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The Missing Piece:

Boredom and “non-games” in ludified audiovisual composition

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Abstract

Gamification has found its way into many facets of human life in the 21st century. The proliferation of accessible technology, including apps, has allowed for gamification to be used for learning, exercise, and many other normally non-gamified activities. This has extended into the humanities as well, with gamification being used in artistic works, most commonly multimedia audiovisual artworks. The term "gamified" or, more recently, "ludified" is used to describe art works that use game-like elements. This could include goals similar to those in gameplay, certain mechanics that are derived from gameplay, aesthetic elements, and many other possibilities. This relatively new genre of art music has been increasingly more prominent in both concert performances and scholarly discussions surrounding new music. I will discuss at length my approaches to gamified, or ludified, audiovisual compositions in this thesis, with focus placed on an approach that involves the use of a type of game called a "non-game". I argue that creating audiovisual art that is inspired by this genre of "non-games" can allow gamified works to place more focus on aesthetic elements, rather than the conceptual focus that is afforded by goal-driven gamified works of art. Through the extensive analysis of a non-game inspired work I composed titled *The Missing Piece,* I examine the potential of integrating game-like elements but without the clear competition and goals that are normally present in games.

Abstrakt

Gamification ist in das tägliche leben des Menschen durchgedrungen. Die Verbreitung zugänglicher Technologien, einschließlich Apps, hat die Verwendung von Gamification zum Lernen, Trainieren und für viele andere normalerweise nicht gamifizierte Aktivitäten ermöglicht. Dies hat sich auch auf die Geisteswissenschaften ausgeweitet, wobei Gamification in künstlerischen Werken am häufigsten in multimedialen audiovisuellen Kunstwerken verwendet wird. Der Begriff „gamified“ oder neuerdings „ludified“ wird verwendet, um Kunstwerke zu beschreiben, die spielähnliche Elemente verwenden. Dies könnten Ziele sein, die denen im Gameplay ähneln, bestimmte Mechaniken, die vom Gameplay abgeleitet sind, ästhetische Elemente und viele andere Möglichkeiten.

Dieses relativ neue Genre der Kunstmusik wird sowohl in Konzertaufführungen als auch in wissenschaftlichen Diskussionen über Neue Musik immer wichtiger. Ich werde in dieser Arbeit ausführlich meine Ansätze zu gamifizierten oder ludifizierten audiovisuellen Kompositionen diskutieren, wobei der Schwerpunkt auf einem Ansatz liegt, der die Verwendung einer Art von Spiel beinhaltet, die als „Nicht-Spiel“ bezeichnet wird. Ich argumentiere, dass die Schaffung audiovisueller Kunst, die von diesem Genre der „Nicht-Spiele“ inspiriert ist, es gamifizierten Werken ermöglichen kann, sich mehr auf ästhetische Elemente zu konzentrieren als auf den konzeptionellen Fokus, der von zielorientierten gamifizierten Kunstwerken geboten wird. Durch die umfassende Analyse einer nicht-spielinspirierten Arbeit mit dem Titel *The Missing Piece*, die ich verfasst habe, untersuche ich das Potenzial der Integration spielähnlicher Elemente, jedoch ohne den klaren Konkurrenzen oder Zielen, die normalerweise in Spielen vorhanden sind.

Introduction

Gamification has permeated nearly all facets of our life. Our phones contain apps that help us learn languages in a gamified way, we have gamified exercise programs, and even training programs use gamification. One natural extension of the ubiquity of gamification is the integration of gamification into art. When we speak of "gamified art", this could imply art works that contain clear game-like elements, such as scoring components, goals and objectives, and even competition. This thesis, however, explores a type of gamification that is derived from the concept of "non-games". Satoru Iwata put forth the concept of non-games in his keynote speech at the 2005 Game Developers' Conference, describing them as "a form of entertainment that really doesn't have a winner, or even a real conclusion" (Schneider 2005). Mr. Iwatas's idea already imagined that non-games would, in a sense, be more aesthetically-driven. Without the clearly established gameplay and rules, such games must inherently focus more attention on aesthetic elements, since the objective of such works is to create "beautiful moments", which is precisely how Michael Samÿn and Auria Harvey described their concept of not-games. Samÿn and Auria's 2010 "not-games" manifesto further developed the idea of non-games, describing these games as a re-interpretation of games as art. They describe the idea of not-games as a design challenge:

"The question is not whether videogames are art. The question is how can we make good art with the medium of videogames. Not-games proposes that one direction of exploration may be to abandon the idea that what we make, should be a game. To approach the medium with an open mind" (Samyn 2010).

This manifesto anticipated a genre of art music that would emerge in the 2010s often described as "gamified music", and more recently, as "ludified music." (Ciciliani, Lüneberg, and Pirchner 2021). This paper does not seek to question whether video games are art or not, or whether gamified music can really be considered "games." Instead it discusses a work, designed as a not-game, that uses the concept of non-games as a starting point to apply a more aesthetically-driven approach to gamified music. Therefore, the first concern when writing gamified "non-game" musical works is that

the work must be in some way more concerned with aesthetic content, rather than with rules of gameplay or concept.

Form and time is of great importance to me as a composer of gamified music. The last decade has seen an increase in work, including works composed for Unreal Engine, Unity, and other software that use game-elements, and game-elements have proven to provide expanded possibilities for composers. However, there are some limitations and complications that can arise when composing using game elements, most prominently formal concerns. Many gamified works are also of variable form and duration, rendering it impossible to write music for these works that is a specified duration of time and has a specified form. There are variances in form that arise that are not seen in other open form works that do not incorporate game elements, due to the fact that sometimes the performers or gamer do not have the kind of control that musicians do over a piece of a fixed duration. Games can be much more unpredictable, because often some kind of game-related task must be completed, and this relies on the gamer or musician actually completing this task. The time it takes to complete a required task can differ from player to player or play instance to play instance. This often leads to variability in time passed during the whole or sections of a gamified work, or, in the event that a game is timed, variability in the precise events that happen during gameplay.

In this document I discuss some of the ways I have approached formal concerns in gamified music, and most specifically, the use of boredom and non-games to generate a coherent musical form. Some of the precedents of this work are explored, including my introduction to the field of gamified music. An in depth analysis and exploration is provided of the piece *The Missing Piece* (2019) for live musician as gamer and live audiovisual electronics. I discuss conceptual and pre-compositional elements and goals as well as the eventual sounding and visual result, with special emphasis on the form and aesthetics of the work. The self-limiting form constraints of the gameplay environment are explored, and how these constraints actually function in a live performance.

Gamification as potential in audiovisual art

New music in the 20th and 21st centuries has relied significantly on ideas of innovation and also ideas related to progress. While not all scholars are in agreement about the notion of progress, some composers have developed new devices and

techniques to expand the compositional palette and provide novel ways of creating music. Composers sought development in the sonic domain, including new instrumental techniques, pre-recorded sounds, and deriving musical material from physical phenomena like spectra or alternate tuning systems. Experimental composers such as John Cage questioned the concept of music, form, and performance. Others began to include theatrical elements or other extra media. The first significant recognized inclusion of theatrical elements in music can be seen in the "Instrumental Music Theatre" of Mauricio Kagel in the 1950s and 1960s. (Heile 2006). However, aided largely by the widespread availability of software/hardware, composers of the 21st century have developed this concept further, composing multimodal and multimedia works. This development, which has been described using terms such as "the new discipline" (Walshe 2016) or "Music in the Expanded Field" (Ciciliani 2016), incorporates the expansion of all media into composition, including theatre, dance, visual art, digital media, video, etc. One emerging form of this multimedia music that has become prevalent in the last five years has been that of gamified music, which draws on elements from video games. Using media, indeterminate form, and innovative sound, gamified music includes ideas from nearly all of the innovative trajectories in the postwar period.

Marko Ciciliani defines the term gamification: "Den Begriff 'Gamification' fasse ich in dem Kontext als die Verwendung von Game-Elementen in einem Nicht-Game-Kontext auf" (Kämper 2017). Compositions that derive any sort of game element, therefore, could be considered "gamified" composition. It should be noted that in some cases, the term "gamified" is being replaced with the term "ludified", due to the commercial and marketing connotation of the former, with a notable example being that of the GAPPP (Gamified Audiovisual Performance and Performance Practice) project.

Historically, game elements in music have been used, although mostly sporadically. A well-known example is the musical dice game often attributed to Mozart. Composers such as John Cage and Earl Browne made more extensive use of game and other chance and rule-based elements during the 20th century that had a substantial impact, especially in American experimentalism. It is in the 21st century, however, that composers started to explore elements drawn from video games and video game music, and this will remain the focus of this thesis. I will briefly discuss here two ways in which video game elements have impacted art music significantly: first, as New Interfaces for Musical Expression (NIMEs), and second, as compositional tools.

Video games inherently provide potential in the field of NIMEs because they are interactive media that require user input. In the early to mid-2000s, interactive interface development was an important issue for game and game console developers, with the Wii representing on of the most impactful innovations, as the game controller itself required gestural control. This led to the development of camera-based motion tracking for game control, including the release of devices such as the Kinect. The Kinect tracks multiple points on a player's body that are then interpreted by the game system to control a player's actions in the game. Many musicians and performance groups used these systems to create interactive works, including Jeffrey Stolet's *Lariat Rituals*, which uses the GameTrak controller, performances by the University of British Columbia laptop orchestra in 2013, all of which used multiple Wiimotes, and many others. A 2013-2014 composition by Rob Hamilton and Chris Platz, however, would use the avatar in the game itself as an interface for musical expression. *Echo Canyon* is designed in the Unreal Engine and interfaces with OSC to allow for the sonification of movements made by an avatar "player-character" controlled by an Xbox controller (Hamilton 2014). A later work by Hamilton and Platz, *Carillon* (2015), consists of an interactive musical performance environment built within the Unreal Engine with support for the Oculus Rift and Leap Motion (Hamilton 2016). These examples are profound not only because of this development of a game avatar as a NIME, but because they represented some of the first obvious and clear uses of a video game as the basis for a composition presented at an international conference leading to the development and further expansion of this entirely new type of audiovisual composition.

Awareness for the capabilities of gaming environments to provide robust systems for interactive audiovisual environments has grown substantially since the presentation of Hamilton's gamified compositions. This has led to further developments in the research of gamified music, including large research projects involving multiple people across several disciplines. The GAPPP project, for example, which took place at the Institute for Electronic Music and Acoustics at the University of Music and Performing Arts, Graz, Austria from 2016-2020, was one of the first and largest research undertakings that focused completely on the artistic capabilities of gamification. This project resulted in several gamified compositions created by various composers, including Marko Ciciliani, Christof Ressi, Kosmas Giannoutakis, Alyssa Aska, and many others. The project aimed to "develop a thorough understanding of the

potential of game based elements in audiovisual works", recognizing the potential for gamified systems to provide new compositional tools and strategies ("GAPPP: Gamified Audiovisual Performance and Performance Practice" 2021).

Marko Ciciliani has been one of the most influential and prolific composers of gamified audiovisual music, having not only composed several gamified works of his own, but also leading the IEM's GAPPP project and authoring papers and books in the field. *Formula Minus One* (2014), for example, places a performer in a Formula One like situation where they must respond in real time to the audio and visuals, effectively "steering", as if driving a Formula One car. *Kilgore* (2017/18) involves two players with both their live and virtual representations making their way through several stages in a vast 3 dimensional environment (Kämper 2021). All objects in the world have corresponding sounds, and Ciciliani developed a set of game rules to not only drive play but to encourage interaction with these objects, and thus the composition of the piece. *Anna & Marie* (2019) is probably Ciciliani's most expansive gamified work, consisting of a "concert installation involving two performers on electric and baroque violin, generative electronics, two navigable virtual 3D worlds, augmented reality, light design" that implemented ergodic storytelling (Ciciliani, Marko; Lüneberg 2021). The work was premiered at Donauschingen 2019, and is one of the largest scale performances of a gamified composition premiered at a major international contemporary music festival, expanding the boundaries of gamified music into the genre of music theatre or contemporary opera.

Gamified music continues to be pursued and developed around the world, with composers in Vancouver such as Keith Hamel, Brian Lee Topp, and Remy Siu composing interactive works using Unity ("Unity 3d" 2021). The study of such music is also emerging along with the research field of ludomusicology, which currently consists of a community that holds an annual international conference and is comprised of a growing list of associated scholars with an international presence. It is clear that by the 2020s the use of game-elements has had a significant impact on the field of contemporary music. Therefore, having a significant body of completed works and with a strong research backing, now is the time to evaluate not only its role and place in music history, but also to question the aesthetics and musicality of such works.

Aesthetics of video game music

To begin the discussion of the aesthetics of gamified music, I will first discuss the aesthetics of music for video games. The challenges facing composers for gamified art music are similar to those faced by video game music composers, specifically those related to form and time, due to the precise way in which games are interactive. Video games are interactive media that involve active participation of a user or player, and each player will take a different length of time to progress through a video game. Therefore, a video game could be considered an art form with an indeterminate time structure. This makes it difficult to compose music with rigid time structures for the soundtrack of a video game. The use of looping and generated music is common in video games to provide unending music. This has resulted in the development of several techniques and aesthetics unique to interactive, non-linear media.

The simplest description of looping is the continuous repetition of a section of sound. However, composers of video game music have innovated looping techniques to create loops that contain some variance with repetition. Loops that do not repeat in exactly the same way every time are called dynamic loops (Aska 2017).Two of the most common techniques for the creation of dynamic loops are *vertical re-orchestration* and *horizontal re-sequencing.* Vertical re-orchestration involves the breaking down of a musical composition into several smaller components that can be layered on top of one another simultaneously to form different orchestrations of the same composition (Aska 2017). A simple application of vertical re-orchestration involves multiple loops, each for a different instrument with a slightly different pitch and rhythm pattern, but with the same harmonic structure and overall tempo. Horizontal re-sequencing involves the breaking down of a musical composition into several smaller sequences that can be rearranged to create variant copies of the same work (Aska 2017). Horizontal re-sequencing provides more challenges to composers, as it involves small selections of music that can be re-arranged differently at time. Therefore, a composer must consider how each section flows into the other, so that any possible combination will make musical sense.

The above-described techniques represent just a small fraction of the ways in which composers can approach the composition for unending, non-linear media. They also provide very simple solutions to some of the challenges faced by composers of such media. Generative music provides another option for video game composers to create music for non-linear media. This is defined as any music that is generated in real

time in some capacity. Much like the dynamic looping procedures, there is a wide spectrum in generative music. *Red Dead Redemption* (2010) is one example, which consists of a collection of multiple pre-composed stems that are selected via algorithmic procedures (Jeriaska 2011). This sounds very much like horizontal re-sequencing; however, the stems apply to the entire game rather than a single portion of the soundtrack that loops continuously. Therefore, this generative, rather than a looping procedure, as no singular piece of music is looped throughout the game. The composers of these stems needed to carefully consider this and provide stems that would work cohesively no matter what, and because of this every stem is in the same key, in this case, A minor.

A more extreme example of generative music is present in the game universe-building God-game *Spore.* Players begin the game as a single-cell organism that eventually evolves, and throughout the course of the game an entire world evolves. The music is completely generative to reflect the generative nature of the game. All of the music is created using PureData (PD) software coupled with procedural sound generation. This allows for an unending soundtrack with infinite possibilities.

All of the aesthetic considerations of video game music also apply to gamified music because it is also a form of non-linear media. Composers of gamified music must consider ways in which these non-linear, but yet still time-based, forms of media can remain cohesive while retaining the gamified nature. Another important consideration is the aesthetic cohesion between the visuals, audio, and gameplay. In all of the games described above, the non-linear music aesthetics and techniques are closely linked to the gameplay and visual environment of the game. One of the clearest examples of this can be observed in the NES game *Super Mario Bros.,* as the enclosed spaces contain much shorter loops with less variance in the melody, orchestration, and rhythmic content, and the outdoor "overworld" contains music with a longer looping structure and more variance within that structure (Aska 2017). This paradigm would be retained and implemented in many subsequent video games.

Personal Artistic Precedents

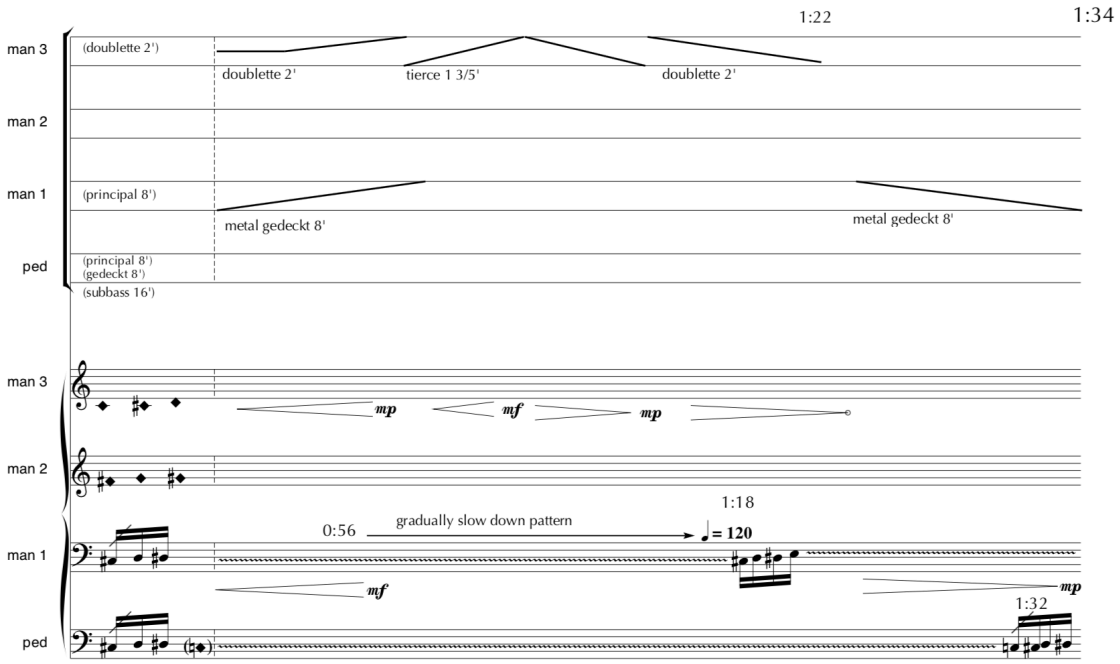
Prior to composing *The Missing Piece,* video game music and game aesthetics were always an interest of mine and often influenced my electronic as well as acoustic compositions. Video game composers' need to approach form and time differently due to games' non-linear structure led to several innovative techniques, and these techniques and ideas served as an impetus for my own desire to arrange sound through time. Although gamified art music is different than commercial video games and does not necessarily share the same concerns as game music, the issues that arise due to the temporal variability in games still remain in gamified art. Prior to composing gamified works, however, I had already incorporated video game music aesthetics into my regular composed concert works.

Compositions inspired by video game music aesthetics

Using video game music aesthetics enabled me to write pieces of a set duration but that explore forms with a less goal-oriented structure. The first such piece I composed with very strict influence from video game music was *0-3.non-linear* (2017) for harpsichord. Very early video game music was limited by the technology available at the time. For example, the Nintendo Entertainment System (NES) (1983) was capable of producing only five channels of sound playback: three square waves, one triangle wave, and one channel of very low bit sample playback (Aska 2017). In addition, these channels had limited abilities to produce dynamic envelopes, resulting in terraced dynamics. The limited timbral possibilities, coupled with the lack of nuanced envelopes, resulted in composers creating works with heavy rhythmic contrast and polyphonic textures. There are many parallels between these limitations and the capabilities of the harpsichord, especially pertaining to dynamics and the ability to sustain tones. Therefore, when I composed the piece, I also placed a heavy focus on rhythmic structures, and elements derived from looping techniques in early NES music. However, the formal structures overall in each of the four movements were relatively straightforward and through composed.

Another such piece inspired by video game music was my 2017 composition, *looped(dynamic)* for organ. I used the techniques derived from dynamic looping to create differences in time perception, so that a clear formal structure in the piece from a goal-oriented perspective could not be perceived. There are two continuous repetitive pattern structures that occur through the piece, one in manual I, and the other in the

pedal. The pitches in these structures change slowly throughout the piece, but the overall movement and texture remains consistent. Drones are created using fixing of the keys in manuals II and III and these are gradually revealed and silenced throughout the work by pulling stops and retracting them at different moments in time. The work therefore had a repetitive nature, but without exact repetitions, much like the dynamic looping techniques present in video game music. These formal ideas would inform much of my process composing gamified art works. Example 1 contains a short excerpt from the score.



Example 1 looped(dynamic) for organ

The environment as score

The first gamified audiovisual piece I composed is titled *verschleierte* (2018) for voice, cello, and gamer. *Verschleierte* consists of two live musicians responding to the visuals of a 3-dimensional environment driven by a live gamer. The work sets fragments from the text "Das verschleierte Bild zu Sais" by Friedrich Schiller in what I describe as a gamified art song. The work is placed in an environment that draws on realistic 3-dimensional environmental aesthetics, but is completely surreal due to the colours of the environment and the textures of the terrain. To structure the work, I created one large

outdoor area that forces the player to traverse long distances, and one enclosed area, in which the player can move from one end to the other much quicker.

My primary objectives in the composition of this work were to structure the form of a gamified work in the context of an art song, and to incorporate live instruments as well as gamers controlling avatars in the performance of the work. The end result consisted of a musical score that the instrumentalists received and interpreted during the performance, the game software, which was created in Unity and controlled by a live gamer, and software built in Max to control all of the audio processing and allow for messages from Unity to change parameters of the sound output (and vice versa).

This work drew from the structure of the gaming environment in some way as a basis for the form of the piece. While the instrumentalists do receive a normal score, they have to respond to the events of the game in real time. At the same time, sound events and sound changes in the electronics are triggered by the actions of the game player. To increase this link, I also gave the instrumentalists some control over the game play: the volume of the cellist affects the speed of the player, and the volume of the vocalist affects the turn/look sensitivity (which actually makes it more difficult for the player). These choices were made due to text setting, which I will talk about later, along with other details of the piece.

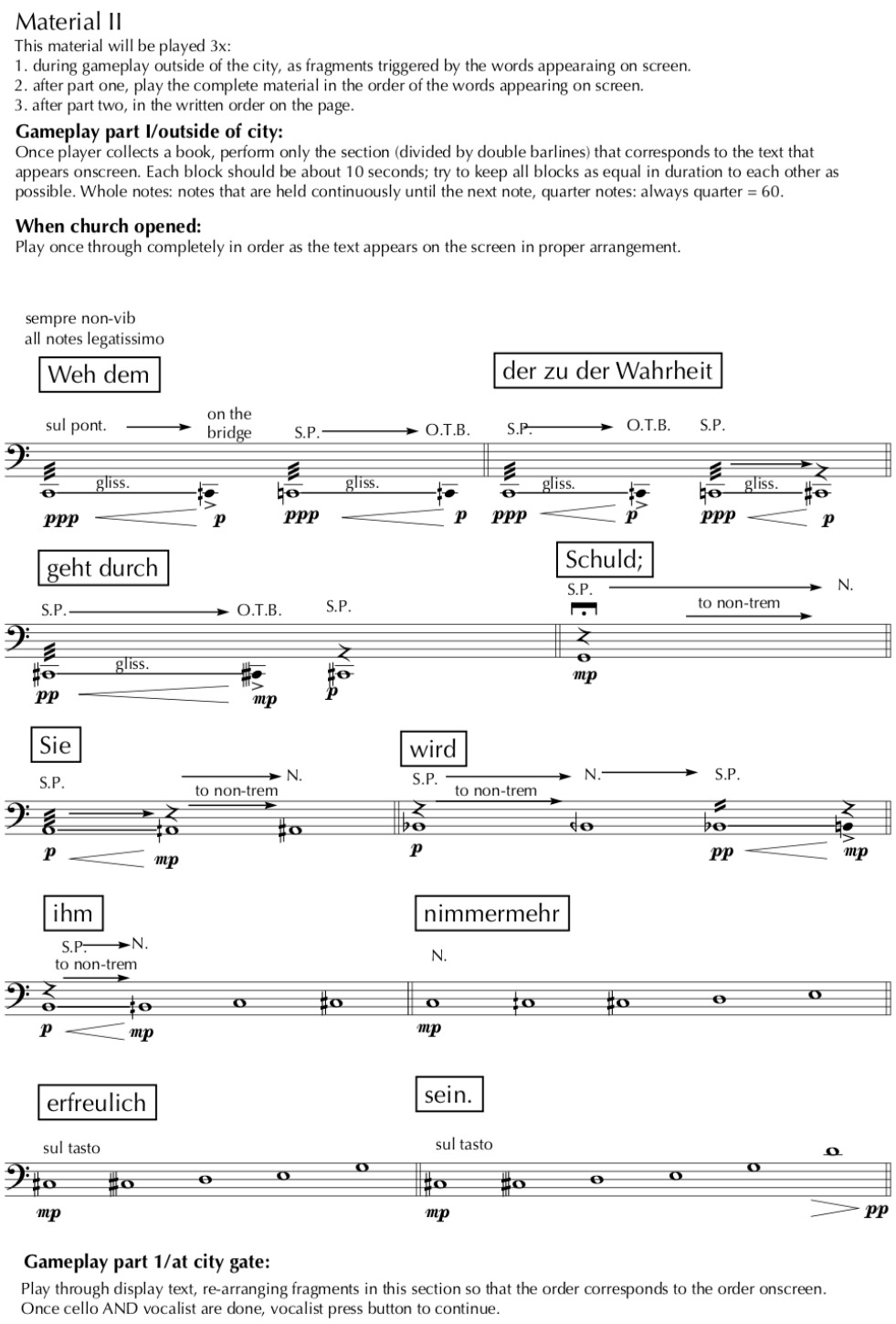
I wanted to embed the gamification into the formal structure of the work, while also maintaining that it is an artistic performance and not just a video game played in front of a live audience. Because I was just learning how to use the Unity game engine, I opted for a simple 3-dimensional environment using mostly downloaded assets and a basic terrain. I decided that some of the terrain objects would have an influence over the sound environment as the player approached them, and, being that it was set in the outdoors, I designated water and trees as the drivers of these triggered and influenced sounds because they were clearly contrasted objects against the barren desert terrain.

Prior to creating the environment in Unity, I drew a sketch of a possible map with water and tree placements, then created the outdoor environment in the software using this map as a starting point. I created a path, so that the player would be encouraged or guided (but not explicitly instructed) to follow it to its end, where they are greeted with a small, gated village. This gated village represents the second "section" of the piece. All of the architectural and environmental elements are much closer together inside the village, which results in a much shorter form and faster

temporal structure when the player is inside the city. The player must traverse much further distances outside of the village to have an impact on the sound or forward progression of the game.

I did implement visible goals to both the player and the audience in *verschleirte*. I thought of these as a kind of a virtual score/part for the game player. Therefore, in each section, the player is instructed to collect books and there is a continuous display showing the player how many books they have collected and how many remain to be picked up. If the player tries to enter the city prior to picking up

enough books, they will be presented with text that instructs them to finish collecting books before entering. This forces the player to explore the entire map, searching for books and triggering sounds. There are several layers of the



Example 2 verschleierte, excerpt, cello

piece that inform this interactive performance process: 1) the written score for the two instrumental performers, 2) the electronic sounds triggered during gameplay and 3) the effects of the instrumental sounds on the gameplay (information that is sent from the max patch INTO the game software).

The decision to have the player pick up books to advance the game was not an arbitrary one – essentially any object could have been chosen if the idea was to have a player fulfill goals in a game situation. I wanted to work with the variable form that gamification lends itself to, but framed using the context of an art song, a genre which traditionally makes use of texts. I assigned a fragment of Schiller's poem to each of the books that are randomly distributed throughout both the outside area and the inside areas. When the player picks up a book, that randomized text is displayed on the screen. The books were used to reflect the fact that the player is collecting "text", rather than picking up arbitrary objects. The books in themselves are also symbolic, as the text itself relates to a youth seeking knowledge, and the collection of these books can be interpreted as the player collecting a certain quota of knowledge.

This book collection is also important to the musical score because each performer is given an instrumental part with two components, continuous material and material that is to be played when specific elements appear on the projection screen. The cellist, for example, has a continuous background loop that must be played throughout the performance. The vocalist has a continuous section that they must sing through prior to beginning the game, which gets recorded to a buffer and stored for later use. Both instrumentalists also have words written above short "fragments" in the score, which they must perform whenever that text appears on screen. So, when, for example, the player picks up a book with the text "Sie", both performers must stop what they are doing currently and play the score fragment corresponding to "Sie". This is demonstrated in the excerpt shown in Example 2. This interaction is during part one of the game, when the player is outside of the village limits. When the player finally picks up all of the book fragments and returns to the city wall, the game pauses for a moment before letting them inside, and displays the poem text not in its original order as written by Schiller, but in the order in which each fragment was picked up. The instrumentalists must then play through the fragments in this re-arranged order. Then the player may enter the village and the instrumentalists may proceed to the musical score instructions for part two.

Inside the village the gameplay is similar, but the performers have different instructions and no longer play score fragments as books are picked up. The vocalist performs background material that is altered as the total number of books picked up increases. The cellist only responds by increasing the tempo of their given background loop as more books are collective. Finally, when everything is picked up inside the village, the player can proceed to the door in front of a large church. A church was chosen because of both the connection between religion and pilgrimage (and the character in the text can be perceived as being on a pilgrimage for knowledge), as well as for a more practical reason: the village was intended to evoke a quasi-medieval aesthetic, and no building would have been allowed to have a higher elevation than the church. The elevation was used as a means to lure the player to the front door, thus ending the game. Once at the door, the text appears on the screen in its original, un-altered form, and the performers can finally play through the score fragments from the first section uninterrupted and in the order they appear chronologically in the score.

The triggered electronic sounds are also related to the triggered score fragments the performers must interpret. There are two types of triggered electronic sounds in the game: those triggered when the player picks up a book, and those triggered when a player gets within a certain range of trees and water. At the beginning of the performance, prior to the gameplay starting, the vocalist performs the entire collection of score fragments in order. This is recorded in a buffer and stored. Whenever the player picks up a book, a new sound is triggered from this buffer. Each of these triggered sounds plays back the buffer at a different speed, creating a proportional canon. These speeds affect the pitch of the buffers, creating a harmonic structure as more books are picked up. This harmonic structure relates to the played material, producing different partials of a spectrum on D, the fundamental note of the score's quasi-modal structure. The cello sound is also recorded into a buffer. Sounds using these buffers are then triggered whenever the player walks close enough to trees or water, with each having a unique manipulation of the sound.

The text setting also influences the structure of the interaction and gamification. The choice to re-arrange the text was entirely a formal one. Gamification by its very nature results in works that have in some way, an indeterminate structure. Texts often provide a frameworks in art songs with which composers can give form to their compositions, or texts themselves are embedded into the formal structure. In *verschleierte*, by making the decision to rearrange the text due to the gameplay, I am

setting the text in an indeterminate way. Just as a player will never be able to recreate their exact gameplay in a video game each time they play, the order in which the books are picked up will vary every time, and the triggered (live and electronic) sounds along with it. When the player arrives at the village entrance, the fragments are then played in the order they appeared, linking the musical fragments in the larger part of the first section of the piece to the end of it.

Another way in which the text setting is embedded into the gamification pertains to the interaction between the voice and cello sound inputs and the game player. It is beyond the scope of this paper to extensively analyze the used text, but the most important ideas to take away are that it involves a youth seeking knowledge, guided by a Heirophant who warns him against seeking it in a destructive way, while being tempted by looking behind the veil of knowledge by an oracle. I decided to have the cello play the "role" of the Heirophant and the voice that of the oracle.

The instruments' amplitudes are tracked using the max/MSP software, and these amplitude values are then sent via Open Sound Control (OSC), a protocol for networking multimedia devices, to the game software. Higher cello amplitude increases the speed of the player (making the path easier), while higher voice amplitude increases the look sensitivity of the player (making the path more difficult and harder to control). Sounds triggered that contain pre-recorded voice eventually veil all of the other sounds, including environmental sounds and those played by the live musicians, while sounds triggered that include cello provide environmental cues and clarity of environment (tree sounds, water sounds). When the player finally enters the city, nearing the end goal of the game, the triggered voice sounds are replayed at extremely fast, rather than slow, speeds, which obscures the environment even more. These performance actions make it very clear that this is not just a game created for performance in a live environment, but an artwork that contains gamified elements. However, in the case of *verschleierte,* goal-driven objectives still remain at the forefront of the formal construct of the work. My second gamified work, *The Missing Piece,* had no visible game objectives for either the performer or the audience, raising entirely new questions of how to create a gamified work that is coherent without the core elements that drive the structure of games.

The Missing Piece

The Missing Piece was composed as an artistic response to a paper and presentation given by Olli Tapio Leino at the GAPPP 2019 symposium titled "Performing and Audiencing Profound Boredom in Euro Truck Simulator 2 Multiplayer: An existential-ludological perspective on computer games and performance". This paper and lecture explore the topics of profound boredom in video games, as well as audience empathy with virtual avatars or virtual performers, framing *Euro Truck 2 Simulator* as both a non-game and a potential for experiences profound boredom.

I found one term described in the paper in particular especially influential: non-game. I have already mentioned above some of the descriptions of non-games, including that they are games that do not rely on competition, and that they contain a series of beautiful moments. I would extend that further and define non-games as "games that do not rely on objectives or competition, and contain a series of experienced moments". I add these clarifications because not all games contain competition necessarily, but rather specific objectives, and I refrain from using a subjective qualifying term such as "beautiful". I decided to use my understanding of non-games as a starting point for my piece, which resulted in an end product of an endless runner non-game in which a live musician performer controls the movements of the virtual avatar in the game.

The second important point of the paper from which I chose to draw inspiration was the discussion of audience relatability to the performance of a computer game, and specifically, relatability with an avatar. Leino describes that: "in contrast to 'traditional' performances, where empathy and intersubjectivity can most often be taken for granted, in gameplay performances the empathy toward the player/performer requires both anthropomorphizing the performer (i.e. recognizing the player/performer as a human), and, technomorphizing ourselves as audience members (i.e. imagining what it would like to be in the player/performer's shoes)…" (Leino 2021). He continues by explaining that empathizing with the performer of a computer game requires understanding on the audience's part of the conditions of the game or the conditions of the world the player exists in. While writing *The Missing Piece* it was not only important for me to consider the game mechanics, or rather, lack of game mechanics, but also performance presentation of the work. *The Missing Piece* was therefore written for a bass clarinettist

who controls the avatar with their playing, live audiovisual interaction, and live electronic sound.

On Boredom

One concept discussed at length in Leino's paper, related to his discussion of non-games, is that of the experience of profound boredom induced through certain types of gameplay. Leino describes boredom as an opportunity for a player to view a game in a different way, or to have a different playing experience due to this boredom. The boredom actually enhances the gameplay experience: "Nothing in the game changes as the player succumbs to profound boredom. What changes is the way the player sees the game" (Leino 2021). Leino examines the way in which this profound boredom is achieved in *Euro Truck Simulator,* which he considers a non-game, through the repetitive gameplay, lack of competition, and lack of novel experiences. This idea of profound boredom places emphasis on the game's aesthetics, because the focus on the material, rather than the game play mechanics, intensifies.

One of my favourite books as a very young child was *The Missing Piece* by Shel Silverstein. The basic premise of the book is that a circle travels through the world, but very slowly because they are missing a piece, preventing them from rolling fast. This frustrates the circle, because they believe themselves to be missing something, and so they spend the entire book searching for this missing piece. When they finally find it, they realize they are rolling so fast they cannot stop and smell the flowers, or look at the butterflies, or experience any of the other small joys they used to. The circle decides to, ultimately, leave the "missing piece" behind. *The Missing Piece* therefore contrasted the goal-driven versus journey-driven experiences, with the circle ultimately deciding to favour journey-driven experience.

As I was using the book as a creative impetus, and the character in the book rolled continuously, I used the concept of an endless runner as a starting point for the game. An avatar walks continuously through terrain in the game. If the bass-clarinettist is not doing anything at all, the avatar will continue to move at a pre-determined base speed. Terrain is randomly and endlessly generated during gameplay, so the avatar will never run out of environment to run through. Alongside the endless forward movement in the game, I wanted to eliminate any indication to the performer (or the audience) of game objectives and/or goals. There is no feedback given during the gameplay, such as points, indications of items collected, timers, etc. Instead, the intention in *The Missing*

Piece was to create an environment in which some objects could be interacted with, but rather than making clear objectives to the performer, this interaction was encouraged through the design. The terrain in *The Missing* is entirely white and grey, with plants and trees on either side of forward-pointing pathway. Large and brightly coloured gems are randomly distributed around the space. These large and colourful objects stick out considerably from the rest of the game environment, which may lead to curiosity on part of the player and a desire to pick them up.

As the performer collects many of these gems quickly, the terrain slowly changes and colours are added to the terrain, adding colour to the previously colourless plants. The sound environment becomes more saturated, with heavier processing on the live bass-clarinet and more generated sounds playing at a higher volume. However, at the same time, the base speed of the avatar also increases, making it more difficult for the player to steer and collect the gems. As the player fails to collect gems within a certain time limit, the terrain becomes white again, and the base speed of the avatar decreases. The sound once again becomes simpler.

All of these things were built into the game to create a natural, self-generating form in the context of a boring "non-game", and to use the advantages of "non-games" to develop a gamified art work. Natural ebbs and flows are therefore built into the form of the piece. In the end, nothing monumental happens. The player enters, interacts with the environment, moments are explored, and then they simply leave. There is no objective or musical event that the player must reach before ending the piece, and therefore no composed ending. The player decides when the performance is over by deciding to exit the stage.

Sound input and output

The avatar is controlled entirely by the clarinettist during gameplay. The audio input of the clarinettist is continuously sent into a Max patch that tracks the amplitude, frequency, of the clarinettist's playing. The amplitude controls the speed of the avatar. The avatar will always have a base speed and cannot go slower, but higher amplitudes can cause the avatar to move faster. The frequency controls the steering direction of the avatar.

Prior to performance, thresholds of lowest and highest pitch are established. Every pitch that the clarinettist plays below the lowest threshold will result in the avatar turning left. Every pitch that the clarinettist plays above the highest threshold will result

in the avatar turning right. The avatar has a default "forward" motion, so as soon as the clarinettist ceases to play these low or high frequencies, the avatar will turn forward again. Short accents toggle fly mode on and off. One short accented note will cause a grounded avatar to fly, and a subsequent short accented note will ground the avatar once again.

The clarinettist receives a score with very simple instructions. The music is restricted with a “pitch pallet” that can be played at any time throughout the piece, at any octave, and with any playing technique. The performer can alter the speed, dynamic, length, or any other features of notes in order to control the player. For example, playing a pitch in a much lower octave to turn left, or adding a crescendo so that the avatar also gradually increases speed. Notes can be long or short and the player can add percussive effects to toggle fly mode on and off.

Starting and finishing the piece are also left open to the performer. The performer enters the performance stage with the software and the electronic sound texture already running, and, after playing for a while, leaves when they feel as if they have experienced enough. The player controls also limit the gameplay and pitch content and help to contain the form of the piece. If the player wants to turn, they have to play a high or low pitch, and continue to play that pitch, since the player defaults to not-turning. This affects the overall pitch material of the piece. Therefore, the controls are designed not just to enable movement of the avatar, rather they are carefully thought through as another means of constraining the variable gamified form.

The sound input from the bass clarinet is tracked via max/MSP, where it is assessed and processed, and the resulting data is eventually sent into Unity where it is further processed by scripts that control the avatar’s movement. At the same time, information from Unity is sent into Max, making changes to the generated electronic sound and the amplified clarinet sound. The changing of the audio and visual landscape is dependent on the player picking up a certain amount of gems within a certain period of time. The total number of gems picked up is tracked by Unity. If the player does not pick up subsequent gems within the pre-determined time frame, the total number of gems decreases, and the timer starts over again.

To suit the continuous aesthetic of the piece, the generated electronic sounds consist of a four collections of continuous drones. Whenever the player picks up a gem, the pitch content of one of the drones changes immediately, producing a sound response to this in game action. The gem count is sent to the Max software to affect things such

as volume of the drones, delay effect parameters, and amplification of the clarinet. The pitches of the drones, however, are affected by the specific colour of the gem picked up. There are four colours of gems, and each colour of gem has a corresponding collection of drone pitch possibilities. Whenever a gem is picked up, a message is sent from Unity to Max containing the colour information of that gem, so that a specific pitch in a specific collection of drones changes. All of these pitch changes are continuous loops of the same pitch collection, so that the pitches of each drone collection will change in the same order, but always at different times. Due to the difference in colours being picked up, the pitches will also always be arranged in somewhat different harmonic constellations.

Performer empathy

One other important concern in both Leino's paper, as well as the ludomusicology community at large, is that of audiencing gamified works, and more specifically in Leino's paper, works that contain an on screen avatar. The issue of "pressing buttons" or "mouse clicking" during performance has long been a debated one in the electroacoustic and computer music communities. The performance paradigm in electronic music breaks from that of acoustic music, since the energy required to produce sound is produced by the electricity that is supplied to a computer. This differs from traditional paradigm of a physical performer on a live instrument, because the performer must use their own physical energy to create the necessary vibrations on the instrument to produce sound. This issue becomes even more prevalent when audiencing gamified works because not only do they present the "laptop orchestra" issue (are the performers really affecting the sound? Or simply checking their email?), but there is often already a performer in form of an on-screen avatar.

Leino discusses in his paper the difference between a game being controlled by a live person and that of a game being controlled by players generated by artificial intelligence, known colloquially as "bots". "Looking at the bots' performance, we quickly realize that they are free from the constraints of embodiment and interface. Limited potentially only by the computer's speed, the bots often outperform humans in precision, speed, and efficiency. The condition by which they exist in the game is far removed from that by which we do so as players, thus leaving no room for empathy" (Leino 2021). This difference between artificial intelligence and human decision-making can also be observed in a study described in *Patterns of Intuition,* when the

difference between humans and computers generating random numbers was shown to be observably large (Nierhaus 2015).

These examples demonstrate that there are valid reasons to integrate a human performer in a gamified composition, but the reason why I chose to use an instrumentalist, rather than a game player has not been addressed. In thinking about my own experience watching others play games, I find that the periods in which I felt the most empathy or personal connection with a person playing a game, or with the avatar in the game itself, was when I was watching someone struggle with something that seemed extremely easy. For example, watching a small child play a side-scroller like *Super Mario Bros.,* and continue to fall into a hole and lose a life even when this is easily prevented. Another example would be watching a player keep running into an enemy and losing lives when a simple jump (press of the A button) would avert this.

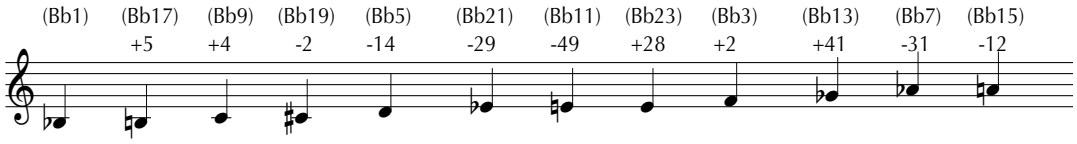
Controlling a player in T*he Missing Piece* using the standard keyboard and mouse input is extremely easy. Pressing the shift key to run, increasing the speed of the player, requires no energy on part of a player. However, a when a performer is required to play their instrument continuously to increase speed, or to continue turning, they must use a significant amount of effort to achieve a relatively simple goal. At times during game play, the avatar misses gems that are seemingly easy to collect due to the nature of this audio-based control system. The performer exertion is even more apparent because I chose a breath-based instrument, requiring even more sustained energy on part of the performer.

This creates this exact situation of performance that I was looking for: a very simple task that is actually difficult to achieve by the avatar. And this leads the audience to experience not just the boredom and monotony of the game and sound itself, but also to experience the struggle of the performer to execute these very simple and monotonous tasks.

The end result of the performance and experience then becomes a dichotomy between this boring experience of journey-related non-games, consisting of beautiful and experiential moments, and the frustrating experience of goal-related gameplay, as the audience and the performer each have individual frustration with seemingly-simple gameplay rendered difficult by the design of the interface.

Musical analysis

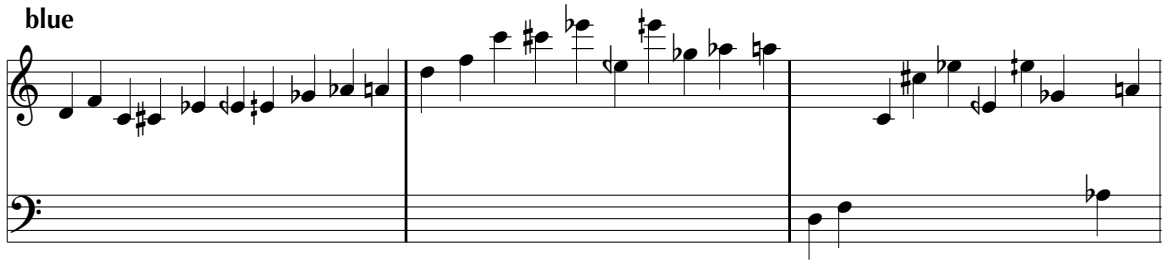
I will discuss the following components of the work: 1) the pitch content, primarily from the generated electronics, 2) the interactivity between the sound and visuals, and 3) the formal structure, especially how the gameplay influences the formal structure. I will use my own score and patches to discuss the musical components, and the studio recording of the missing piece to analyse the audiovisual interactivity and connectivity. To analyse the formal components, I will use both the live performance video from GAPPP as well as the studio recording.



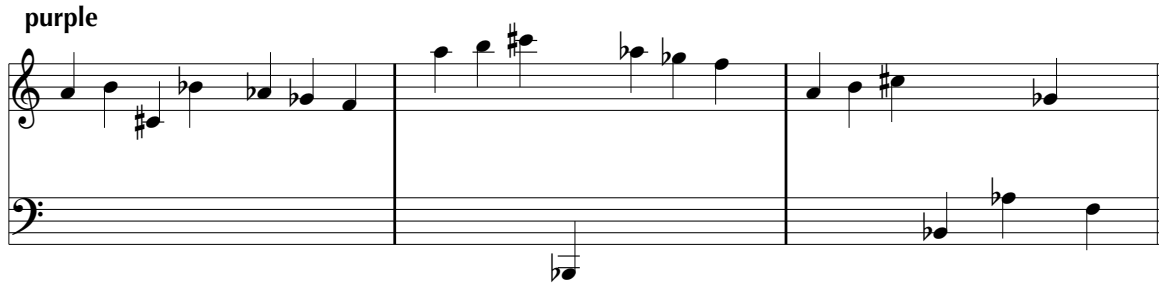
Example 3 The Missing Piece, basic pitch material

The generated electronic sound consists of collections of pitches (or frequencies) that are played in continuous loops. There are four collections of these synthesized sounds, each corresponding to one of the gem colours. Each contains a pre-determined number of pitches, all of which sound simultaneously. These pitches are shown in Examples 4-7. The "purple" gems and "moonstone" gems each have corresponding collections of ten sounds each, while the "teal" and "blue" gems have sound collections of seven sounds each. All pitches in every collection are derived from partials of the B-flat harmonic series beginning on B-flat1 (this base material can be seen in Example 3), but not always occurring in the correct octave. This was chosen because B-flat1 is the lowest sounding pitch producible by the bass clarinet.

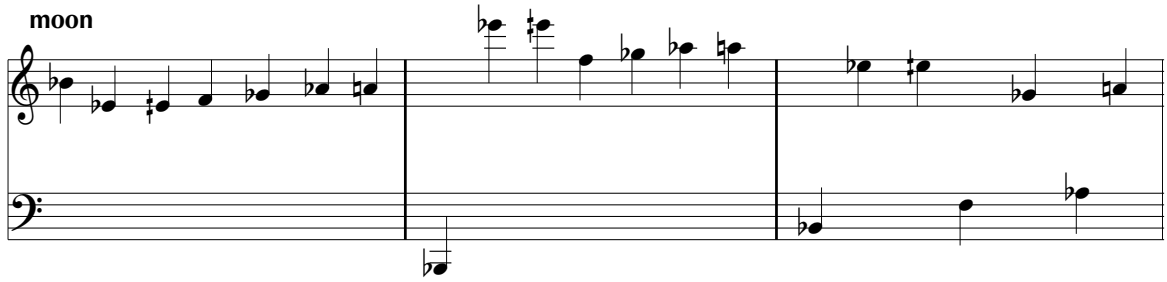
When the avatar collects a gem of a given colour, it triggers a change to the next pitch in its corresponding sequence. Because it is impossible to predict in what order the player will pick up gems, it is impossible to predict the order in which the new pitches will be triggered, resulting in a somewhat variability of the overall harmony of the synthesized pitches. However, the synthesized pitches are very restricted, and consist of only a few discrete pitches and their octave displacement components. This also allows the sound to remain variable, yet with some cohesion and consistency. The images below display the pitch collections from each gem colour, separated into seven or ten pitch groups. These diagrams use the accidentals indicated in the harmonic series above for consistency, even though in some instances enharmonic spellings may make more sense. The only exception is the pitch 'e', for which I have used half-flat and half-sharp



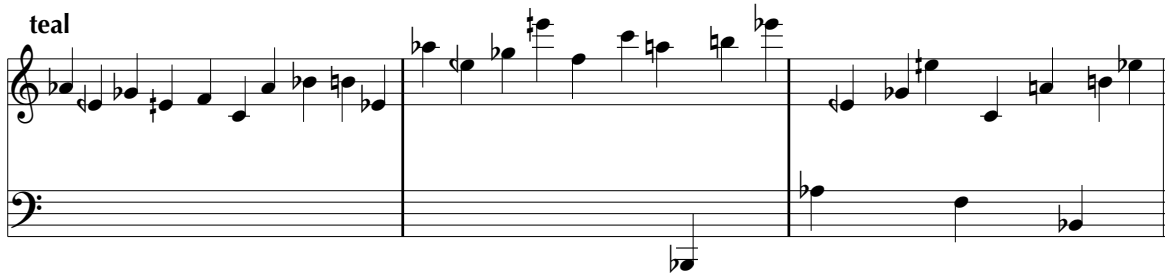
Example 4 The Missing Piece, blue crystal pitch material



Example 5 The Missing Piece, purple crystal pitch material



Example 6 The Missing Piece, moon crystal pitch material



Example 7 The Missing Piece, teal crystal pitch material

to indicate the two different intonations of the pitch. The most important feature of all of these cycles is the use of large jumps of several octaves between successive pitches, as these will be the most perceivable during the performance.

The bass clarinet material has a similar base material as the generated electronic sound, with everything derived from a B-flat harmonic series. Originally an extremely

strict sequence of pitches was used. However, due to the less than expected predictability of the sensitivity of the pitch-based controls, as well as the more unpredictable harmonies resulting from the generated electronic sound, the end result was much more flexible, allowing the performer to also respond to the current sounding harmonies.

There are many things to consider when analysing the audiovisual interaction, such as actual interaction between the performer and the visuals, the perceivability of the gamification, and the convergence or divergence between the visuals and the sound. In this analysis I will primarily focus on the relationship between the performer's actions and the sound and visuals. As described above, I am using a specific video to analyse these relationships, and all of the time codes indicated are derived from this video (Aska 2019). The piece opens with a fade in of the visuals, revealing an avatar walking steadily through a virtual landscape. The performer enters the performance space after this fade in has occurred, allowing them to enter the virtual space and interact with it, rather than enact its beginning or end. Rather than the performer performing a "piece", with a clear beginning, middle, and end that they are responsible for, the performer enters an already existing situation, interacts with it, and leaves – the avatar can continue to walk, endlessly, even after they are gone.

The performer quickly demonstrates through the interaction the function of the controls. At 1:28, the avatar speeds up as the clarinettist plays a crescendo, and then slows down as the sound decreases in volume. The link between the avatar speed and the volume of the clarinet becomes clearer as the clarinettist plays another crescendo-decresendo immediately after this, and the avatar responds once more by speeding up with the increase of volume, and subsequently slowing down as the volume of the clarinet decreases. At 2:24, the clarinettist plays the first very low note, and the avatar turns left. As soon as the low pitch stops sounding, the avatar returns to their original forward motion. At this moment, the audience is made aware that these two actions (playing volume and low pitches) have some kind of effect on the avatar, but not a lasting one – as soon as the sounds cease to play, the avatar returns to their original speed and direction. The clarinettist demonstrates the use of high notes to force the avatar to turn right at 3:27, which is followed quickly by them playing some fast attacked notes at 3:35 to display how the avatar can begin and end flying. Therefore, by four minutes into the piece, the clarinettist has gradually revealed how the controls of the game work as well as their simplicity. Because of this, the audience may feel a sense

of frustration, due to the difficult nature of such seemingly simple controls. At 7:51, for example, the performer attempts to guide the avatar into collecting a gem in the air, but misses, even though this seems like an easy target. These gem misses are prominent throughout the performance.

While the relation between the performer and the avatar is immediately perceivable, the sound changes when gems are picked up are less immediately apparent. This all depends on the order in which the player collects the coloured gems. Each colour of gem has its own oscillator bank, which changes on a loop, as described above. Strong changes, such as moving to pitches higher or lower than other pitches currently played, are much more immediately apparent. However, for some picked up gems, this is not the case, and the sonic changes are much more subtle, creating a gradually shifting texture rather than a strong relationship between action (picking up a gem) and reactive sound (the pitch changing when the gem is picked up).

To analyse the form of the work, I am comparing both the original live performance video, and the studio recording (Aska 2021). I will primarily take into account the changes that take place that are related to the gameplay environment, such as changes in colour, speed of the avatar, and electronic sound response. First I will examine the form of the live performance. A broad overview can be seen in Table 1.

0:00-7:10	Mostly colourless, very few changes, increases in musical density due to attempt to collect gems
7:10-10:24	More colour, although not drastic, changes especially apparent when slap tongues played (7:59, for example)
10:24-15:18	Mostly colourless, with a slight colour change around 11:19, but then back to colourless

Table 1 Analysis, live recording

There is a very long period in the beginning of the performance where very few colour or sound texture changes occur. This is primarily due to lack of gems visible on the terrain; every time a new terrain is generated, the software randomly selects one of six terrains, and some contain more gems than others. It is not until more than seven minutes into the work that changes become visible in the game, with some colours appearing on the blue and purple plants. This coloured environment remains until 10:24, when most of the colour is gone again. There is a short period around 11:19 when the environment changes slightly, but otherwise it remains static and colourless until the

end of the piece. The studio recording appears to be quite different, when examining Table 2.

0:00-3:45	Some colours, many changes
3:45-9:45	After a blank square, return to colourless environment
9:45-13:00	Consistent brief changes, constant but subtly fluctuation
13:00-14:38	Colourless, empty

Table 2 Analysis, studio recording

While the performance recording seems to have an arc-like structure, with a slow beginning, and increase of activity in the middle, and then a fade-out at the end, the studio recording actually begins with more activity, which decreases after the first few minutes. The studio recording has two periods with more colour changes interleaved with two periods of less colour. I think that several similarities can be observed between the two difference performances. First, the periods of emptiness or lack of colour tend to be longer than those with colour changes. During these periods, the clarinettist often struggles to pick up gems, and there is perhaps more focus placed on the musical actions on part of the clarinettist in an effort to pick up the gems. Second, the colour changing periods tend to be quite brief, and very fluctuating. Overall in both structures, an oscillation between coloured sections and colourless sections can be observed, rather than any sort of linear structure of continuous increasing colour.

This analysis highlights the overall boredom or "boring-ness" of the work as a whole. The pitch and harmonic content is limited and repetitive, the interaction between the performer and the game is simple and revealed early on, and the formal structure is also very simple and gentle oscillating between two poles of a similar sound and texture. All of these elements work together to result in a work that contains very few novel moments. Instead, the repetitiveness of the overall aesthetic and environment allows the audience and the performer to experience the non-novel and "boring" moments deeper, perceiving them, as Tapio Leino described in his paper "in a different way".

Conclusion

Gamification has provided a new artistic tool that has led to the creation of several new significant works, which perhaps represent a uniquely twenty-first century type of composition – ludified composition. All music is somehow derivative and representative of the time period that it is created in, and ludified audiovisual works draw upon the ubiquity of interactive media, such as games. However, game elements can produce significant challenges, especially in the sense of form and structure in music. While indeterminacy is nothing new in composition, the live interaction of video games and the relationship between the sound and the video are unique to ludified audiovisual works. Therefore, the genre is still young, allowing much room for development and discussion. Recent increases in accessibility to specific types of software such as Unity have completely expanded the range of options for composers and artists wishing to undertake such projects. The recent and growing interest in ludomusicology provides a platform for scholars to discuss and evaluate ludified works, only solidifying their importance. However, the case for creating these works has already been argued, and they are well established in the art music world, co-existing with other multimedia works.

This paper does not aim to question or assert the relevancy of ludified art. Instead, the question posed in this paper relates to the concept of non-games. How does the use of non-games impact the field of ludified music? This is where I would argue that non-games allow for more focus to be placed on aesthetics. The audience and the performer are not presented with novel visuals, gameplay, and sound, but rather immersed in a continuous and – in the case of *The Missing Piece* – monotonous experience. They are forced to experience the elements of the performance and only the elements of the performance, as the pitches, visuals, and gameplay are limited and continuously repeating. The form ebbs and flows, but the overall tone of the game remains the same. And this makes it very important to question – what is the overall tone of the game? How does one sculpt the time during the gameplay so that the tone and experience is coherent?

The interest of such games cannot come from novel methods of play, interactions, the suspense that exists from waiting to see who won a competition, or whether the player is achieving their visible goal. One possible option of focus, therefore, is on that of the aesthetic content and quality of the game. *The Missing Piece*

does not evoke any programmatic, extra-musical ideas. It does not seek to engage the audience by interesting them in an onstage competition, or display of ability. Rather, it seeks to place them in a beautiful experience that presents a snapshot of an infinite, continuous moment. It allows for a moment to feel boredom, which is perhaps a rare feeling during a time when many people are continuously stimulated. During this moment, there is very little novelty. It is not a game.

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