

# A Typology of Rumble

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## ABSTRACT

Rumble is a feature of most modern games published for home consoles, yet no existing studies on rumble and haptic feedback consider its various manifestations and functions in digital games. Likewise, analytical frameworks for understanding digital games tend to overlook rumble as a significant component of the game object or experience. Building on analyses of nine games from the PlayStation family of home consoles, this paper explores rumble as a two-level semiotic structure, consisting of a feedback source and (a) level(s) of operation. The two components are suggested as the base for a typology that accounts for the specific feedback source – environment, object, interface, or body – and its specific levels of operation as ludic, dramatic, technical, or an overlap of any of these. We present examples of each type to discuss the uses, applications, and limitations of the framework in relation to both analysis and design.

## Keywords

Rumble, haptic feedback, DualShock, typology, semiotics

## INTRODUCTION

In digital games, haptic feedback is most commonly understood in one of two ways: as a consequence of input of game commands, for example pressing the directional buttons on a controller to select options from a menu, or as a subset of sensations specifically generated by certain components of the physical gaming interface (Parisi 2009, 113). The latter category of feedback is most often implemented in the form of *rumble*, vibrational pulses generated by game controllers in response to a specific in-game situation – a staple of controller design since the late 1990s (Parisi 2015). Despite its continued presence in digital games and game controllers, investigations of rumble, as well as those of general haptic feedback in relation to digital games, are made difficult due to what Lipkin perceives as haptics' lack of “the complex system of signification found in discourses on visuals and sounds” (Lipkin 2013, 36). Lipkin argues that, while a player may interpret visual elements of a game (such as certain colors) in various ways and in accordance to particular cultural constructs, such

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constructs are lacking in relation to the different implementations of controller rumble, leaving players and researchers alike with an inadequate vocabulary for describing the role and operation of rumble in game play (ibid., 36-37). A further reason for this may be the close coupling of rumble to other sensory modalities of digital games in a manner that ties its semiotic identity to other channels to which it plays a secondary, additive role. For example, Parisi describes the semiotics of rumble in complementary terms, as contributing “another dimension to the player’s haptic experience with the game” (Parisi 2009, 119). According to Parisi, the “*tactile semiotics*” (ibid., italics original) of rumble are understood in connection with feedback from other modalities, contributing to the modeling and differentiation of game objects and aspects of the gameworld – for example, helping to tell apart one weapon as distinct from the next, due to different vibrational patterns (ibid., 120).

The claim that rumble may be used as a contributing modality has also been echoed in game design literature – for example, Swink claims that “haptic feedback can serve to enhance the perception that the thing being controlled in the game has a real, physical character” (2009, 162). Curiously, however, such claims have not been accompanied by more focused research on rumble. For Parisi, this scarcity of focused work on rumble reflects its status as an overlooked, presumed constant of gaming hardware (Parisi 2015).

The goal of this study is to attempt to bridge this gap in research and contribute towards a clearer and more comprehensive understanding of rumble and its utilization in digital games. This will be done by analyzing rumble in a selection of games published on the PlayStation family of home consoles. The analyses will be the fundament for a general inquiry into the uses and functions of rumble, which will ultimately lead to a typology of rumble feedback sources and levels of operation. In the following sections, we will briefly present the concept of rumble in relation to studies on haptic feedback, outline our methodology, and present the corpus of games investigated as part of the study.

## **FROM HAPTIC FEEDBACK TO RUMBLE**

A brief overview of the broader category of *haptic feedback* is needed to fully understand its use in the context of this study. Hayward et al. understand the adjective *haptic* in relation to human bodies’ “capability to sense a natural or synthetic mechanical environment through touch” (2004, 16), and as designating both *tactile* and *kinaesthetic information channels*, which often work in tandem due to their anatomical inseparability. Tactile channels convey information regarding the physical and thermal properties of the objects being touched, while in addition being involved in the transmission of “vibrotactile sensations [which] refer to the perception of oscillating objects in contact with the skin” (ibid., 21). In contrast, kinaesthetic information channels are involved in relaying information related to the state of one’s body in three-dimensional space, as well as to the motion forces the body generates (ibid.). Haptic interfaces are designed to stimulate these two groups of channels and “to make use of the extensive and exquisite capabilities of human touch, including proprioception [and] motor control” (ibid., 18). As such, the concept can be said to act as an umbrella term for a broad and varied category of devices which in some ways make use of the information channels pertaining to human touch.

Haptic interfaces have been successfully implemented in virtual environments as part of the multimodal approach to rendering properties of virtual objects (see e.g. Srinivasan and Basdogan 1997, for review). In virtual environments, haptic feedback helps to account for the complex composite dynamic qualities which make up movement. Lécuyer et al. (2004) found that self-motion perception in virtual reality (VR) environments was aided by haptic feedback, while Marchal et al. (2013), in

their review of multimodal rendering of walking on virtual grounds, conclude that the addition of haptic and auditory cues can improve the sensation of walking on natural surfaces of different kinds in virtual environments. Haptic feedback has also shown potential in the domain of *fitness games* (otherwise known as *exergames*), where kinaesthetic haptic feedback (i.e. manipulation of mechanical forces to which the player is exposed) can be used for increasing difficulty levels for more seasoned players and for improving the sense of virtual presence; as such, it may act as a good complementary modality to visual feedback (Stach and Graham 2011, 30-31), or even as its substitute for players with visual impairments (Morelli et al. 2010).

As a specific subset of haptic feedback, vibrational feedback has been shown to contribute to an increase in touch fidelity in a number of settings, being implemented in the training of surgeons and astronauts and used for computer-aided design, among others (Okamura et al 1998). Furthermore, vibrotactile feedback may also have a positive influence on user engagement with particular devices, such as digital music instruments (Marshall and Wanderley 2011). Nevertheless, when it comes to digital games, this form of feedback remains, as noted earlier, insufficiently theorized and investigated, with a few exceptions in the form of market research by gaming and gaming hardware corporations (e.g. Immersion 2010). It is our hope that the present study will go some way towards improving this situation.

## **METHODOLOGY**

### **Methodological considerations**

While the study of rumble may itself seem a niche and delimited area of research, we find it necessary to force upon the study further limitations as to the object of investigation. Most, if not all modern consoles have some sort of rumble mechanism in their controllers, and the nature of the rumble depends on the specifics of the hardware. Therefore, we have limited the study to Sony's line of home consoles – PlayStation 1, 2, 3, and 4<sup>1</sup>. In the upcoming chapter we will outline the historical development of Sony's DualShock controller, the first iteration of which was developed and released for the PlayStation 1 (Gallagher 2010). For now, it must suffice to say that Sony has been a key player in the development and popularization of controller rumble, to the extent that the brand of its controller family, the DualShock, can be said to have been built on its vibrational capabilities. This close, and for the most part stable, link between rumble feedback and the PlayStation home consoles, from the introduction of the original DualShock to present day, represents the main reason why the PlayStation console family was chosen as an area of focus.

The specific titles studied in this paper were chosen based on availability and the authors' familiarity with the games in question. As such, the procedure for selecting the games may best be understood as a non-probability convenience sampling method where "subjective methods are used to decide which elements are included in the sample" (Etikan et al 2016, 1). This poses some issues in relation to generalizability and biases. However, the study is exploratory in nature, building a structuralist framework for understanding various types of rumble based on the examples analyzed. This does not mean that the typology proposed covers all imaginable variations of rumble, nor that we manage to pick up on every single type of rumble in the games under scrutiny; rather, we aim at presenting a pragmatic overview of the various ways in which PlayStation games appear to utilize the rumble feature. No matter the size of a sample, there is a risk of missing things in studies like this, and therefore we do not claim that the typology presented is a definitive truth. Instead, we hope it offers an overview usable for scholars and designers alike for better understanding the implementation of rumble in digital games.

## Selected Titles

The titles analyzed are games from all four generations of PlayStations; two games from the PlayStation 1 and 3, one game from the PlayStation 2, and four games for the PlayStation 4<sup>2</sup>. All games chosen for the project are single player titles and of the action/adventure genre, where the player controls a single avatar seen from a third person perspective. They were played on their respective consoles using original hardware. These types of games were chosen as the rumble can be used both as a means of characterizing the game-as-heterocosm as well as functioning in relation to the game-as-system<sup>3</sup>. This results in some additional limitations to the study; it only reflects the use of rumble in a narrow category of games, disregarding large and popular categories such as, for example, abstract games, multiplayer games, and sports games.

The nine games studied are: *Metal Gear Solid* (Konami Computer Entertainment Japan 1998) and *Resident Evil 3: Nemesis* (Capcom 1999) for the PlayStation 1; *Silent Hill 3* (Konami Computer Entertainment Tokyo 2003) for the PlayStation 2; *Batman: Arkham City* (Rocksteady Studios 2011) and *Brothers: A Tale of Two Sons* (Starbreeze Studio 2013) for the PlayStation 3; and *Uncharted: The Lost Legacy* (Naughty Dog 2017), *Horizon Zero Dawn* (Guerrilla Games 2017), *God of War* (SIE Santa Monica Studio 2018), and *Marvel's Spider-Man* (Insomniac Games 2018).

## Gameplay and Rumble Log

To understand the use of the rumble in each of the titles listed above, we played each game in two different ways: a one-hour close-playing session in which all instances of rumble were carefully noted in what we call the *Rumble Log*; and general, at times multiple, longer play sessions, where special or noteworthy uses of rumble were noted. The Rumble Log reflects only the rumble experienced during the first hour of play of each title, and hence may not account for interesting examples appearing later in the games. For example, the Queen's Ruby in *Uncharted: Lost Legacy*, an item that gives off rumble cues when the avatar is in close vicinity of a hidden treasure, can only be obtained after making significant progress in the game. Therefore, the added longer play sessions function as secondary measures to help account for these special cases. Not all titles were completed, but all were played to an extent where we became familiar with the core gameplay and thus the basic and most frequent uses of rumble.

The Rumble Log is far too extensive to include in this article, and consists of many pages of thorough notes that were compared and collated into the analysis. An example of a few lines from the log is presented below to illustrate what these notes look like.

<i>Sporadic rumble when exiting doors</i>
<i>Very weak heartbeat rumble pattern when health is low (yellow)</i>
<i>Weak heartbeat rumble pattern when health is critically low (red)</i>
<i>Very weak rumble when you fire submachine gun</i>

**Table 1.** Excerpt from *Silent Hill 3* Rumble Log.

While the level of detail present in the Log is not necessary for forming larger categories, some of the finer details that could otherwise have been overlooked become helpful when comparing the different types of rumble presented in the

different games, and thus the Rumble Log has some influence on the typology after all. Moreover, the Rumble Log is used for the initial analyses leading to the typology, and it therefore functions as a pragmatic, albeit detailed, tool for accounting for the various manifestations of rumble.

Before presenting the analysis of our data set, we will first present a hardware overview of the four iterations of Sony's DualShock controllers used for the purposes of the study in conjunction with the respective gaming platforms for which they were originally released.

## **THE DUALSHOCK CONTROLLER FAMILY**

While the use of rumble on digital gaming platforms dates back to the mid-1970s (Wolf 2008, 39), the mainstream implementation of this form of haptic feedback on home consoles can be traced back to 1997. The year saw the release of the Rumble Pak, a first-party hardware accessory for the Nintendo 64 console (Watts 2013), as well as the first iteration of Sony's DualShock controller (Plunkett 2011). The original DualShock, released in November of 1997, is similar in design to the Dual Analog controller, released earlier that year; the DualShock retains the two analog sticks of the Dual Analog, but features shorter, easier-to-hold grips, as well as rumble capabilities, only present in the Japanese iteration of the Dual Analog (Walker 2012). The DualShock differs in several aspects to Nintendo's Rumble Pak. The latter is a battery-powered optional attachment for the Nintendo 64 controller and features only a single eccentric rotating mass (ERM) motor (GadgetUK164 2014); in contrast, the DualShock does not require a separate source of power to facilitate its rumble and, as its name implies, contains two ERM motors. The motors are of differing sizes, one in either grip, which allows for complex, stereo vibrational feedback (Gallagher 2010).

In the years to come, the original DualShock would prove to be a go-to controller template for Sony and its future iterations of the PlayStation console. The strong adherence to the established identity of the original DualShock is already evident in the subsequent version of the controller, the DualShock 2, which was included with the PlayStation 2. The DualShock 1 and the DualShock 2 differ minimally in terms of functional hardware, the latter only being altered by the addition of analog face buttons, and are otherwise cross-compatible with both consoles (Plunkett 2011).

Sony's first controller for the PlayStation 3, the Sixaxis, differs from its predecessors in both name and features: it is the first official PlayStation controller to employ Bluetooth wireless connectivity, analog shoulder triggers, and motion-sensing capabilities, but notably does not feature rumble feedback. At the time of release of the PlayStation 3, representatives from Sony advanced a claim that the motors needed to generate rumble feedback interfered with the motion sensor of the controller (Orry 2006), while later also citing that rumble was "the last generation feature" (cited in Klepek 2007). It was speculated that the omission of rumble was in fact due to a lawsuit between Sony and Immersion Corporation over the latter's patent on rumble feedback in game controllers; the lawsuit was settled in 2007, with the DualShock 3, an update to the Sixaxis once again featuring rumble feedback, being announced by Sony later that year (Kohler 2007). Despite the latter's inclusion of rumble motors, the Sixaxis and the DualShock 3 are visually almost indistinct, and furthermore do not represent a significant departure from the visual identity established by the original DualShock (Figure 1).



**Figure 1.** A collection of controllers for the first three PlayStation consoles. Clockwise from top left: DualShock 1 (Amos 2011a), DualShock 2 (Amos 2011b), Sixaxis (Amos 2011c), DualShock 3 (Amos 2011d).

The adherence to the visual style of the original DualShock extended to the DualShock 4 controller for the PlayStation 4 (Figure 2), which, regardless of the inclusion of a touchpad and LED light bar, among other changes, features clear similarities in terms of basic shape and button layout with the previous iterations of the controller. Though it has been characterized by some as the most drastic redesign since the controller family's inception (Mishra 2013), the DualShock 4's adherence to the design tradition established by its predecessors was emphasized by Sony in the promotional materials distributed in the wake of the PlayStation 4's release (Sony Computer Entertainment Inc. 2013), marking the evolved controller as a full-fledged member of the DualShock family.



**Figure 2.** A DualShock 4 controller (Amos 2013).

The latest iteration of the DualShock also represents the first significant change in the controller family in terms of rumble design on the level of hardware. In addition to the already mentioned minimal hardware differences between DualShock 1 and 2, it should be noted that, per Sony themselves, DualShock 3's rumble feature is exactly the same as that found in DualShock 2 (Brightman 2007). Much like its predecessors, the DualShock 4 features two vibration motors of different sizes in either handle of the controller. However, unlike the earlier DualShocks, which featured a larger analog motor and a smaller digital one, both of the motors in DualShock 4 are analog. Game developers are able to vary the vibration strength of each of the motors independently, thus providing more precise rumble sensations of a larger range (Orland 2013).

Due to the evolution in the rumble design on the hardware level, our corpus of games features four titles for the PlayStation 4, more than for any other individual console in the study. However, due to the exploratory nature and specific focus of this study, we did not conduct qualitative comparisons between DualShock 4's rumble and that of the previous controllers in the family. Instead we chose to note particular instances of rumble utilization, which we outline in the following section.

## ANALYSIS

We will now present some general examples and recurring types of rumble identified in each of the nine titles played for this project. These types will be further explored and deconstructed to form the typology and they are therefore meant as heuristic and descriptive, to be revised later. The following section contains spoilers.

### Metal Gear Solid (PS1)

This title presents an array of different types of rumble, most of which function in extending the player's sense of "being there" by means of "simulating" the forces that the avatar is implied to be exposed to. "Simulating" is noted in quotation marks as the rumble of the DualShock cannot actually simulate forces experienced by a human(oid) body; the vibration of the plastic device does not come close to the feeling of being immersed in water, taking a beating, or being next to an exploding grenade, all situations that trigger rumble in *Metal Gear Solid*. Instead, the rumble strengthens the understanding of the avatar as a prosthetic extension of the player (Klevjer 2007). In addition to the simulative effect, the game uses rumble to intensify dramatic situations. For example, the player experiences a pulsing rumble, much like a heartbeat, in two cutscenes where NPCs have seizures and die.

*Metal Gear Solid* is the only title in this study that makes an explicit self-referential, fourth-wall-breaking statement through rumble. This happens in a boss fight with the NPC Psycho Mantis, who asks the player to put the controller on a flat surface, after which Mantis purports to use his mental abilities to move it. In actuality, the in-game sequence of Mantis demonstrating his power is accompanied by three strong controller rumbles of varying length (short, medium, and long). Similar explicit references to the player occur in later Metal Gear games, and have become a staple of the series.

Common/recurring types	Entering/exiting water; elevator doors/movement; taking hits; environmental events (exploding grenade, helicopter, etc.); NPC actions in cutscenes; dramatic effects in cutscenes (heart rate, jumping, environmental events).
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Notable types/other	Vibration on/off and vibration strength test (Weak/Strong) in the options menu; self-referential rumble in the Psycho Mantis cutscene.
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### Resident Evil 3: Nemesis (PS1)

As in the other games analyzed, *Resident Evil 3: Nemesis* makes use of rumble as a way of expressing the force aspects that the avatar is implied to be exposed to, both directly (through weapon use, taking hits, and jumping from heights), but also less directly (by being in an environment under destruction). In addition to this, rumble is used to focus the player's attention on certain NPC actions, both in and out of cutscenes, such as when zombies break open a door or certain characters enter a location, the latter which is also an example of how rumble is used as a dramatic effect. Another interesting example of rumble usage is the heartbeat pattern which occurs during certain set action choices in dramatic situations where the player needs to choose their avatar's reaction from two given options. It is worth noting that there is no rumble during the FMV (full motion video) sequences in the game, although the events presented therein are frequently of the same type which, during normal gameplay or in-game cutscenes, trigger rumble.

Common/recurring types	Environmental event (explosions, debris, etc.); weapon use; taking hits; death; stepping down from high surfaces; NPC actions in the environment during gameplay/cutscenes; action choices; dramatic effects in cutscenes (appearance of NPCs, environment).
Notable types/other	Vibration on/off in the options menu.

### Silent Hill 3 (PS2)

*Silent Hill 3* is conventional in its rumble design. Rumble is used primarily for indicating whether a melee attack is successful in hitting the enemy, whether the enemy is successful in getting a hit in, and when using firearms. Furthermore, a very weak to weak pulsing rumble pattern similar to the rhythm of a heartbeat is used to indicate low and critically low health, respectively. An occasional rumble is triggered when entering or exiting a location, but this rumble seems sporadic and random and we were unable to observe any specific logic of when it was triggered.

Common/recurring types	Successful melee attacks (hitting something); taking hits; health indicator; environmental events (train approaching); dramatic effects in cutscenes (environmental events); firing weapons; reloading weapons; entering/exiting locations (sporadic).
Notable types/other	Vibration strength settings in the options menu (Soft, Normal (default), and Hard; can be changed mid-game).

### Brothers: A Tale of Two Sons (PS3)

*Brothers: A Tale of Two Sons* utilizes the rumble in atypical and innovative ways. There is no rumble for the initial 30 minutes of the game and it is generally used sparingly throughout. The first occurrence of rumble is in a playable sequence where a giant lands next to the brothers after a long jump, functioning both as an environmental rumble as well as an indicator of NPC action. Similar types of rumble occur throughout the game as the avatars encounter large creatures, and in a specific instance the rumble gains a ludic function: when having to escape an invisible giant, the strength of the rumble that occurs every time the giant takes a step indicates its locations and proximity to the player. In the final section of the game, after the death of the older brother (one of the two avatars), using the older brother's interaction button on the controller causes a continuous strong rumble. Following the use of the late older brother's interaction button, short and sporadic rumbles occur, seemingly only on one side of the controller – the side in which the younger brother's action button is located. This dramatic and atypical use of rumble is unique for this game and appears to be designed to trigger an affective player response.

Common/recurring types	Environmental events (structures collapsing, etc.); NPC actions during gameplay (movement); dramatic effects in cutscenes (taking hits, environmental events); dramatic effects during gameplay (avatar actions in the final stage of the game).
Notable types/other	Affective rumble during late gameplay.

### Batman: Arkham City (PS3)

While most types of rumble in *Batman: Arkham City* seem rather conventional and appear in many of the other titles in this study, three observations make the game stand out from the rest. The first is an example from a cutscene where dramatic rumble is used to mark the switch between the two personalities of the NPC Two-Face. A second example is the lack of rumble when Batman lands from jumps from greater heights. This lack of rumble is also found in *Spider-Man* and to some extent in *Horizon Zero Dawn* (when playing child Aloy), and contributes to an unusual sensation of lightness. The lack of rumble is in marked contrast to the otherwise rich and detailed rumble profile of the three titles. A third interesting example is the use of rumble during off-screen events in the very beginning of the game where a white screen appears in combination with a strong rumble as Bruce Wayne undergoes electroshock torture.

Common/recurring types	Off-screen events; environmental events (capsule landing); taking hits; successful attacks and counter-attacks; NPC actions during cutscenes; dramatic effects in cutscenes (environment, character-specific, jumping); weapon use.
Notable types/other	Lack of rumble when landing from greater heights.

### God of War (PS4)

Like *Batman: Arkham Asylum*, *God of War* includes a very rich and detailed rumble profile where most actions are associated with a particular type and strength of rumble. The linear opening with limited interaction presents various types of environmental rumble, as well as rumble used for dramatic effects (particularly in an instance where Kratos manipulates a massive tree trunk) which set the stage for the abundant rumble throughout the game. We did not note any particularly remarkable or distinctive rumble examples, yet the DualShock 4 controller appeared to facilitate an even more detailed array of types of rumble deployed in the various types of movement and actions performed by the avatar.

Common/recurring types	Environmental events (tree falling, gates closing); picking up items; jumping; falling; climbing; interacting with/using items (chest, health stone; axe); rowing; taking hits; parrying; attacking; NPC actions during gameplay; NPC actions during cutscenes; dramatic effects in cutscenes (NPC actions; environmental events)
Notable types/other	Vibration strength settings in the options menu (scale from 0 to 10 (10 is default)).

### Uncharted: Lost Legacy (PS4)

While *Uncharted: Lost Legacy* implements various types of rumble that can be found in many of the other titles explored in this study, two particular examples stand out. The first is related to the previously mentioned Queen's Ruby, an optional item that the player can obtain roughly halfway through the game that, once activated, triggers rumbles when in proximity of a treasure, causing the player to engage in a Marco-Polo-like game in order to find it. The second example is found when using the lock pick to open locked doors and weapons crates. Here, the player needs to rotate the left controller thumbstick to move the lock pick to the correct position, the proximity to which is indicated via rumble. The lock picking vibration is turned on by default in the game's options menu, but it may be switched off by the player.

Common/recurring types	Dramatic effects in cutscenes (NPC actions on avatar, interacting with key objects); taking cover; attacking; taking hits; environmental rumble (explosions, aircraft attacks); jumping; falling; sliding; health indicator.
Notable types/other	Lock pick controller vibration setting (On/Off); Queen's Ruby (treasure proximity rumble); lock picking (rumble as indicator of correct lock pick position).

### Horizon Zero Dawn (PS4)

*Horizon Zero Dawn* was the game that initially sparked our interest in rumble. This is due to the observation that the rumble profile notably changes when Aloy grows from child to adult. As a child, only few movements trigger rumble: jumping/falling from greater heights, sprinting and jumping, and rolling. This stands in contrast to the

rumble profile of movement for adult Aloy, where regular jumps, slides, and climbing result in rumble of varying strength. The game also presents very detailed rumble profiles for each of the weapon types that become available throughout the game, and as with *God of War* and *Batman: Arkham City*, the game presents many different types of rumble where most avatar actions and many NPC/enemy actions are associated with a distinguishable type and strength of rumble.

Common/recurring types	Environmental events (bats in cave, rocks falling, etc.); jumping; falling; climbing; sliding; healing; NPC actions during gameplay (movement, killing enemy NPCs, performing area-of-effect attacks); aiming; weapon use; melee attacks; actions in HUD (using the Focus); taking hits; health indicator.
Notable types/other	Rumble profile for child Aloy and adult Aloy differ (e.g. adult Aloy has rumble on jumping, child Aloy does not).

### Marvel's Spider-Man (PS4)

Perhaps due to gameplay similarities, the rumble in *Spider-Man* resembles to a great extent that of *Batman: Arkham City*, the primary difference being that of the detail of rumble afforded by the DualShock 4 controller. The primary action of swinging from building to building demonstrates the refined rumble of the controller and exhibits attention to rumble design. The rumble for each swing correlates with the length and speed of said swing, contributing to the sense of prosthetic extension, as previously discussed in relation to *Metal Gear Solid*. However, certain actions, in particular jumping and landing after a long jump or swing, do not trigger any kind of rumble, contributing to a feeling of lightness. The game frequently uses rumble as a dramatic effect in cutscenes, primarily in relation to actions in the nearby environment, as well as in gameplay, for example to indicate the switch between regular gameplay and combat, or when activating Spider Sense.

Common/recurring types	Environmental events (phone vibration); dramatic effects in cutscenes (jumping out of the window, truck crashing); switching from cutscene to gameplay; swinging; jumping post-swing; Web Zip; dramatic effects in gameplay (combat begins, Spider Sense); attacking; taking hits; health indicator.
Notable types/other	Vibration on/off in options menu.

### TOWARDS A TYPOLOGY OF RUMBLE

We see in many of the examples above that the rumble can be separated into two distinct dimensions: the *feedback source* – where the rumble originates from, and the *level of operation* – the purpose of the feedback. The structure is inspired by traditional semiotics and the idea of there being different orders or representation (Barthes 1983 [1967]; Hjelmslev 1963). The study of semiotics often refers to these two levels as *denotation* and *connotation* respectively. Denotation is the first order of

representation, “the definitional, literal, obvious or common-sense meaning of a sign” (Chandler 2007, 137), whereas connotation, the second order of representation, is “the socio-cultural and ‘personal’ associations (ideological, emotional, etc.) of the sign” (ibid., 138).

Following the idea of orders of representation, we suggest that rumble in digital games can be explored using a similar line of thinking. The first order of representation is that which we have termed the feedback source – the specifics of the cause of the rumble. In a game setting, we see various causes for rumble (see Figure 3 below), as exemplified in the brief analyses of the games above. The feedback source may be the *environment* itself, for example when the avatar is located close to explosions, falling trees, or helicopters taking off or landing. In these cases, the feedback source is an entity in the game environment and the rumble contributes to the sensation of the avatar being exposed to certain forces in its surroundings. The feedback source can also be a specific *object* manipulated by the avatar, for example a weapon being fired or a chest being opened. Another source of rumble feedback is the *interface*, most often encountered in extradiegetic rumble settings menus or when performing a vibration strength test (like in *Metal Gear Solid*), but also in intradiegetic situations, such as when marking enemies using the Focus in *Horizon Zero Dawn*. Finally, the broadest category of feedback sources is that of the *body*, understood broadly as encompassing both avatars and NPCs, whether humanoid or not. This category is further divided into three sub-categories: *kinaesthetic* feedback sources, such as movement, including sprinting and jumping, unarmed attacks, and climbing; *physiological* feedback sources, as for example heart beats and emotional or physical shock; and *extrasensory* feedback sources, like telekinesis or Spider-Man's Spider Sense.

**Environment**

Explosions, falling trees, helicopters landing

**Object**

A weapon being fired, a chest being opened

**Interface**

Extradiegetic rumble settings menus, vibration strength test, HUD actions

**Body**

Encompassing both avatars and NPCs

- **Kinaesthetic**

Movement (sprinting, jumping), unarmed attacks, climbing

- **Physiological**

Heart beats, emotional or physical shock

- **Extrasensory**

Sixth-sense, telekinesis

**Figure 3.** Feedback sources.

In addition to being linked to different sources or causes, we can also see that rumble may be utilized for different purposes, leading to a second level of classification in the present typology (see Figure 4 below). Rumble may be used to as a form of feedback related to the game's *ludic* systems, as a method of indicating system states or actions, such as, for example, when using the Queen's Ruby to locate a hidden treasure in *Uncharted: Lost Legacy*, or when using the Focus to mark enemies in *Horizon Zero Dawn*. Another use of rumble is for *dramatic* purposes; in this case, rumble is used to heighten the sense of narrative or interactive realism, or to contribute to characterization. Examples of this kind include the vibration pattern of Peter Parker's phone in the opening cutscene of *Marvel's Spider-Man*, or that which appears when Bruce Wayne undergoes electroshock torture off-screen in *Batman: Arkham City*. Finally, rumble may also appear as *technical* feedback, used to

demonstrate or adjust the functionality of the rumble hardware, such as when testing the vibration strength in the options of *Metal Gear Solid*.

**Ludic**

Used for indicating system states or actions

**Dramatic**

Used for heightening the sense of narrative or interactive realism

**Technical**

Used for demonstrating or adjusting the functionality of the rumble hardware

**Figure 4.** Levels of operation.

An important point in relation to the different levels of operation of rumble is that they are not mutually exclusive categories. Indeed, in many cases, it is very difficult (and arguably not pragmatic) to categorize instances of rumble as representing feedback at only one level of operation. Most frequently encountered examples of rumble – such as feedback connected with movement, with melee and distance combat, or with weapon use – both convey information about the game state and contribute to a higher degree of realism of the diegetic world. One such example is the heartbeat rumble pattern which accompanies low and critically low health in *Silent Hill 3*; here, the rumble feedback is used both to indicate the low remaining health of the avatar and to heighten the dramatic tension of the dire situation in which Heather, the game’s protagonist, finds herself. Therefore, though we can analytically distinguish between different levels on which rumble operates and use them to describe particular instances of rumble, it should be noted that, in practice, many of these instances represent complex signifiers, used for more than a single purpose.

## **USES, APPLICATIONS, AND LIMITATIONS**

The typology presented is first and foremost a vocabulary for describing various types of rumble. Having reviewed literature on rumble and haptic feedback in relation to games and game studies, we found this type of vocabulary missing. We believe that the suggested terminology can help scholars describe the specifics of rumble in digital games, which may increase the likelihood of rumble being considered a part of more game analyses, including, for example, close readings.

The terminology suggested is structured around a specific way of thinking rumble in a hierarchical relationship of first order and second order of signification. This structure is based on the core principles of semiotics. The typology is built on observations from a selection of games and hence rooted in empirical data. Yet, the typology, along with its terminology, is inherently based on the structuralist and to some extent formalist way of understanding representation inherent in the works of, for example, Barthes and Hjelmslev. In this is also an explicit counter-argument to Lipkin’s statement that haptics cannot be understood as a complex semiotic system akin to visuals and sound. Here we must point out that we do not conceive of rumble as unrelated to other types of feedback generated by a game, including that communicated by the visual and audial modalities. Instead, the level of operation of the specific case of rumble can be understood only in context, and we therefore do not treat it as an independent semiotic system.

An alternative way of deriving an understanding of rumble would be to study player responses and have players report back on their experience with rumble in different games and instances of said games. Such a method would give a better understanding of the experienced rumble, whereas our typology is intended as a theoretical tool for analysis and for facilitation of discussion regarding the role and function of rumble.

As previously argued, there are certain limitations to the study, as it encompasses a limited selection of games and close-playing of only the first parts of the titles included. However, we found that similar types of rumble were used in each of the game titles, and thus we are confident that the typology accounts for some of the most frequently encountered types of rumble. Special outliers and borderline cases may not fit neatly into the feedback source categories, and may present new levels of operation. Yet, rather than seeing this as a fault in our typology, we see it as a necessary premise of any structuralist framework. Perhaps thinking outside the boxes that we have observed in the games, and thus documented in the typology, will also be helpful for game designers, by inspiring them to incorporate rumble in new and innovative ways.

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## ENDNOTES

<sup>1</sup> In addition to these four, Sony has also released two handheld consoles - the PlayStation Portable and its successor, the PlayStation Vita. However, since neither of these natively includes rumble feedback hardware, they were excluded from the present study.

<sup>2</sup> Only a single game for the PlayStation 2 console was included in the study due fact that the controller, as will be noted later in the paper, shares the same rumble technology with the DualShocks 1 and 3. Similarly, we included more PlayStation 4 games due to advancements on the level of rumble hardware design incorporated into the DualShock 4.

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<sup>3</sup> The terminology here is borrowed from Vella's (2015) distinctions, used to account for respective the avatar (in system) and character (in heterocosm).