V-actions that has been accelerated or eluded explicitly. For instance, navigating the worldmap in an RPG, or developing military structures and units in a RTS seem to encompass a lot more efforts

than what is actually performed by players, who will most likely perceive an acceleration of the action.

As we can see from this typology, video games designers have at their disposal a range of solutions to create an echo between the actual motor engagement of players and the actions associated with figures integrated in the ludic system. But games also have developed solutions to model these actions in a disembodied way, and such abstraction can potentially lead to a rather extreme contraction of action. Even though we have defined each concept solely in terms of isomorphism and symbolism in this layer, the relationship between P-actions and V-actions always supposes that players receive some feedback about the virtual actions, and this feedback comes in multiples shapes with many different purposes. As we will see in the next section, a punctual mapping isn't always tied to an outrageously spectacular cinematic sequence, and the acceleration of action can be represented with minimal audiovisual efforts.

### 3.2.3 *Feedback layer*

In *Gameworld interfaces*, the fundamental thesis defended by Jørgensen is that the totality of the perceived gameworld – and not solely the common indicators and HUD elements – acts as an interface; it lends players access to the game system. As the author notes, "To appear as attractive as possible, many games imitate a cinematic visual style and attempt to hide system information inside the game environment, thus stressing the gameworld itself as interface" (2013:19). But such feedback can prove impractical; "in game situations, there is often a need to use more explicit signals than what the gameworld itself can offer, which is in conflict with the idea of transparency" (2013:35). Here we can see another continuum shaping up, prolonging Grodal and Gregersen's dyad about isomorphism/symbolism: the audio/visual/tactile feedback provided can be inscribed within the gameworld in itself (diegetic feedback) or through a series of specific signs developed in game conventions, and better known as indicators (signaletic feedback). In the context of a tangible or punctual mapping scheme, the effect of a selected action – such as a punch or a kick – might be communicated solely through the variation of a numerical or visual indicator (such as in many classic RPGs or turn-based strategy games) but without a clear contraction of depicted efforts. For synthetic mappings, this acceleration could be perceived through elliptical depictions of the gameworld itself or with conventional signaletic indicators.

Jørgensen stresses the importance of the ludic balance in interface design. In this regard, providing information about game events (through the gameworld in itself or conventional signs) is only one of many game-specific forms of feedback one could encode in a comparative system. Building on Jesper Juul's recent account of games as the art of failure (2013), two fundamental categories of feedback have been added to the system: markers of progression, and markers of failure. Both are defined by the common principle of additional information that cannot be reified as part of the diegesis, but with a positive or negative valence respectively. The former is characterized by positive emphasis, such as an uplifting jingle, written or spoken praise, clear segmentation that mark out progression, or any other sign communicating the idea of progress. Depending on the figure, this could mean enemy waves, experience levels or spatial subdivisions. Failure markers refer to any message or setbacks imposed on players to communicate the idea of an insufficient performance. Interruption of play or a direct address such as "Game over" can occur in relation with specific figures, for instance if players fail to reach a set point in space, preserve their character's integrity, or neutralize a set number of enemies. Scoring systems are also typically used to emphasize progression or failure,

but since they are so specific to games, the concept of "score" has been singled out in the analytical system. Altogether, these concepts prove to be an efficient way to highlight which figures are valued by the game; the segmentation of the experience through interactive figures make it possible to specify which domains of agency are explicitly encoded as essential to reach winning states. The synergy between interactive figures and ludic feedback in this analytical system can provide clear information about the goals of any given game, without noting down every actual goal explicitly (as many formalists suggests). For instance, progression markers accounting for the navigation of space or character development already highlights these figures as important goals.

The conjunction of the various interface layers allow us to provide interesting and sometimes paradoxical game portraits. For instance, a platformer may integrate resource management through a very synthetic form of mapping, in which players simply have to "walk over" objects in order to pick them up. These objects might be of the "collectibles" ilk, mere fruits or jewels with no further integration in the game system as a tool or currency. Yet, scoring feedback might be provided consistently for this figure, while navigating the levels, preserving oneself or even neutralising enemies – all figures that are heavily associated with the genre – is not accounted for in such a ludic way. These observations are already useful, but in order to see the bigger picture from a gamer centric perspective, one needs to highlight the type of challenge faced by players for each figure.

### 3.3 Modes of ludic engagement

A typology of mapping design is useful to inspect the mechanical relationship between actual manipulations and virtual actions in light of concepts such as motor isomorphism and symbolism, but does not say much about the actual challenge of playing the game. Any of the mappings could be integrated in furious action sequences or play a part in complex strategies elaborated by a player. This last category of the analytical system seeks to bring forward these various modes of engagement that have been integrated in games, always in relationship with specific figures. In an effort to analyse the experience of interactive movies, the Ludiciné research team proposed a four-component typology in 2008: trivial implementation, execution, resolution and strategy were all defined according to the range of action sequences envisioned by users and to the relative emphasis put on sensorimotor or imaginative skills (2008:248). More recently, Veli-Matti Karhulahti proposed a thorough inspection of essential challenges in games that resonates with the Ludiciné categories, but with a clear focus on the static or dynamic nature of the challenges. It seems irrelevant in the context of this paper to engage with the author's polemical title/argument ("Puzzle is not a Game!", 2013), but his definitions of puzzles vs. kinesthetic and strategic challenges have been useful to strengthen the typology presented here. However, Ludiciné's nomenclature has been privileged since the current project also seeks to discuss the experience from a gamer-centric perspective, while Karhulahti's seeks to produce strong ontological claims about the objects. Furthermore, in order to account for the broader corpus and diversity of gaming situations, the analytical system integrates another mode of engagement: tactical coordination (figure 5).

| Short term… | | Action planning / consequences | | …Long term |
|---|---|---|---|---|
| **Actualization** | **Execution** | **Tactical coordination** | **Resolution** | **Strategy** |
| | | -Skillset- | | |
| Minimal | Sensorimotor | Sensorimotor | Imaginative | Imaginative |
| | | -Challenge- | | |
| Static / Dynamic | Static | Dynamic | Static | Dynamic |

**Figure 5. Modes of ludic engagement**

While the concept of trivial implementation/actualization seemed unescapable in the context of interactive cinema (Perron *et al.*, 2009), it is interesting to note that some video game genres model specific figures with such minimal ludic requirements. For instance, communication in many JRPGs is rather trivial and seeks mostly to nourish the fictional world of the game, and some turn-based neutralisation sequences are so obvious that many classic series ended up integrating an "auto combat" feature. In the context of interactive movies, the concept of "execution" referred to the *Dragon's Lair* model of challenge (hit the button or trigger in a split second in order to move forward). While shooting galleries and quick-time event sequences in games still rely on such sensorimotor coordination to a great extent, it appears problematic to associate all action segments with such a highly constrained and unforgiving mode. The common notion of tactical engagement has been integrated in order to account for those instances where players benefit from a plurality of mechanical options and a performance interval in the execution of any figure. In this mode, players' range of expectation and implementation is relatively short; they envision strings of mechanics that seek to address a current situation / obstacle. This corresponds to the definition of tactics in Craig Lindlay's account of gameplay gestalts, specifically when he points out that such strings of moves are "consciously chosen by a player in response to the actions of an opponent or other aspects of a developing situation" (2005).

Recent contributions on adventure games (Gazzard, 2013; Lessard, 2014) and RTS games (Dor, 2014) help us refine our understanding of concepts such as puzzle-solving and strategy building. However, in the context of this comparative system, such granularity has to be synthesized into functional definitions. In a classic contribution, Espen Aarseth highlights how games such as *Doom* and *The Speaking Clock* purposely design moments where players will be confronted to a challenge that cannot be engaged with the previously acquired cognitive toolset; progression is halted until a new solution can be devised (1999). In the context of this analytical system, "resolution" refers to the necessity for players to reconstruct an unknown and heavily scripted action sequence in order to progress. Karhulahti observes that such challenges do not entail interacting with dynamic elements (such as indeterminate configuration outcomes and game states); since these aspects are predetermined completely, "puzzles entail configuring *statics* alone" (2013:3). Retrospectively, this criterion is also useful to strengthen the distinction between execution (statics) and tactical coordination (dynamics). Resolution mode has been associated most clearly with puzzle design in adventure games. As Lessard points out, "Progress [in the genre] is structured around puzzles that are often complicated, opaque, or arbitrary, punctuating player experience with long periods of unrewarding wandering and experimentation" (2014). Along with Clara Fernández-Vara (2011), the author points out the genre's progressive turn towards a more casual game design; this hypothesis could be extrapolated to some extent by the analytical system presented in this paper. For instance, recent popular entries in the genre significantly reduce the strain of navigating labyrinthine spaces. The integration of puzzle elements in action games would be another interesting aspect to monitor through this system.

When it comes to strategy, Karhulahti's discussion appears to encompass a lot of different cases, from the performance optimization in *Tetris* to RTS and tactical RPGs (2013:6). Lindlay's 2005 definition is more specific and functional in the context of this comparative endeavour. Any figure could be modelled through the necessity to constitute "a larger scale policy or plan, consciously followed by a player in order to win at the end of a larger scale time structure" (2005). Ludiciné (2008) and Dor (2014) also highlight

the encapsulation of moves exerted in response to the depicted game state into longer action planning. Resolution and strategy-based engagement both require intense imaginative activity – or frustrating trial and error – from the players, but the former is concerned with apprehended challenges while the latter anticipates further complications. Furthermore, resolution-based challenges typically possess unique or a very limited range of potential solutions, in a design that could be seen as the epitome of progression games. By contrast, strategy games are known to create a functional performance interval and could thus be associated more closely with games of emergence; the reputation of players are often based on their ability to develop and implement novel strategies / play styles.

Finally, it is important to point out that these categories can be combined. Karhulahti insists that strategic and puzzle-based challenges also integrate time critical kinesthetic challenges quite often. Two typical cases can be envisioned from the definitions in place: time critical puzzles could be say to be a mix of both static modes of engagement (resolution-execution), while real time strategy games require action planning with dynamic elements both in the short term and long term range (strategic ccordination).

To summarize, the comparative system aims to analyze and document action modelling in video games through the synergy of five conceptual categories, for a current total of 30 key notions. One could analyse a prototypical platformer such as *Jungle King* (Taito, 1982) with little effort using such a system (figure 6).

| Interactive figures | Manipulation interface | Mapping | Feedback | Mode of engagement |
|---|---|---|---|---|
| Navigation | Generic | Tangible | Diegetic<br>Progression marker<br>Score | Tactical coordination |
| Preservation | Generic | Tangible | Diegetic<br>Signaletic<br>Failure marker | Tactical coordination |
| Neutralisation | Generic | Tangible | Diegetic<br>Progression marker<br>Score | Tactical coordination |

**Figure 6. Analysis: *Jungle King* (Taito, 1982)**

As expected, the navigation of space is clearly valued in this ludic system; each successful jump between the jungle vines in the first level are rewarded with a 100 score increase and a sound effect that seems to exceed the limits of the gameworld, while a uplifting jingle congratulates players who manage to reach the end of each level. With the same action mappings, players are required to dodge incoming alligators in the second level; they will face a clear progression setback if they are hit, and eventually the dreaded "game over" sign. Interestingly, the game integrates a "diving" health line in this level, and thus feedback is provided both diegetically and through a dynamic conventional visual indicator. Later entries in the genre are not only complicated by the integration of spatial activation and resource management – especially power-ups and collectibles – but through mechanics associated with role-playing games, such as character development. Navigation of space also acquires a puzzle-like quality in some famous series. One of the potential useful features of the analytical system is the ability to reveal and document the rate of such hybridization.

In the case of a classic adventure game such as *Dejà Vu* (Icoms, 1985), the system yields a completely different analysis (figure 7). As we noted earlier, this particular game was an early example of the "drag and drop" interface afforded by the mouse; in the context

of resource management, it acquires a corporeal quality. Activation of mechanisms in the environment could have leveraged the same potential, but instead of engaging the body in an isomorphic way, the design actually integrates the same on-screen buttons that would become common in adventure games for more than a decade ("open", "close"). Apprehension (the "examine" mechanic) triggers a textual description which highlights part of the diegesis, and this feedback acts of a summary of the actual apprehensive actions exerted by the agent; it could thus be assimilated to a form of synthetic mapping. Whereas most of the elements associated with the navigation, activation and resource management figures play a role in the elaboration of puzzles, a lot of the descriptions provided are rather trivial and seek to flesh out the gameworld. Since the game tries to mimic a sort of hard-boiled detective fiction, the option to fight characters has been added; in contrast with common action games, such a figure is mapped in a strictly punctual manner, and plays very little role in the overall challenge. The figure of communication has been largely left out here; the genre will integrate it more systematically at the turn of the 1990s, sometimes as a trivial element to be actualized in order to flesh out the gameworld, but often as a complement to puzzle-design. Interestingly, no progression markers or score have been integrated here. While the decision to exclude this numerical transcoding practice and to put the diegesis forward could be said to be typical of the adventure genre, exceptions exist – not least many classic game series from Sierra.

| Interactive figures | Manipulation interface | Mapping | Feedback | Mode of engagement |
|---|---|---|---|---|
| Navigation | Screen augmented | Synthetic | Diegetic<br>Signaletic | Resolution |
| Resource management | Corporeal<br>Screen augmented | Metonymic | Diegetic<br>Signaletic | Resolution |
| Activation | Screen augmented | Punctual | Diegetic | Resolution |
| Apprehension | Screen augmented | Synthetic | Diegetic | Resolution |
| Preservation | Screen augmented | Punctual | Diegetic<br>Failure marker | Resolution |
| Neutralisation | Screen augmented | Punctual | Diegetic | Actualization |
| Communication | Screen augmented | Metonymic | Diegetic | Actualization |

**Figure 7. Analysis: *Déjà Vu* (Icoms, 1985)**

An interesting feature of the analytical system comes from its reversibility: once the modes of engagement have been determined for each figure, one could use the resulting analysis to discuss each of the modes integrated in the game with a consistent vocabulary. *Jungle King* for instance could be defined simply as a tactical coordination game with navigation, neutralisation and preservation mechanics, while the resolution of puzzles in *Déjà Vu* blends the dimensions of navigation, activation, apprehension and resource management.

## 4 DISCUSSION – AN IDEALIZED EXPERIENCE

Ultimately, the development of HACS seeks to document the history of the video game experience through a comparative analysis of gameplay configurations inscribed within the game objects. A fundamental methodological concern might arise already from that mission statement: why focus on games when the objective is to understand the game experience in itself? What about the actual practices of players that codetermine the evolution of gameplay at any given point in history? As Sicart points out: "In the act of

playing, players will appropriate agency within the game world and behave in unpredicted ways" (2008). Interestingly, similar debates have determined the evolution of methods and schools of thoughts in literature and cinema studies. Reception theorists such as Hans Robert Jauss and Wolfgang Iser and semio-pragmatic scholars such as Umberto Eco and Roger Odin critiqued earlier theories for their reluctance to acknowledge the active role of users in the actualization of meaning. Nowadays, in the context of fan culture studies, these classic contributions also appear too far removed from the study of actual reader/viewer practices. While semiotic theories elaborated during the heyday of Structuralism seem to crush the agency of users under the normative weight of texts, institutions or psychic apparatuses, they are not incompatible with studies of actual users and meaning-making practices.

In his introduction to *A Casual Revolution*, Jesper Juul encourages scholars in the field to study both games and players in order to shed light on gaming culture; "the idea of having to choose between players and games is a dead end. Instead I take as my starting point the way games and players interact with, define, and presuppose each other" (2009: 9). In the context of this comparative historical project, a choice had to be made for the sake of efficiency and consistency. Reducing the complexity of ludic interactive design to a functional system for encoding and comparative purposes was in itself a daunting task, and it would have been difficult at this stage of development to integrate an analysis of the different performance styles and player innovations that thankfully always occur in the experience of gameplay. In a more recent effort on the formation of gaming culture in the UK, Graeme Kirkpatrick made a similar decision to focus on textual traces – in this case, the specialized press – in order to shed light on the concept of gameplay in the mind of the community. In his chapter "Approaching video game history", Kirkpatrick justifies this methodological decision through the Bourdieusian concept of habitus: "The habitus urges, interrogates, makes the object speak, while for its part, the object seems to incite, call upon, provoke the habitus" (Bourdieu, quoted by Kirkpatrick, 2015: 20). Games and players are caught in a reflexive entwinement; while formal elements or audience behavior might be put clearly at the beginning of a causal chain for some odd episodes in gaming history, it is often difficult to assert explanatory priority to the game object or its social context (2015: 75).

Choosing to study only the discourse or the game artefacts in order to understand gameplay will inevitably appear limited. In a recent contribution, Alex Wade and Nick Webber highlight the call made by the author of this paper in 2012 to integrate player histories in order to build more balanced historical narratives, and point out that the call has been unanswered at this point. However, since "games and gamers emerge together and condition one another" (Kirkpatrick, 2015:14), the objects can be said to mirror the state of the social practice to some extent, and can be used to reflect on the evolution of this practice. Further research conducted by trained sociologists on the actual performances of the games studied with this analytical system could greatly benefit the historical inspection of games and gameplay. As of now, the system presented in this paper provides an idealized view, heavily determined by the object, on the history of the practice.

One of the very concrete limitations of HACS comes from its inability to account for the complexity of the modelling beyond the interface mappings and encompassing challenges. Arguably, the necessity to navigate space with four directions or eight directions already makes a big difference in the experience of that figure. Furthermore, the amount of distinct obstacles presented in the virtual space and the relative prevalence

of these challenges in the game are other important aspects of the modelling activity that are not accounted for here. The development of these game design elements is certainly not trivial from a historical standpoint. Noting down the quantity of figure-related mechanics and obstacles in a consistent manner appears unrealistic at this point of the project. However, in order to partially account for the relative complexity of the games and the taxing nature of the challenges, it would be possible to figure out an average playtime for each of the games filed, based on publicly available traces (such as Long plays on YouTube, or data from the website howlongtobeat.com) or set up experimental conditions to establish these average playing times between specific group of players.

One might also point out that very common visual categories (such as 2D, 3D, first-person and third person configurations) are absent from the system. The opening quote from CGW highlights just how much space these aspects take up in our technological imagination; the dream of VR has been strongly associated with the idea of first-person apprehension. More recently, Klevjer insisted on the importance of 3D visuals in the elaboration of realistic agency and the modern avatar/prosthetic extension of the player (2006). The exclusion of these aspects was done on purpose; it doesn't seek to invalidate their analytical relevance, but in a context where 30 concepts cannot translate with proper accuracy the breadth and variety of participatory configurations, integrating a functional typology of visual markers would not be convenient. Furthermore, the system would automatically lean towards a certain visuocentrism, as other typologies – for spatial or temporal configurations for instance – would be as relevant to integrate. In the gameplay-centric approach put forward in this project, it seems more important to specify the types of mappings and modes of engagement associated with the figure of apprehension.

A last distinction might be functionally integrated within HACS in order to refine our comprehension of each figure: the declension of the avatorial figure. While many games minimize the audiovisual characterisation in favor of an "empty shell" that fits our common understanding of the avatar as an "extension of self" (Aldred, 2014), the concretization of interactive figures rely on much more convoluted configurations in many cases. For instance, navigation of space in classic RPGs such as *Phantasy Star* is conducted as a group of adventurers with tangible or synthetic mappings, while neutralization mechanics are split between the many different characters and occur through punctual mappings. The resulting configuration can be evocative of turn-based or real-time strategy games, but interestingly it has not been encoded through the figure of agent management in game culture. In these "commandeering" experiences, navigation and neutralization is experienced with great intensity, especially considering the encompassing strategic investment of players in these scenarios, but these figures still require the coordination of multiple agents. In this context, it might be useful to specify for each figure if agency is modelled through a singular entity or as a collective, and thus provide a better translation of the intricate nature of these genres.

In the end, it could be argued that the analytical system as a whole seeks to expose the process of avatarial configuration in games. Each game genre models human agency in a very selective manner; the system allows us to indicate how player effort is channeled through the diversity of interface design and the modes of engagement for each figure. In doing so, it can be an ideal tool to better understand which roles are offered to us in video games, and how these configurations co-evolve and influence each other throughout history. Most importantly, it can account for the complexity of the interactive language that has been developed in the history of games, gearing us up while the fascination for the ideal of VR / transparent mediation takes hold once again in the gaming community.

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