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On the ontological status of musical actions in digital games

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Introduction: an example of musical action in digital games

Nearly every contemporary digital game makes use of audio. More or less complex musical compositions are included in a variety of fashions, alongside "sound effects" - sounds that are designed and assembled without necessarily featuring a prominent musical nature. Game players take action within these digital acoustic environments, perhaps winning or losing a given game, and eventually changing their game state. They are also in control of a certain portion of the sounds that the developers prepared for them. Quite simply, by pushing buttons on input devices, sounds are triggered. By using attentive listening in digital game environments, the players make sense of these spaces. This process of sonic emission, and the cognitive efforts required to make sense of it, is fundamental in order to play digital games.

This paper addresses sound and music in games from this perspective: as a digital game player, I am afforded the possibility to juxtapose substantial acoustic segments, effectively determining the resultant acoustic output of every session. When it comes to address the aural experience of digital games, this fundamental aspect is perhaps less considered, with most of the attention being devoted to the nature of musical compositions in digital games. For example, the tunes Koji Kondo composed for Super Mario Bros. (Nintendo 1985), the first title in the popular franchise, are part of the collective pop culture imagination. Schartmann (2015) devoted an agile book to the game's soundtrack. In this work, the author praises' Kondo's eclecticism: the "Overworld" track features "a chord more reminiscent of a jazz classic or a Debussy prelude than a video-game track, while the "Underwater" waltz is a perfect accompaniment to Mario's gentle swimming, exemplifying "Kondo's music-as-movement philosophy" (Schartmann, 2015).

Kondo's compositions are indeed a milestone in digital game audio. Yet, when I recall what was the most distinguished audio feature of Super Mario Bros., I personally bring up a different example. I remember my younger self playing the game, and being fascinated by the glissando sound of Mario's jumping. As noted by Whalen, "Mario's leap has a pleasant sound (i.e., it does not use minor or diminished intervals), not only because we are supposed to identify favourably with Mario, but also because a typical game player will likely hear the same sound repeated hundreds of times in a dedicated period of gameplay" (Whalen, 2004).

Eventually, my fascination with that specific sound would suggest me to just jump on the spot, repeatedly, as fast as possible. While doing that, I would disregard, for a moment, all the challenges of the game - for instance, completing the level in a given amount of time. By jumping increasingly faster, I would notice that the sound was actually being reproduced in a different fashion. The game engine would cut the final part of the glissando, effectively eliminating the final decay of the sound. If we think of the jump sound as a smooth "*boing*" sound, the result of my actions was a frenetic boi-boi-boi-boi-boi followed by a final, complete "boing", when I was finally done pushing the jump button as fast as a I could. Amused by my discovery, I would try to catch my older sister's attention in order for her to witness my humorous performance. This little, somewhat subversive and exhilarating moment is one of the fondest memories I have of the game, probably because it allowed me to do something different with that "pleasant sound", turning it into the material for a rather cacophonic moment. It is also important to note that all the actions I just described happened over the sonic backdrop described by Schartmann – that is, the famous "Overworld" tune.

How could my impromptu actions be described? On one hand, I was momentarily disregarding the objectives that the game designers were telling me to reach – completing the course as fast as possible. Also, I was effectively retooling the game to put on a comedic performance for an audience (albeit a small one). This is far from a rare occurrence: Švelch (2014) describes the exploits of various players he labels as "mischief makers". These players take "advantage of the capacity of video games to generate unexpected coincidences, collisions, and nonsensical situations [and] utilize them for comical effect". In these cases, "neither the game designer nor the player were fully in control" (Švelch, 2014). Moreover, Flanagan describes various instances of "critical play". The concept includes acts in which the players "occupy play environments […] in order to question an aspect of a game's "content", or an aspect of a play scenario's function that might otherwise be considered a given" (Flanagan, 2009). In this regard, playing critically means to perform in a subversive fashion in the context of a given situation imbued with semiotic meanings, expectations, and appropriate behaviours.

In both cases, the term "playing" seems to describe a rather broad range of actions, within varying circumstances, but happening in digital environments. However, unlike the examples brought up by Švelch and Flanagan, my example with Super Mario Bros. concerns specifically the acoustic aspect of interacting with digital games. The sound I ended up producing was the result of the actions of different actors. On one hand, the audio designers and programmers have coded the characteristic glissando. During a play session, it is then synthesized by the Nintendo Entertainment System integrated audio processing unit, the 2A07, "a versatile instrument that generates […] every percussive shuffle in Super Mario Bros." (Altice, 2015), as well as any sound present in any NES game. Finally, the result is actually triggered in its final form by the player (in this case, myself). As such, the audio designers did not necessarily predesign the "boing" sound deprived of its decay part, but it was however a potentiality in the range of possible sonic outcomes afforded by the 2A07 chip.

This example shows certain behaviour, action or set of actions that can be considered as musical; in fact, for a moment during gameplay my actions seemed to primarily have a distinct musical connotation. Such an occurrence is probably under-analysed within Game Studies. Specifically, it has not been identified in digital games that are not overtly pertaining to music, such as "music games". In the next section, I will present the methodological challenges that the analysis of musical performances in digital games present. Also, I will draw a parallelism within musicology, in order to situate this problem within the debate concerned with the nature of musical actions.

The theoretical tools in game studies: the text paradigm

Digital games have been considered as a multi-media: a new phenomenon that incorporates materials and motifs from previously existing medias. As described by Aarseth, "games became subject to humanistic study only after computer and video games became popular […]. These [digital] games, unlike traditional games or sports, consist of non-ephemeral, artistic content (stored words, sounds and images), which places the games much closer to the ideal object of the Humanities, the work of art. Thus, they become visible and textualizable for the aesthetic observer, in a way the previous phenomena were not" (Aarseth, 2003).

The idea that a digital game can be understood as a "text", or a piece of work to be analysed, is also reflected within the sub-field of game sound studies. In a sense, a segment of the research is focused on sound *as found* in digital games. This perspective focuses on "music" by considering it solely as a piece of work, without addressing its performative aspects and connotations. For example, Whalen clearly states: "by "videogame music" I generally mean the parts of the soundtrack that are pre-composed and recorded for playback to accompany specific locations or events in the game" (2004). Music is considered as an object that has been pre-manufactured, and subsequently eventually experienced during play sessions. It is also presented as an accompaniment to other actions, presumably directly related with traditional game functions (winning, losing, competing, and the like). Similarly, In "Understanding Digital Games" (Egenfeldt-Nielsen, Smith, & Tosca, 2008), the authors categorize the different aural elements that are part of the "sound landscape" of digital games. Music, which is found among other components, is considered as "the soundtrack to the game. Music is usually used to add to the atmosphere of the game (or set the mood), but can also be directly tied to the game world". The terminology at use here - specifically, the term "soundtrack" - is clearly derived from film sound practice, and thus contiguous with concepts from media studies. Music is understood as being on a track: a pre-composed linear path. However, digital games are considered to differ from movies in that "videogame designers typically want the music to adapt to present circumstances of the game" (Egenfeldt-Nielsen, Smith, & Tosca, 2008). This can be obtained by modifying certain tunes to reflect in-game situations. Other options are also possible: "certain music files may be split into various sections and looped for various periods of time" (Egenfeldt-Nielsen, Smith, & Tosca, 2008).

These techniques refer to the structural peculiarity of the musical works composed for digital games. Game sound studies have theorized different approaches to pin down what constitutes "non-linear" in relation to sound and music, clarifying a terminology mostly imported from audio design and composition.

According to Collins, "video game sound is often referred to in a vague manner as "interactive", "adaptive" or "dynamic" (2007). Moreover, "the non-linear aspects of games audio, along with the different relationship the audio has with its audience, poses interesting theoretical problems and issues […]. Dynamic audio is audio which reacts to changes in the gameplay environment or in response to a user" (2007). Subsequently, Collins further divides dynamic audio in two categories of game audio.

The first is interactive audio: "sound events occurring in reaction to gameplay, which can respond to the player directly" (Collins, 2007). For example, if the player pushes a button, the character on screen performs a given action such as swinging a sword, producing a "swoosh" sound.

The second example is adaptive audio: sounds that change not in reaction to some direct user input, but to changes in the game environment. "An example is Super Mario Bros (1985), where the music plays at a steady tempo until the time begins to run out, at which point the tempo doubles" (Collins, 2007).

If this account considers audio in general, without necessarily discerning in between the traditional dichotomy of music and sound effects, Kaae focuses "on the compositional requirements of dynamic music" (2008). Providing materials for musical content of digital games problematizes the traditional conventions of "linear film music" composition. Once again, the issue of non-linearity is identified as fundamental in game music analysis and production. This is understood as a challenge for the composition of substantial, presumably long, and relatively complex musical pieces to be used as content for digital games. Kaae refers to "linearity" in music as a series of possible musical structures commonly used in compositional practices, which generate archetypal forms and repetitions. Specifically, "cyclic form often takes place at many levels in the music, from the overall form of the musical piece down to each individual phrase" (Kaae, 2008). The composer willing to use cycling forms in musical works for digital games has to take into account that such cycles might be broken by various kinds of game occurrences (player's action, in-game event, etc.), as previously described.

Interestingly, Kaae proposes the hypertext format as an example of a multi-linear structure, comparing it to dynamic music compositions. In a hypertext, different nodes can cause a different assemblage each time the user intervenes. Once the node is accessed, the text in that node has to be read in a linear fashion, before proceeding to the next node.

For Kaae, it is possible to use a similar structure to compose dynamic music: "a piece of music can be split into smaller pieces, for example a verse and a refrain […]. It should also now be easy to see the correspondence between phrases, verses, refrains and so on in music and the nodes in a hypertext, and this is exactly how dynamic music is often build […]. Small pieces of music are put together to form a hyperstructure" (Kaae, 2008).

In this account, the paradigm of the text – and of the hypertext – is explicitly referenced. Musical compositions in digital games are understood as "musical hypertexts," so to speak. However, as previously discussed, the hypertext functionalities are generally insufficient to describe digital games, failing to take into account cybertextual implications. Understanding musical composition in digital games as musical hypertexts prevents an analysis of the cybernetic feedback loop they are part of: the player activity is excluded.

In fact, Kaae is considering the "listener," rather than the digital game player: "No matter how the music is organized, it will always appear to be linear to the listener in a structural sense, but this is not necessarily the case to the composer or the practicing musician, as the manuscript for this music may very well be non-linear".

This description underlines the importance of the "manuscript" as the primary musical object to be produced and analysed, rather than its manifestation in a given performative situation. In the case of a digital game, however, the player will not be just a listener, such as a spectator sitting in a concert hall or enjoying a record at home. In the cybertext, players exert ergodic actions to traverse the text, and their ability to listen and react to musical cues structures the final musical output. The player, therefore, is not only involved cognitively in interpreting and understanding music, but actively reconfigures its sections through ergodic action.

On the text paradigm in musicology

In order to study and build an understanding of the musical implications of ergodic action, it seems natural to import theoretical tools from the field of musicology, creating a musicology of digital games, or perhaps a ludo-musicology. In order to do that, it is necessary to address the following question: what is the subject matter of musicology? In a basic, self-explanatory understanding, we could easily claim that musicology studies music, and move along. It is however a discipline based in the Humanities, therefore placed in the group of disciplines previously considered by Aarseth. Contiguous disciplines of musicology include historical musicology, music theory, philosophy of music, and more.

The musicological method, and the very nature of the discipline, has however been fiercely criticized. "Musicology is, almost by definition, concerned with Western classical music, while other musics, including even Westerns popular musics, are dealt under the rubric of ethnomusicology" (Small, 1998). This creates a methodological conundrum: musicology

claims to study music, but continuously refers to "music" as only a segment of the many possible musical expressions. The consequences are that "the word music becomes equated with works of music in the Western tradition" (Small, 1998).

Small's concerns are echoed by Blacking, who criticized the structural division of ethnomusicology and musicology. If all those "other" musical practices are meant to be the subject of ethnomusicology, "music" is therefore implicitly "more modestly redefined as a system of musical theory and practice that emerged and developed during a certain period of European history" (Blacking, 1973).

Authors within philosophy of music have also reached similar conclusions. "Anglophone philosophy of music [...] has seen music as an aesthetic practice centered on the creation of objects - musical works of art. […] The view tends to favour an approach featuring the inspection and analysis of the aesthetic properties of the musical object, and to correspondingly neglect questions about the social, political, and cultural aspects of musical practice" (Alperson, 2018).

This is a crucial passage, because it clarifies that the boundaries of enquiry are not solely determined by geographic, historic, or ethno cultural delimitations. Small identifies problems of reification in musicological enquiry, somewhat echoing what has been previously discussed with regards to the problems of the text paradigm within game studies. The object of research of musicology, quite literally, has become an actual tangible, identifiable text: the work of music.

As seems self-explanatory, "work of music" should not be equated with "music". It could rather be understood as a subset or a component of a larger group of objects and activities. The musical work is, in this context, largely understood as the composition, or the musical score, as Small doesn't consider remediations or documents such as musical recordings. In this regard, the action of composing a musical work sits together with performing, listening, dancing, and other actions that are awarded musical meaning.

Small, therefore, contests the implicit assumption that "musical meaning resides uniquely in music objects" (Small, 1998). The focus on textual analysis, understood in its literal sense as the musical work - or even more explicitly, as the musical score - denotes a minimal concern toward the creative importance of the musical performance. The Western classical tradition is a "literate musical culture"; the ideal function of the performance is to deliver the content of a musical work. Small argues that the relationship between composition and performance should be reversed and is adamant in stating that "performance does not exist in order to present musical works, but rather, musical works exist in order to give performers something to perform" (Small, 1998).

Small concludes by effectively redefining music, from an object to a group of activities. "To music is to take part, in any capacity, in a musical performance, whether by performing, by listening, by rehearsing or practicing, by providing material for performance (composing), or by dancing" (Small, 1998). These actions, and more, are to be considered as “musicking”.

This description of the term musicking helps in narrowing down some if its implications. The musicking concept is in fact ostensibly wide, multi-faceted, and sometimes provocative. The musical performance, and the vast web of relationships that it shapes, is at the center of Small’s musicology, as opposed to the analysis of the musical text alone.

Musical actions in digital games I: prominently musical games

As discussed so far, understanding digital game music solely as a more or less complex form of musical hypertext seems to prevent a deeper understanding of the different musicking practices possibly involved. In discussing the intrinsic complexities of digital game musical texts, we might fall in what Alperson considers as *spectatorialism*: “an ontological and evaluative position that concentrates on the more or less intrinsic aural qualities of musical properties available to the listener” (2018). If that is the case, it becomes evident that the musicology of digital games should not focus exclusively on music as an object within the digital game multimedia package, but rather as a complex knot of actions and actors. As mentioned, Kaae and Collins, and of course many other authors have presented compelling evidence of the musical nature of digital games. It is clear that digital games do contain peculiar musical works. At the same time, even on a superficial analysis, it appears clear that players of digital games understand, interpret, react to, trigger, structure, and perform game music. The game players are at the center of a cybernetic loop that involves them cognitively and physically. Music is intertwined with that process and is one of the key aspects of play experiences. Studies of digital game sound and music propose different approaches to unravel this problematic knot.

What is the musical nature of player’s actions? To find an answer to this question, I will look into previous researches and a few different digital games.

Particularly apt examples to focus on are the popular music-based games Guitar Hero (Harmonix/RedOctane, 2005) and Rock Band (Harmonix, 2007). These games started highly successful franchises, spawning numerous iterations and selling more than 46 millions units worldwide (Miller, 2012). The original Guitar Hero (2005) contains re-recorded versions of popular rock, punk, and metal songs, in which the player is responsible for the progress of the guitar track. The game is played with a special “guitar” controller: by pushing the right fret button at the right moment, in conjunction with the strum bar, the player triggers a short section of the guitar track. Failing to do so will inhibit the playback of a segment of the recording. The acoustic output of a flawless game session, instead, will consist of a faithful rendition of the song. On top of that, a number of other sounds, such as in-game crowd reactions and other feedback sounds, are added.

It seems unproblematic to place the player's actions in these cases within the framework of musicking. The performative action involved seems directly related with that of performer of music – an instrumentalist of sort. However, Miller (2012) problematizes the matter, inscribing the musical interaction of Guitar Hero and Rock Band in a long history of technological consumption, started by the widespread diffusion of audio recording and playback technologies. "Ever since it became possible to reproduce recorded performances in domestic setting, people have been engaging in musical practices that fall between the poles of passive listening (if there is such a thing) and *musica practica*" (Miller, 2012). An example of this is are so called music-minus-one recordings, commonly used as practice tools for different instruments and music genres. Karaoke, which also subtracts one performer from a recorded musical piece, applies a similar technique, but in a different, possibly more playful context. In this sense, Miller structures a media archaeology of Guitar Hero and Rock Band, examining previous forms under which similar cultural modalities were expressed and satisfied (Huhtamo, 2005).

These games have, however, instigated a new phenomenon: "[The games] let players put the performance back in recorded music, reanimating them with their physical engagement and adrenaline. Players become live performers of prerecorded songs, a phenomenon I refer to as "schizophonic performance" (Miller, 2012).

"Schizophonia" is a term that has been introduced by Schafer to indicate "the split between an original sound and its electroacoustic reproduction […]" (1994). It originally implies a negative connotation, as it serves to "dramatize the aberrational effect of this twentieth-century development" (1994). Never before, in fact, a sound event could have been stored on a medium and reproduced in completely different contexts.

In Guitar Hero and Rock Band, players "serve as gatekeepers for someone else's musical performance" (Miller, 2012). Schizophonia is, however, an incredibly pervasive phenomenon, and its implications have been augmented by the cultural implications of digital technologies on the soundscape (Truax, 2001). As such, it is possible to think of other examples that could arguably be considered schizophonic performances. For example, many elements of DJing practices have to do with performing, in a live setting, recordings produced by other artists. This is however commonly obtained by modifying elements of such recordings, for instance adding audio effects, samples extracted from other audio sources, or most notably by juxtaposing or "mashing" different recorded tracks to create a new mix.

By contrast, the schizophonic performance of Guitar Hero and Rock Band appears to be more self-contained: rather than producing new renditions or combinations of existing tracks, the games mostly use these tracks as non-ephemeral content for a digital game. These performances are hence peculiar in that they are characterized as ergodic performances: the player has to exert non-trivial effort in order to traverse the game text.

The ergodic element in Guitar Hero and Rock Band can therefore be understood as the unique variable that differentiates these performances from other examples of schizophonic performances. Unlike DJs, players are in fact traversing an artefact that has already been pre-composed; thanks to their effort, they will be able to access other parts of that artefact. In Guitar Hero, for instance, the players have to proceed through a song: failing to do that would preclude access to other parts of the game, such as new levels, tracks, and other forms of content. This is not the case in a DJ set: the performative practices that we mentioned before are not intended as an effort to traverse an artefact (or fail to do so).

The idea of schizophonic performances shows a possible modality through which digital game players interact with musical elements, and in turn, exert musical action. The players' musicking action at stake remains close to that of a performer of a musical composition, however the action can be further described by considering its ergodic and schizophonic nature.

Musical actions in digital games II: adaptive musical systems

If digital games that are prominently musical are natural choices for analysis, musical action in digital games can however be also registered in games that are not immediately identifiable as related with music.

As mentioned, Collins (2007) identified in "adaptive music" a musical composition prepared in order to work with a game engine that will trigger different parts in response to the action of players or other in-game agents. Adaptive musical compositions can be found in games as old as Super Mario Bros., up to contemporary examples.

Adaptive musical works have also been analysed for their implications in relation the notion of diegesis. Imported from film studies, diegesis has been adapted in different ways to digital games. This has brought to analyses of players' action in relation to their diegetic placement (Collins, 2008); (Grimshaw & and Gareth, 2007); (Jørgensen, 2007). For instance, a player can act within the diegetic space following extradiegetic musical cues such as "background music", short-circuiting the supposed clear cut distinction of diegetic space (Jørgensen, 2007).

A full discussion on the applicability of the notion of diegesis to digital games is beyond the scope of this paper; however, I intend to note that these diverse examples point out to a similar occurrence. In all cases, player's actions have often contingent musical implications. Players, willingly or less so, control parts of the musical content, juxtaposing them during gameplay. A valid example can be found in The Legend of Zelda: Breath of the Wild (Nintendo 2017), in which different musical cues and segments are triggered according to the player's movements on the game map. For example, approaching a group of enemies will

trigger a specific tune, which has been associated with combat. This will in turn mute, for the time being, the standard musical accompaniment associated with a given in-game location.

The adaptive system has different functions directly related with gameplay actions, alerting the player of immediate danger, while providing a musical commentary to specific game situations. From a musicking perspective, however, it has to be noted that the player is an actor in a form of musical performance: in fact, the final musical output that is actualized during a given play session is directly correlated with the player's activities. Even if those activities, such as moving and approaching a group of enemies, are not immediately musical, musicking is in action since the player is juxtaposing musical segments, producing and structuring a certain acoustic output. As such, in this case, the action is not finalized toward musical results, but is however imbued with musical meaning, since the feedback loop typical of digital games happens to be permeated by musical features.

This understandings of musical action aims to be consistent with the musicking concept. Small, in fact, does not aim to build a hierarchy of importance, nor to favor certain musickings over others. "The verb to music is […] descriptive, not prescriptive. It covers all participations in a musical performance, whether it takes place actively or passively, whether we like the way it happens or whether we do not, whether we consider it interesting or boring, constructive or destructive, sympathetic or antipathetic" (Small, 1998).

The degree of active participation in the musicking is therefore of relative importance. In the cases considered, the player of Legend of Zelda: Breath of the Wild seems to be passive if compared to the player of Guitar Hero/Rock Band. In both cases, however, relevant musicking can be found. As such, the musical action does not need to reach a certain degree of quality or relevance in order to be considered as musicking. Disregarding musical actions because of insufficient complexity would therefore not fit within the musicking framework. Similarly, a less active or discernible form of musical action is, nevertheless, to be considered for its degree of musicality and as such should be included in this discussion.

Conclusions

This paper intends to present the argument for a renewed musicology of digital games, taking into account those player's actions and musical meanings that seems to go, in many cases, unnoticed. Rather than understanding digital games for their properties as aesthetic objects, I intend to problematize the nature of the actions that players perform in digital game spaces.

The analysis of the musical text found in digital games, is in this regard, fundamental. Throughout the paper, for example, I referred to Collins' definition of adaptive musical systems and compositions, and reversed the perspective on it, focusing on the musical actions that such systems afford to the player. The analysis of the musical text, however, has to take

into account the intersection in between ergodic and musical actions, in order to properly consider the cybertextual capabilities of digital games.

The discipline of musicology, on the other hand, has produced useful perspectives on the multiplicity of forms, actions, and behaviors that music includes. Effectively, Small and Blacking point to the fact that the musical work is not the base ground of music in general, but rather a part of it. This perspective can be applied to the study of digital games. An early reading of digital games that are prominently musical reveals the nuances of the musical performances that are afforded. However, it is important to note that the status of musicking is not reached once a certain quality or degree of performativity is eventually reached. By being involved in ergodic actions with musical accompaniments, players often become connected with musical playback, and as such with legitimate examples of musicking.

While trying to present an argument for the analysis of musical actions within digital games, this paper has not mentioned a number of topics that are certainly relevant in this regard. For instance, parallelisms can be traced with aleatoric or indeterminate musical compositions, which have already questioned the canonic prerogatives of performers and composers. In these examples "the composer deliberately relinquishes control of any element of the composition" (Bailey, 1993), allowing for "multiple outcomes" (Gottschalk, 2016). Substantially different actualizations of a work are possible, depending from the performer's agency on the musical text.

Another open question regards the relationship in between musicking and play (here intended in its ludic sense). The concept of "playing" - ideally, the quintessential action of the game player - has already been considered as a broad umbrella term, which cannot accurately describe the diverse actions players perform, such as labor-like activities (Calleja, 2011). Similarly, Leino argues, "we may somewhat paradoxically suggest that the essence of playable artifacts is nothing ludic" (2015). How to situate the musical facets of game playing, in relations with its presumed ludic nature, is a topic that has not been addressed for the time being.

In conclusion, with digital games are intertwined with music. This has sprouted new possibilities for musical creation and interaction. We "music" with digital games: we take part in processes that ultimately lead to music. We're not exactly performers, composers, dancers, or listeners, but we seem to conflate those traditional figures, and possibly create new ones.

Games

GUITAR HERO. Harmonix/RedOctane, Playstation 2, 2005.
THE LEGEND OF ZELDA: BREATH OF THE WILD. Nintendo, Switch, Wii U, 2017
ROCK BAND. Harmonix, Playstation 2, PlayStation 3, Xbox 360, Wii, 2007.
SUPER MARIO BROS. Nintendo, NES, 1985

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