Loops and Metagames: Understanding Game Design Structures

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ABSTRACT
In this paper we present a set of formal concepts that can help in game design analysis. Our goal is to provide a conceptual framework based on terminology used in game design.

Keywords
Game design research, Interaction Design, Loops, Context, Formalism.

1. INTRODUCTION
Game designer and scholar Frank Lantz once defined games as "basically operas made out of bridges" [1]. A closer look at games shows that, while the metaphor holds, it also falls somewhat short, as operas or bridges are nowhere as complex as games. Digital games in particular, the object of study of this article, are particularly complex sociotechnical constructs: they are engineering feats, pushing the boundaries of real-time and distributed computation while at the same time create communities of players and spectators. The boundary between the technical and the human, the cultural and the mechanical becomes blurred, and games become assemblages of play [2][3][4].

However, as game design researchers we need to have a formal vocabulary that allows us to dissect and understand the underlying structures that allow for this complexity. By formal we refer to a vocabulary of clearly defined terms that can be applied to concrete analysis of phenomena with conceptual clarity. Because games are designed objects, there are elements in them that we can isolate, analyze, and systematize in order to try to better understand what makes a game aesthetically, culturally, or commercially successful.

This paper introduces a formal model for game design analysis. This formal model is based on Sicart's theory of play [5], his game mechanics definition [6], and Björk and Holopainen game design patterns [7]. The model we propose is a complementary theoretical framework that could add another set of useful concepts for research game designs.

We propose a method for analyzing games as sociotechnical systems (as understood in [8][9]) designed around game loops that are both affected and contextualized by larger "structures" we will call metagames. We will use the well-known concepts of loops and metagames, with a particular focus on the way they are used in Free to Play game design [10], a design space in which the economic need for a distinction between interaction and context became a key element in the evolution of its development practices. Our model appropriates the concepts of loops and metagames and expands them through the lenses of philosophy and play research to be applicable for analyzing game designs.

Our model is both an analytical tool and a theoretical argument about what game design is, given a clearly defined level of abstraction. Our goal with this model is to have an impact in research, education, and design practices. We intend to systematize a set of concepts used in game design practice, formalize them through definitions, and exemplify the advantage of using these definitions as analytical and creative tools.

We will start by presenting the need for formal tools for analyzing game designs, and how that research is methodologically compatible with our model. We will then define loops and metagames, building on game studies and games research. We will be using a range of different digital games to illustrate our concepts, but we will illustrate our model with a short analysis of the PSVita edition of *Spelunky* [11]

What we are presenting in this paper is a work in progress, an instrument we've been using in teaching game design and game design research. Our ambition is to bring into game design research precise terminology and concepts from multiple other disciplines to uniquely formulate concepts applicable to understanding game designs, and so help develop game design research as an academic field. But our real ambition is to understand why and how these operas made with bridges, these imaginary embodiments of impossible actions, actually work.

2. THE SEARCH FOR FORM
Academic studies on the formal elements of game design are becoming popular as the discipline of game studies abandons its origins as a humanist discipline, and engages with traditions from the social sciences, computer science and board game history [12]. Other recent work, with which this article wants to establish a conversation, draws on multiple academic traditions to understand the sociotechnical structures that can be designed to facilitate the activity of play as mediated by computers ([13] [14] [15] [16] [17]). It seems that game studies requires now more than passing knowledge of computer science, philosophy, sociology and anthropology, and classic humanistic disciplines such as history or literary theory.

This article proposes a formal(ist) model for the analysis of game designs. We understand formalism in game design research as a method to describe structures present in games within clearly defined levels of abstraction [18] [19]. Formalism, in this sense, makes no claims about the nature of the objects studies, or the absolute validity of the observations, since those are bound to a level of abstraction. In our understanding, game design research

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should describe the relation between the object and the activity that it creates [20]. Game design research is concerned with the role of design in the creation of playable experiences. Unlike textbooks that explain the development process of a game, game design research literature [21] [22] [23] wants to understand the design in game design, following classic ideas in design research [24].

In this article, the playable experience we want to understand is that described by Sicart in Play Matters. Instead of assigning the design of the game object as the source of a particular experience, we understand that the playable experience is consequence of a negotiated appropriation by the player of a designed object. [5]. To play is to engage with an object with the purpose of achieving a particular experience. On occasions that experience will be derived from total submission to the designed systems (competitive play), and on occasions it will be the outcome of pure appropriation (toys), but most of the time playing is negotiating how much we play as the games wants us to, and how much we resist the need of "playing right" [25] or playing to win [26].

The concepts presented in this article facilitate the study of those elements of a design crafted to create a particular conversation [27] between the player and the game system, a dialogue of resistance and appropriation with the goal of achieving a particular experience. The structures of game design allow players to identify activities, goals, challenges, and act upon them, in order to achieve their experiential goals.

This formal analysis applies the method of abstraction [18] to better understand game design. In this article we are applying Floridi's understanding of the method of abstraction, since it has also been used in game studies [28]. A level of abstraction is a "finite but non-empty set of observables. No order is assigned to the observables, which are expected to be the building blocks in a theory characterized by their very definition" [18, p. 52; emphasis ours]. A collection of levels of abstraction will be defined as a gradient of abstraction: "a formalism defined to facilitate discussion of discrete systems over a range of Levels of Abstraction" [18, p. 54]. Game loops are a level of abstraction that allows the analysis of the relations between rules, mechanics, and processes. The metagame is a level of abstraction that allows for the study of elements external to the core interaction with the game that has nevertheless importance in the experience of the game. Any analysis of a game that takes into consideration both loops and metagames will be operating in a gradient of abstraction that allows for the observation of the relations between different levels.

Since games at play are complex sociotechnical structures, all modes of analysis need to explicit their levels of abstraction, specifying the observables being analyzed and situating them in the gradients of the assembled sociotechnical experience of games [3]. When we analyze a game, we need to specify what we are looking at, to avoid making intellectual fallacies. Methods like the one presented in this article should make that process relatively easier.

The concepts we are presenting in this article, game loops and metagames, are a part of a tradition in the analysis of the formal elements of computer games: see for instance [29] [12] Church, 1999; Elias, Garfield and Gutschera, 2012, or the industry-oriented definitions used in [30] [31] [32]. In this sense, our concepts should be seen as inserting themselves between the two most relevant formal concepts in game design research: game mechanics and design patterns. What our concepts allow is to add an extra level of abstraction that is coarser than game mechanics, but less abstract that game design patterns.

Sicart's work on game mechanics [6] was likely the most comprehensive attempt at formalizing the action units that structure all games. According to Sicart, game mechanics are "methods invoked by agents, designed for interaction with the game state" (ibid). The easier translation of Sicart's concept is that game mechanics are the verbs available to all agents in a game that can be used in order to engage with the game system. Sicart's concept allows for a granular and detailed analysis of the actions available to players, and so it opens up a level of abstraction that facilitates detailed analysis of discrete actions available to players.

However, Sicart's concept does not allow for broader levels of abstraction. Sicart's analysis of *Shadow of the Colossus* [33] hints at the relation between one mechanic and one specific emotional outcome. However, the game he chose is well known for its minimalist design, and it affords those kinds of analysis. Since his definition of game mechanics has been scarcely used to make comprehensive analysis of games, we argue that Sicart's concepts do not scale up properly when trying to analyze more complex relations between game mechanics and the intended play experience they are designed to create.

While game mechanics as defined by Sicart are valuable concepts for performing local, focused analysis of discrete elements in game design, they lack the capacity to understand relations between them, and how mechanics, as series of actions and processes, create specific gameplay experiences. If we want to understand how multiple game mechanics are joined together and thus create complex gameplay experiences, we need a level of abstraction that assumes the existence of game mechanics - as relational items in processing and interaction loops.

Another formal approach to game design studies that proposes a level of abstraction to analyze games is Björk and Holopainen's Design Patterns [7]. Design patterns are macro structures of design elements that put together form recognizable patterns in a game design. Following the computer science model of design patterns, and inspired by activity theory (a good reference for design and activity theory is [34]), Björk and Holopainen identified a large number of patterns with the purpose of understanding the superstructures that are repeated in games, and how those form our knowledge of how games are designed and played.

Design patterns are extremely useful conceptual instruments that allow for the establishing of typologies, as well as for the identification of innovations and conventions in games. However, the level of abstraction required to make use of the design patterns leaves out the possibility of detailed analysis of the ways the elements of the patterns are interlocked. Additionally, given its broad level of abstraction, design patterns sometimes conflate elements that are direct gameplay activities with elements external, but related to the player experience, such as a games' economy, narrative, or context of play.

There is, then, a gap between the analytical possibilities of design patterns and of game mechanics. We have conceptual instruments to analyze game design as broad patterns and as detailed actions,

but we lack a proper, formal terminology that opens levels of abstraction in between those two.

What we need, as game design researchers, is a formal understanding of the ways game mechanics are interlocked with each other, how this interlocking is connected to a particular play experience, and what is the role of elements external to direct interaction but relevant to the experience, such as the game narrative, economy, and context of play.

Our goal is to add a new gradient of abstraction that will allow the analysis and evaluation of series of mechanics, and how they are affected by (designed) contexts.

3. LOOPS AND METAGAMES

When we say "we are playing a game", we are essentially bundling through the word "play" a complex assemblage of interactions, contexts, social structures and technologies. "Playing" a "videogame" implies interacting with a computer system with the purpose of achieving an experiential goal, often mediated by system-driven, designed goals. Game design is the art and craft of creating devices that focus and stabilize these assemblages. Game design is the design of play through the interaction with a rule-based, formal system (as opposed to toy design, or playground design, though these other areas do overlap significantly in terms of processes, techniques, and goals). Game design research should be the analytical approach to the processes that create these assemblages.

To analyze these processes in a proper level of abstraction, we will use the concept of game loops to analyze all the actions designed in the system for player interaction, and the concept of metagame to analyze how the game object creates a particular context that also plays a role in the configuration of the play experience.

Interacting with a game system can be described as the establishment of an encounter [35] [36] between the freedoms of play and the constraints of interacting with designed systems. Interacting with a game is a constant dialectical challenge of submission and rebellion, of getting what we want through what we can do [5]. The ludic experience exists at the tension between play and designed structures.

This tension is often eased through liminal points in which submission to the system becomes a part of the pleasure of play, in which surrendering the freedom of action to the pleasures of understanding how a system works yields the desired play experience. Game design, in this level of abstraction, is the design of systems in which the player's will to play is matched, either directly or in resonance, by the space of possibility created by a game.

Let's look at the first minutes of playing Minecraft [37] in survival mode to understand how game loops can help us understand videogames. Once we start a game of Minecraft, our first actions should be gather wood, so we can then build an axe and a pickaxe, so we can gather other resources like dirt and stones, to be able to make a shelter before the night comes and the monsters attack. This first loop goes essentially unchanged in the rest of the game, which is basically an extension of the gather, craft, build loop, only changing the materials we work with – and with the additions of loops of enchanting or machine programming.

In fact, Minecraft has other loops available for the player once this core loop is mastered – visiting the Netherworld or killing the Ender Dragon add a combat loop. However, that combat loop only adds one mechanic to the core loop: gather, craft, build (weapons), attack, and gather. The loop, though advanced, is recognizable and builds on the skills the player has already developed in order to start playing the game.

In fact, an argument we can make about Minecraft derived from this quick observation of the core loop is that perhaps its commercial success, despite being a game with a clunky interface and a lot of arcana, is that learning to play means learning the basic loop that will always be available for the player. The first thing we need to learn in Minecraft is, to a certain extent, the only thing we need to learn to play Minecraft.

In this sense, Minecraft's core loop is designed to bound the apparently infinite possibilities of the expanding world presenting to the player to a horizon of possible actions, a possibility space in which some actions that can be performed repeatedly structure the activity. The core game loop of Minecraft bounds the freedom of the player to the particular actions that are possible, and desirable, in Minecraft. From that bounding, gameplay emerges as a ludic experience.

It is now time to formally define game loops. Game loops is a relatively well known concept in game design parlance, and it is often used to describe the sequences of mechanics and processes that conform identifiable patterns of processing and action in a game. Cook [31], for instance, identifies the game aspect of a computer game in loops, understood as sequences in which "

The player starts with a mental model that prompts them to...

> Apply an action to...
>
> The game system and in return...
>
> Receives feedback that...
>
> Updates their mental model and starts the loop all over again. Or kicks off a new loop. "

Kelly [30] defines loops as "the essential atom of gameplay […] opened and closed by player action", again insisting on how these are individual actions chained together, performed by players, and likely calculated/processed by the computer system.

The concept of loop also has a distinct history in the philosophy of technology and computation, as it has been used to describe the cybernetic loops of information transmission, processing, and feedback that constitute the core of an informational ontology. [38] [39].

We would like, however, to build upon these traditions to propose the following definition: game loops are a level of abstraction that describes player input through game mechanics, system processing (evaluation of input matched to the game state and the rules of the game), and feedback output. A game loop is a composite of game mechanics, computing operations, and feedback mechanisms that is repeated until a break condition is reached, either in the game mechanics or in the computing operations.

Returning briefly to Minecraft, the core loop of gather, craft, and build, consists of those three mechanics plus the calculations the system needs to perform in order to allow the player to move from mechanic to mechanic. Gathering enough resources (enough

as defined by a game rule) opens the craft mechanic. An evaluation of the resources of the player by the computer system will allow the player to craft objects that then will be able to be used in constructing. For example, if the player has one diorite cube and one cobblestone cube, she can build two blocks. If she has blocks, she can build walls. Unlike Sicart's isolated mechanics, the concept of loops allows us to see what operations the computer (or the game system embodied through players, as in analog games) performs on the results of those mechanics.

Game loops are composed by game mechanics, player input, system processing, and feedback. Loops are designed to match the appropriative nature of play [5] with the formal elements of system processing. Any player, human or not, will identify actions afforded as openings to start an interaction with a system, an interaction that is continuous through the stringing of different forms of input and output. Game loops put together discrete actions (mechanics, system processing), and by doing so they allow for the player to interact, explore, and express herself through playing with, or through, a system.

In Minecraft, the core loop, in all its simplicity, allows any player who has mastered it to engage in more complex play experiences, exploring the world to find new materials with which they can build new things. The loop is a simple instrument to appropriate the world of Minecraft, and to see it as a raw material ready to be modified at the will of the player.

One way of understanding games as designed objects is to see them as collections of loops. There are loops that encompass those mechanics and processes that the player has to repeat and master in order to play the game (succeeding at reaching a ludic experience). In a game like Dear Esther [40], the game loop is compellingly minimalistic, consisting of exclusively walking around world and unlocking sound files that thread a narrative together. A competitive game like FIFA 15 [41] can be productively described applying at least two core loops, attacking and defending. Attacking consists of passing the ball from player to player until a shot to goal is possible, while defending consists of switching players while keeping the formation in order until the opponent loses the ball.

These loops can be related to other loops - in the case of skill or exploration games, secondary loops can be seen as those actions a player can choose to learn to achieve particular mastery or to explore the whole world and the narrative of the game. Mastery and depth, then, can be a consequence of the interlocking of secondary loops to actions in the core loops. For instance, attacking in FIFA 15 can be enhanced with a secondary loop of performing skill moves that can help gain a competitive edge. Even though it is possible to beat good FIFA players without performing skill moves, the gameplay advantage of mastering those loops makes those situations less likely to happen. Excellent FIFA players not only master the core loops of the game, but also the skill moves loops, and that is precisely where their excellence lies: in the mastery of secondary loops. By adding extended agency to the core loop through skill moves, FIFA developers show how secondary loops can add depth to primary loops. The role of secondary loops, then, can be to make sure that the game has compelling, long lasting depth, that the player has enough variation or skill progression so that players can still feel that their engagement with the game is meaningful.

Loops are a level of abstraction that allows designers to think about the actions afforded to players, their processing by the game system, and how the interaction itself can lead to different types of play experience. Loops are the level of abstraction that allows for the joint analysis of game mechanics and the calculation of results of actions based on rules.

In practice, this use of the concept of loops allows for designers to have a composite tool for understanding the ways in which one particular mechanic is triggered by a player, processed by the system, and translated through a UI/UX framework. Furthermore, it allows for designers to observe sequences of actions and discretely separate them for evaluation and analysis.

This level of abstraction is appropriate to analyze both formal elements, like the relations between items or skills and their effects in game balance, or to determine player skill progression. One interesting example can be seen in FIFA 12 [42], the first game of the franchise that had the revamped tactical defense system, in which players control directly one of their defenders, but can also command the AI to assist in defense. For many months after the introduction of this system, hardcore FIFA players who had developed mastery in the previous iterations of the game expressed their disliking of the new system introduced, because it broke their skills. However, in the long run the tactical defense system improved the game of FIFA, since it added depth to the defensive loop. At the cost of enraging some of the user base, the FIFA developers showed how the redesign of one of the games' core loops could yield a richer experience that can engage even those players that were already tired of the franchise, by forcing them to develop new skills.

Loops can be used in game design research for three purposes: first, to understand and analyze what the player does beyond the core units of game mechanics. This would allow to potentially formally model player actions and how they correlate to the game system, that is, it would allow us to contextualize how game mechanics work together in the creation of a play experience.

Second, the concept of game loops allows us to analyze game processes and how they are interrelated. Since most games tend to have complex systems of evaluation of player action, a formal understanding of how these processes work in relation to player input can help address issues of game balance, or even understand why a game is particularly appealing.

Finally, loops give us the right level of abstraction to understand what players do and why while playing a game, relating game mechanics with system processes, putting them together in a series of input and feedback loops. Since loops are levels of abstraction, we can define them differently according to our research needs. So far I have presented very broad loops (attack/defend in FIFA; gather, craft, build in Minecraft), but as long as we define loops as having mechanics and system operations that define the transition from mechanic to mechanic, we can be as granular as we want in our analytic process. For instance, we could apply Sicart's definition of game mechanics to a particular loop, as long as we also include in our observation the data processing from the mechanic's methods that the game system needs to compute, the feedback output, and a description of how the completion of that sequence leads to another mechanic in the loop.

However, game loops only explain the core actions that the player engages with. Following Sicart's play theory, "playing" should be understood as a more complicated type of experience - it is a situated, emotional experience that allows us to take over or

create a world by entering a dialogue with a system of rules and the actions it affords. We need another level of abstraction that encompasses the non-systemic properties of a game design, so we can study the role they play in shaping the ludic experience. To look at the context of game loops, we propose the concept of metagame.

Free to Play (F2P), more than a game design methodology, is a business model defined by a great challenge: to give away for free enough of the core loops of a game to make players interested in spending more money on elements that are either secondary loops, or totally outside of the interaction loop. In this way, we could argue that F2P shows how the emotional, aesthetic, and cultural importance of games, even for their players, cannot be exclusively circumscribed to the core play interaction For F2P, how that interaction is framed, exposed, and contextualized is also interesting since that is where there are monetization possibilities. Because core loops in F2P tend to be given away for free, designers needed a level of abstraction to understand their monetization strategies. And the result was the evolution of the relatively classic concept of metagame [43] [44] [10] [12].

Metagame (or metagaming) is originally a mathematical concept, applied also in war games and political theory [45]. If we stick to the colloquial uses of the term, in war gaming, metagame often refers to the development of tactical strategies as well as to the importance of actual historical knowledge for gameplay. In other strategy games, metagame is often used to describe the development and discussion of tactics and strategies outside the core interaction with the game loop - in League of Legends [46], metagame is often used to explain the theorycrafting [47] discussions that lead to the development of strategies applied to gameplay.

Taking these definitions into consideration, we define the metagame level of abstraction as any aspect external to interacting with game loops that influences the play experience of a game.

This is a very broad definition that wants to insist on what F2P made explicit with its monetization strategy: playing games is more than just engaging with exciting core loops - it is a situated activity that is meaningful not just as an individual interaction, but within a particular context.

Our concept of metagame is inspired by Dourish's concept of context within sociotechnical practices [8]. As Dourish explains, instead of looking at how actions take place in a context, as if both were separate, we would benefit from seeing action and context as deeply interrelated, so we can understand what elements of the action are affected by the context: "Context is an occasioned property of action in just the same way as ordinariness. Just as ordinariness, or unremarkableness, or relevance of some utterance for the emerging conversation is an achievement of that conversation, so too is any distinction between an activity and its relevant context. Like ordinariness, context is managed moment by moment, achieved by those carrying out some activity together, and relative to that activity and to the forms of action and engagement that it entails. Sacks' discussion of ordinariness as an achievement of social actors illustrates what I mean by making a conceptual turn, from treating something as a ''representational'' problem to treating it as an ''interactional'' problem." [8, p. 25].

In this sense, metagames allows us to see when the activity of playing a game is more than just engaging with the loops, and the role that the context of that activity has in the configuration and experience of that practice. Contextuality is a relational property between objects and agents. Context is a form of practice that is also part of the activity, and as such we need to be able to see it as related to the core technical, formal structure of the object we are interacting with. By using the concept of metagame we want to open the possibility of not seeing the context of the experience of playing as separate, but as a part of the same modality of practices to which game loops belong.

All interactions with informational systems are not meaningful exclusively for their pleasures, but also for the role they play in a larger context, and likewise, the way they are designed needs to be aware of that. Metagame is the level of abstraction that helps us understand not why a collection of loops is pleasurable, but why players want to continuously engage with them, and make them a part of their routines and practices.

Metagame encompasses any element that has been designed to provide a context for the game loops, and that has an effect in the play experience. Because this definition is too broad, and we need better forms of understanding how to use this concept for game design research, we propose 5 types of metagame that are relevant to the analysis of game designs: informational, fictional, economical, performative, and physical metagames.

The informational metagame is the level of abstraction that allows us to understand the importance of sources of information external to the core game loop in configuring the strategies of the player and the player experience. In other words, the informational metagame comprises all that information that is not strictly relevant to play the game, but that expands the experience of the game and affects the interaction with the loop.

In Minecraft, for example, using a wiki to understand what potions can be made, or how you can use certain materials, belongs to the informational metagame. Likewise, FIFA players can watch YouTube videos explaining tactics and skill moves in order to improve their game, learning how to better defend or attack.

The fictional metagame is the level of abstraction that can be used to understand the way in which fictions are used to wrap and communicate the game loops. The fictional metagame can be used to analyze the importance of narrative in the emotions elicited by the play experience. It allows also more classical humanities analysis of games as fictional/rhetorical devices, since this level of abstraction allows us to observe the core loops from the metagame perspective of fictions as rhetorical devices.

For example, the relatively simple loops in the puzzle/exploration game Gone Home [48] become more meaningful once the story begins to unwrap, turning a relatively simple game in terms of the depth of its interactive qualities, into a more complex emotional experience.

The economic metagame is the conventional F2P understanding of the metagame, that is, all elements external to the game loops that can be purchased, either with in-game currency or with real currency, and that have an effect in the experience of the loops. This level of abstraction can be used not only in modeling the way economy affects the core loop experience, but also in performing critical analysis of the ethics of particular monetization models.

The classic examples here are the monetization strategies of games like Subway Surfers [49] or Plants vs. Zombies 2 [50], games that give away their core loop for free with the expectation of players becoming so engaged that they will buy the extra elements that enhance that gameplay. Of course, a perversion of this system is the Pay-to-Win model [51], where players can enhance their performance of core loops not by developing mastery, but by paying. This design approach could be criticized, using game loops and metagames, as unethical since it does not foster the development of skills, a perspective rooted in Virtue Ethics [52]. This critique is beyond the scope of this paper, but we felt nevertheless the need to add it here as an example.

The performative metagame can be used to explain the importance of performativity in the experience of a game. Often, the development of skills in a game means the development of a mastery of game loops. However, we can also find players who not only play the game, but also play with it, for an audience, as performers. This performance can be designed into the game as something that players can develop regardless of their loop-based skill, and can help create communities of practice with different concepts of mastery. Of course, the performative metagame can also be used to explain the particular pleasures of embodiment and immersion/incorporation [53] [54].

The performative metagame is of special importance for streaming channels, in which the best players are not necessarily the most skilled in playing the core loops, but in performing those loops as a form of expression. Speed runs, for instance, are performative shows of mastery of game loops. And in local multiplayer games, the design for performativity is particularly important, given the co-located experience of play – a game like JS Joust is interesting because it is designed around specific ideas of performativity [55] [56].

Finally, the physical metagame can be used to define the importance of the physical context in the shaping of the game experience. All games are played in a particular physical context, and this context can be of extreme importance for the experience of the game. Usually, game design research has not insisted on how any game has to be designed to be played in a particular space.

The rise of local multiplayer and exhibition games has shown that game design research needs to expand its vocabulary to be able to analyze how the design of the physical context of play is also an integral part of the design of the play experience.

Game loops and metagames are then two levels of abstraction that gives us important tools to analyze both the core formal structure of a game, and the context in which it is played. By using both game loops and metagames as instruments for analysis, we can potentially engage with the cultural complexities of games while keeping in mind their technical, formal nature.

4. SPELUNKY CONSIDERED AS ONE OF THE FINE ARTS

Spelunky is a 2D platformer with procedurally generated levels in which players have to collect treasures and riches while traversing different worlds, surviving the challenges posed by the environment and monsters. Initially developed in Game Maker and released as shareware, *Spelunky* was later ported to the Xbox 360, and is now available on all major gaming platforms. We focus on the PSVita version, released in early 2013.

What follows is not meant to be a thorough analysis, but an example of the application of loops and metagames to the study of a particular game design. We will not specify in detail the workings of the game loops or the metagame – we want to give an overview of the possible research possibilities that this terminology offers.

In appearance, *Spelunky* is a fairly classic videogame: a side-scroller in which players control an avatar that can jump, has a short ranged attack, and has to collect resources to survive the environment, trying to traverse it to the end. The game mechanics are fairly common (running, jumping, walking, shooting, collecting, …), but there some design choices makes *Spelunky* is almost an avant-garde game [57].

First, the procedurally generated levels make the game feel unpredictable, but they also avoid rote repetition as a way of developing mastery. In fact, mastery in *Spelunky* is mastery of game loops, of the core actions the player has to perform, but also of how these actions are intertwined and situated in levels that, within their procedurally generated parameters, can be recognizable. A good player learns to "read" the level layout, understanding the algorithmical logic that drew that particular level. Then, she adjusts her strategy to achieve the desired goals in that particular layout, and then she performs the core loop of running, jumping, collecting and attacking based on the initial plan drawn from her expertise.

Second, the game takes inspiration from classic videogames in its punishing difficulty. However, rather than being a masochore or abusive game [58] game designed to develop exclusively coordination skills, like *Super Meat Boy* [59], *Spelunky* adds layers of depth by allowing a multiplicity of player styles to develop from this difficulty - from the fast paced player to the slow thinker, they all learn to master the game by learning and perfecting the engagement with the game loops.

So what is *Spelunky's* core loop? At its most basic, the core loop in *Spelunky* is: traverse the level from the top to the bottom of the map, collecting treasures, avoiding/killing enemies. In more detail, the mechanics would be movement mechanics (walk, run, jump, occasionally fly/glide), attack mechanics (whip, throw, stomp, occasionally shoot), and collecting mechanics (pick up, hold). These are performed in sequence to achieve the goal of reaching the end of the level. At its core, *Spelunky* is an exploration/movement game about getting out of a level with as much profit as possible. The player has also access to ropes and bombs in limited amounts, but their use only marginally expands the movement and attack mechanics (blow up, climb).

Finally, an interesting secondary loop has to do with using attacking mechanics or collecting mechanics to trigger emergent events in the level from which the player can benefit. For instance, grabbing a golden idol to trigger a stone trap that can clear parts of the level from monsters, grabbing mines and throwing them to perform timed attacks on enemies, or using spider webs together with bombs to create timed bombs.

However, looking at the loops in *Spelunky* will show us mostly the pleasures of mastery of hand-eye coordination skills, and not necessarily gives us an insight on the depths of play that *Spelunky* can create. The level of abstraction of loops allow us to see the effects of procedurally generated levels in classic game loops, as well as how mastery and depth are often interconnected, since mastery opens secondary loops. But if we want to know why

Spelunky is also an interesting cultural artifact, and why it has had such longevity, we need to look at how these loops are contextualized by different metagames.

A deep analysis of the different metagames in *Spelunky* is beyond the scope of this introductory article. However, we want to provide an example of how understanding the relation between game loops and metagames can help analyze game designs. The first metagame that we will focus on is the performative one. One of the main reasons for *Spelunky*'s success is how watchable the game is - some of the best players in the world are streamers who publicly showcase their skills on video streams. This is for two reasons: the game has an easily identifiable game loop, based on classic games, that makes it very spectator-friendly, as any casual watcher can immediately understand what happens. However, the secondary loops and the procedurally generated level design affect that core loop in such a way that it is also possible to recognize and admire mastery, especially in the variation of scenarios.

Similarly, the informational metagame explains part of the popularity of the game. *Spelunky* is a game full of secrets, of possibilities opened once mastery of the core loop happens. Learning to play *Spelunky* well does not exclusively lead to becoming better at the core loop, but to being curious to uncover the secret possibilities of this world. Becoming better opens the world and makes the player inquire, and thus pushes players to the informational metagame. Most *Spelunky* players have checked wikis, FAQs and videos to figure out the secrets of the game.

Spelunky is also designed to reward this engagement with the informational metagame: the game has secret levels, objects that trigger particular behaviors, and many other tricks designed to trigger the curiosity of players and lead them to try to learn more by engaging with the informational metagame. The durability and pleasure of Spelunky resides also in how it is designed to create a community that will also reverberate in the development of skills: as a player you want to become better to be able to unlock the secrets that you've learnt about from the YouTube videos of top players - the metagame reinforces the continued engagement with the game loop.

The fictional metagame supports this informational metagame. *Spelunky* makes use of iconography from classic adventures, from computer games to films. It does so not only to make the game more recognizable within a particular genre, but also to tease at the possible ways in which the game can be played. In short, the game's fictional metagame is both a way of communicating to the player how to play *Spelunky*, and what to expect from the game, and to engage her with the informational metagame, suggesting at the existence of secrets to be unlocked.

The economic metagame in *Spelunky* is not that important, since there are no resources external to the game that can affect the game loop. Even though we could interpret the secondary loop of buying items as an economic metagame, we believe that it is more productive to see the purchasing mechanic as adding an extra layer of depth to the original core loop. *Spelunky* has an economic game loop within its systemic structure (the tradeoff between keeping the treasures or using the money at the vendors to help finishing the game), but it does not have any external economic metagame that affects the core loop. The curious reader can engage in the following thought experiment: a true *Spelunky* economic metagame would be moving the vendors outside of the core game loop, and tweaking the economy of the game so as purchases could be made with real money - or, even, purchases could be made based on previous performance and savings before beginning each run. In those hypothetical cases, there would be an economic metagame affecting the game loops.

Finally, the physical metagame in a game like *Spelunky* is slightly less relevant than in other games, since the game shares, across its different implementations in different platforms, most of its core identity traits. However, we would like to briefly highlight how the physical metagame of the PSVita version actually sheds light on the importance of designing the physical metagame.

Spelunky is a great local multiplayer game, as it encourages competition and collaboration, and due to its difficulty, can often lead to hilarious, memorable experiences. For that, the split screen console version works perfectly, forcing co-location as a form of player-to-player interaction beyond the screen. The PSVita version, however, offers multiplayer games by LAN, and in our experience the local multiplayer is a less joyous experience because there is no shared physical space. Two players each looking at their screens is not the same as a shared screen experience, and while it is admirable that *Spelunky* Vita has a local multiplayer option, its physical metagame, due to obvious constraints, is less satisfying than its counterpart on consoles.

With this brief analysis, we wanted to show how applying the concepts of loops and metagame can be used to provide insights about the design of *Spelunky*. Even though our analysis has been superficial, it could be relatively straightforward to expand any of our observations to a larger, more in-depth analysis that would also account for the specifics of the technical construction of the system, and the social and cultural impact of the act of play. For the time being, this brief analysis should serve as a justification and demonstration of the use of loops and metagames in game design research.

5. CONCLUSION

In this paper we have proposed the use of game loops and metagame as two distinct levels of abstraction for the analysis of game design. With this work we want to suggest a way of formally addressing the systemic nature of games, while at the same time contextualizing that nature as a broader sociotechnical practice that can also be designed and analyzed. Our goal was to provide a new toolset to look at game structures that was open to situating these structures within larger contexts, all of which can be designed. In this way, we also want to expand the craft of game design, both as a practice and as a teachable, researchable techné.

Whether this work is a success or not is more risky to assess. We believe that this model is applicable in the pedagogics of game design, and by extension in game design analysis, since it allows for students and researchers a better framing of their object of study, and a vocabulary that allows for the delimitation of the research scope. Using game loops as a level of abstraction, for instance, allows us to think about the role of computer processing in the interaction process of playing a videogame; similarly, thinking about the importance of space and its design in modern local multiplayer games can help us make arguments about the success of new videogame arcades and how it is fuelled, and is fuelling, new game designs.

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