The Gameplay Loop: a Player Activity Model for Game Design and Analysis

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ABSTRACT
To describe the task of the game designer, the literature on the subject often refers to rules and systems. But the main objective of the game designer's work is to create a specific kind of experience: gameplay. Based in both literature and diverse modes of practical experience, this article offers a formal delineation and methodology of the gameplay loop that is applicable for both design and analysis. This approach considers this loop as the potentials states of the player in the game system. This article will report use of this model in the development of recent industry games as well as in the analysis of existing titles for academic purposes.

Author Keywords
Gameplay; gameplay loop; game system; game design; player; video game

ACM Classification Keywords
Design

INTRODUCTION

With the rise of video game degrees and game studies in the early 2000s, game design has become an ever growing object of research. Definitions and methodologies have been proposed in numerous design manuals as well as scholarly research. As production teams continue to grow, so too does the game industry's demand for formalized game design methodologies.

In this multiplication of literature and industrial documentations[1], the main focus often remains on the game system and game rules. The formalization of game design models is still rare, and even more so when it comes to gameplay. The role of gameplay in the game design process has yet to be clarified.

Our[2] current research strives to delineate the experience of gameplay. Furthermore, our research offers a useful gameplay model for game design and game analysis.

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Definition of Gameplay

The word *Gameplay* is commonly used in the industry to describe the process of the player playing the game or encountering a challenge. Literature defines gameplay as an interaction between the player and the game world, systems or rules [7, 14, 6]. This interaction is also described as the actions of the player [15, 13]. For Holopainen [5] the definition includes the notion of Intentional behavior, described as *doing goal directed actions requiring a set of cognitive and sensory-motoric capabilities*. The culmination of the three above mentioned definitions constitutes the meaning of the word *action* as we use it here.

In [3] the authors explored literature and proposed a definition of gameplay. We are basically using the same definition here: *All actions performed by the player, influencing negatively or positively the outcome of the uncertain game situation in which he is engaged in*. The only difference appears at the end: we replaced *immersed in* with *engaged in* to contribute to the ongoing work on engagement [11].

The gameplay loop as a tool

The gameplay loop provides a compelling model for the creation of a tool that is useful for both design and analysis. To avoid confusion: when we use the term *gameplay loop*, we are not referring to the industry model of *Objective Challenge Reward* (OCR). OCR is often described as a gameplay loop, but it represents the game from a very macro point of view. It can be useful for discussing games on a conceptual level, but not for concrete gameplay design. We are also not referring to the input/feedback interaction loop as formalized, for instance, by Swink [16].

[1] The author is a game director, and an industrial expert in game design methodologies. He worked for independent studios and publishers. He contributed to more than 30 major titles since 2000

[2] In this paper we use "We" and "Our" to highlight the contributions from the game development team in the game design case of study, and from the students during the use of the gameplay loop as an analyzing tool.

In our definition of gameplay, action is central. We find examples of action as one of the basic components for gameplay analysis [10]. Action verbs can also be at the center of the design process [1]. For the development of the research game JEU SERAI, we described gameplay with action verbs as a part of the design process. With this last example, the method of naming was not efficiently framed. But even with some issues concerning the subjective interpretation of actions, trying to formalize these actions helps us to understand the origin of design errors that took place during production [2].

Actions, formalized as verbs, are already used to represent gameplay. But in all these cases, we overlook the dynamic aspect of the process. The player is constantly moving from one activity to another. In game design, we sometimes try to invoke a web of actions as a temporary and approximate way to explain the game experience.

This article offers a tool called the gameplay loop, which strives to represent gameplay in action. We want to convey the state of the player in the game system as accurately as possible, and to visualize the circulation between actions. We will focus on the formal representation of gameplay in order to assist in the early stages of game design and the production process as well as game analysis.

METHODOLOGY FOR A GAMEPLAY LOOP

First we will focus on rules from the empirical game design practice of the gameplay loop, which we will then frame within the rules of representation. Then we will apply the gameplay loop model to an actual game design process and game analysis.

The gameplay loop as formal tool

The first version of this approach comes from the practice of game design, in particular the creative brainstorming that occurs during the concept phase of production. We frequently try to represent the gameplay experience and communicate it to the team and executives. The overall goal is to list a certain number of player actions, represented by verbs and minimal context. These sparse depictions of action are then connected in the form of a flow chart.

What the player does can be categorized with different criteria. A good starting point for sorting out action is to determine whether it has an immediate, measurable effect in the virtual world or not. We refer to these two kinds of actions as (1) In Game Action and (2) Out Game Action.

An In Game Action describes an activity which is concretely represented within the game. Most of these actions require input from the player via the controller. For instance, the player presses the A button on a gamepad and the character jumps. To classify such action, we try to give the minimum elements of context or goal. For example in *Space Invader* [17] we can say that the player/spaceship performs actions like "avoid enemies projectiles", "position the ship to fire", "shoot at enemies' spaceships", "take cover". All these actions require player input and have a perceptible effect on screen. We can also include in this category an action like "stay covered", as it is a represented situation on screen even if the player doesn't press any button at this moment.

Figure 1: Screenshot for the hidden object game Pure Hidden. The player plays just by looking at the screen

The other category, Out Game Action, mobilizes perceptive and cognitive capacities. They do not have an immediate representation on screen but should provoke further In Game Actions. Figure 1 illustrates this type of gameplay activity. In the hidden objects game *Pure Hidden* [12] the player spends most of his time looking at the screen and trying to find visual representations of a list of objects. For instance, he can try to find a basketball in the figure. The activity "search the object" doesn't require the use of a gamepad button nor is it represented on screen. But it is clearly an activity in the gameplay loop.

The second type of classification we use is duration of action. We have at least two types of duration: Event Action and Continuous Action. In *Pure Hidden*, "Spot the object" is an instant event, "Search the object" can have a certain duration.

Each of these actions are formalized as boxes in a flowchart graphic. Representing player behavior can easily be done with a flowchart from a macro level, as in the OCR loop. In our case we try to go as micro as possible. It means that if we zoom into one of these boxes, we enter in a specific component of gameplay: the challenge, where player's abilities are confronted by a game situation that you can express in variables and parameters.

Figure 2 shows a brief example of format with the few actions we take in *Pure Hidden*. We already can establish an initial representation of a gameplay loop.

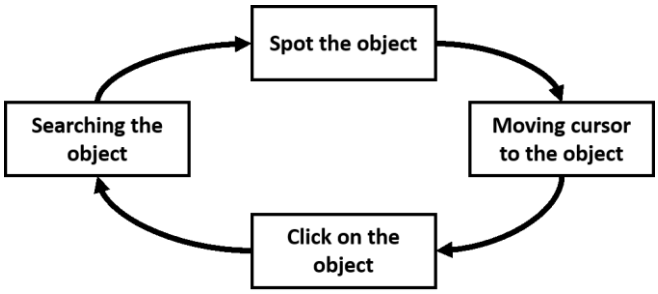

Figure 2: Example of gameplay loop formalization using a few actions from the Pure Hidden.

The goal in game design as well as game analysis is to apply such formalization to identify the core gameplay of the game. This means, the set of actions the player will iterate the most, and in which the wining/losing condition are real outcomes.

Game Design Case Study: Blue Estate

Even if we used this kind of approach to design previous titles, during the development of *Blue Estate The Game* [4] we managed to document the proposed gameplay loop methodology from the very beginning of the concept phase to the final stages of playtest.

Blue Estate is an arcade rail shooter which takes place in the context of a present day mafia war in Los Angeles. Though Blue Estate's gameplay might classify it as an Action Shooter, this title also features a fully-developed narrative and subversive humor. This is quite fitting, as Blue Estate is a ludic adaptation of Viktor Kavalchev's comic of the same name [8]. The player takes the role of protagonists who have to fight their way through environments heavily populated with mobsters. The game was originally produced to be used with motion gaming controllers like the Leap Motion, the DualShock 4, and the Kinect 2. Figure 3 shows an in game screenshot of the game.

Figure 3: Screenshot of the rail shooter Blue Estate.

The concept phase started in March 2012, the pre-production and production lasted until April 2014 for the first complete version on PS4. The Leap Motion version was first shown on October 2013 for the launch of this new device. The author was co-creative director of the game, particularly in charge of gameplay aspects.

Gameplay loop as a tool for game analysis

Currently, the gameplay loop is being used to analyze existing games as a pedagogic method in various academic settings:

- The Master degree in video-game of the CNAM-ENJMIN (French national school of digital media in Angoulème), for an average promotion of 50 students in first year of Master between 2006 and 2013. Here we prepare and teach examples of gameplay loop analysis of existing games. The primary titled used is *Metal Gear Solid 2* [9].
- The Bachelor degree in game design of the Bellecour Ecole (private School in Lyon), for the 36 students of first year, between 2014 and 2015. Students observe gameplay loop analysis and then have to put it into practice themselves.
- The Bachelor degree in digital games of the Cologne Game Lab (institute of the TH-Koln, university of applied science), for the 42 students of the first year, from 2015. Students observe gameplay loop analysis and then have to put it into practice themselves.

The preparation and analysis example ask mainly to identify the core gameplay of the title. In this paper, we will focus on the example of *Metal Gear Solid 2*. Its main form of gameplay is infiltration. We only used the game as a source of information, by playing it and taking notes. We didn't use any publication or previous analysis.

CASE STUDY IN GAME DESIGN

The initial rough concept of *Blue Estate* was: a motion gaming rail shooter augmented by interaction with the environment. A rail shooter is a first person shooter, where the camera is not controlled by the player. The camera 'moves' on a rail and the player engages in arcade gameplay, such as aiming at enemies or at other interactives elements. On this basis, in the first week of work on *Blue Estate*, we had to define what the core gameplay was.

First core gameplay loop

The first creative workshop took place in March 2012. We formalized the core gameplay action – shoot – as a gameplay loop. Figure 4 is a picture of an original sheet used during the workshop.

Post-its represent actions. The green color highlights the In Game Actions such as "Move (the crosshair) to the target", "On Target" and "Fire". The Out Game Actions, "Identify target", "Choose target", are connected with pink arrows to the In Game Actions. These 5 actions were chosen by the participants of the brainstorm. It's on this basis that the main game challenges should be developed. We tried several configurations and discussed the richness of each action before agreeing on this apparently simple flow chart. The iterative gameplay loop the player faces throughout most of *Blue Estate* is: Identify targets, Choose target, Move (crosshair) to the target, (Remain) on target, Fire,

and then restart the loop (Identify targets…). The following statistic conveys how important the design and the description of these little post-its are to understanding the gameplay of *Blue Estate*: the player will repeat this loop nearly 2000 times in order to finish the game. From the very beginning, the team should be sure it can provide variety and changes in difficulty through the whole game.

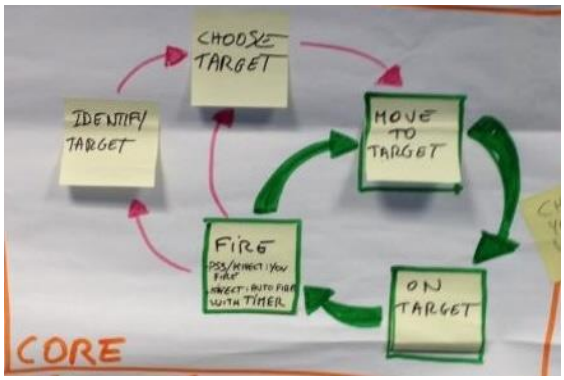

Figure 4: Photo of a brainstorming sheet created during the early concept phase of Blue Estate, where the core gameplay loop of the game is delineated.

An In Game Action

If we zoom in on the "Move (Crosshair) to the target", the challenge confronts the player to a game situation. He uses the motion gaming controller with more or less accuracy to position the crosshair of the weapon on a target. The target can be summarized in a certain number of parameters to challenge the player's mastery of this activity: size of the target on the screen, speed of it, complexity of the path between two targets. Already with these few elements we know we can create diversity of activity and variety of difficulty.

The very first prototype of the game (produced in April 2012) was a proof of concept of this In Game Action. "Move to target" was a priority in our early research and development due to the critical aspect of the motion gaming for the project.

Figure 5 is a screenshot of this first prototype. Most core gameplay aspects of *Blue Estate* were tested in 2D. In the figure, the blue crosshair is controlled by the player via either a Kinect or a PS move. The circles represent targets of different sizes. They can be still or in motion at various speeds and appear randomly on the screen. The number in the middle of each target represents the amount of damage needed to destroy it. The black squares, randomly generated, represent 'cover' the circles can hide behind, thus making them difficult to hit.

Figure 5: Screenshot of an early gameplay prototype of Blue Estate, to experiment the "Move (crosshair) to target" type of challenge

During the pre-production and the production phase, a significant volume of work in game design and level design was related to this specific In Game Action. There is an example of this task which take place during the playtest phase. *Blue Estate* is playable on different platforms and with very different controllers, including the traditional gamepad. To parameter the difficulty and the scoring system across different platforms, we needed to compare player performance of moving the crosshair using the various types of controllers.

Figure 6 is an extract of a playtest report. Here, the same player played the same level once with a PAD (using sticks and buttons) and once using the Leap Motion controller. The two graphics represent the same moment of the game. It depicts 120 seconds of crosshair movement on the screen; the PAD on the left, the Leap Motion on the right. We can clearly see that there is a big difference in player

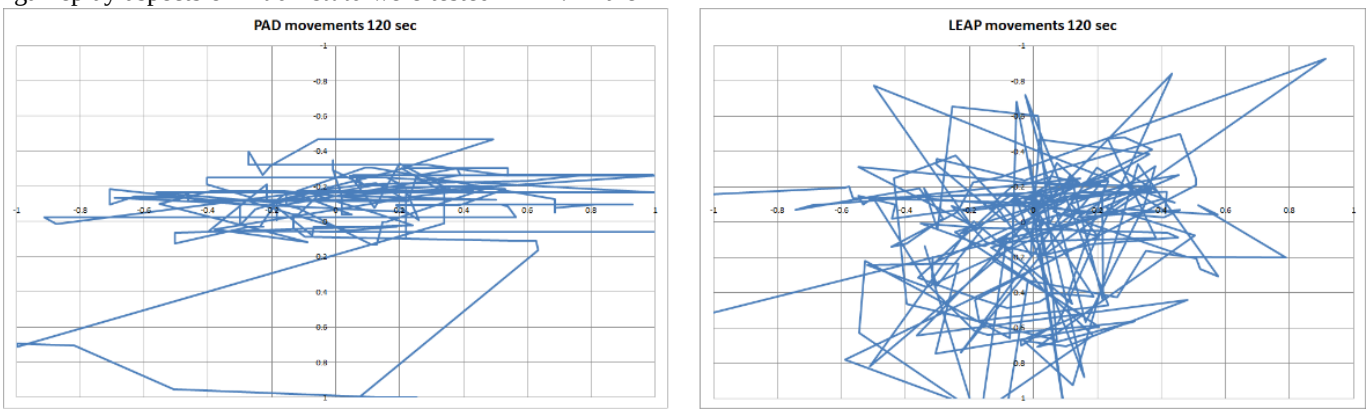

Figure 6: Playtest report of Blue estate: the real "move (crosshair) to target" on screen, with a PAD and a Leap Motion

performance. The data show that with the PAD, player needs 35% more time to reach an enemy.

An Out Game Action detail

The action "Choose the target" does not result in a depiction of player action on the screen. It's a perceptive and planning activity where the player gets information from the screen and may decide which target he should shoot next. It's what we categorize as Out Game Action. The team designed and produced a feature to challenge this particular activity.

When enemies arrive on the screen, they start shooting at the camera, i.e., the player, as the game takes place in the first person perspective. These shoots don't hit the player, they are just signs that the player is in a gameplay situation and has to act. However, some of these enemies occasionally do actual damages to the player. To create a kind of hesitation in the choice of the next enemy to aim, we introduce a Warning Sign icon. This feature is common in many rail shooters. The game system communicates to the player what enemy on the screen will actually inflict damage. In *Blue Estate*, in the Leap Motion first version, this Warning Sign icon is a circle that appears on the enemy. In this circle, a sort of timer tells the player the remaining time before he will take a hit. Depending on the level design, these Warning Signs can appear with a certain frequency, duration and danger. At a very micro level, when the player is engaged in a shootout, he receives information that should cause him hesitate or change his aiming priority.

Figure 7 is a screenshot from the second level of a work in progress version the game. It shows how the Warning Signs appear on enemies. On the enemy furthest left, the timer is nearly ended: the player will take a hit in a second. On the enemy furthest right, the timer of the warning sign started later: the player has a few more seconds to shoot him. The enemy in the middle appears without warning sign. This level design situation includes another kind of element for the player "Choose the target" activity: there is explosive material, the red gas canister just in the middle of the screen. If the player chooses to shoot the canister, the explosion will kill all the enemies on screen.

Figure 7: A shootout with 3 enemies, Warning Signs icons and an explosive material. Elements designed for the "Choose the target" activity

We spent time and resources to make this "Choose the target" an important part of the gameplay experience.

Extend the core gameplay loop

During initial conception workshops, we kept the core loop as a central framework and peripherally added ideas of activity which could modify or increase the intensity of the challenge. Figure 8 is another photo of the brainstorm paperboard we used to summarize our first selection of activities.

Some ideas were commonly found in the rail shooter genre (manage the reloading, take cover or not). Some others came from the particular comedic spirit of the source material, such as the activity "Clear the view". In the first part of the game the player adopt the perspective of the idiot son of the LA Italian mafia boss. This character, featured in the original comic, has mid-length hair, which

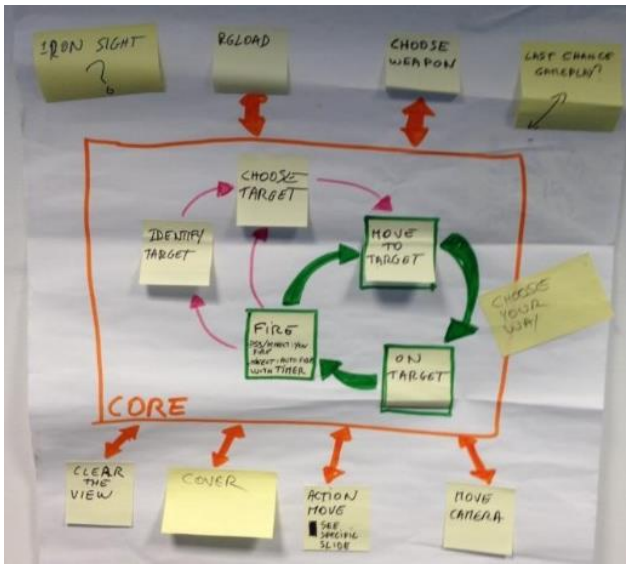

Figure 8; Photo of the early gameplay loop, with additional ideas

he tries to hold back with hair gel. Early on we proposed to use this detail to challenge the "Identify the target" core activity. At some moments, the character's hair falls into his eyes, i.e. on the camera lens, which obscures the view of his surroundings, including enemies. The player has to "Clear the view" by executing a specific move with motion gaming device. For instance with Kinect, the player needs to pass his real hand over his real face.

Five of these propositions were designed, specified, tested and included in the final version of the game.

A broad perspective of a gameplay loop defined early in the design process (alongside it consequences in production) shows the need to clarify our intention and our development priorities. It's worth noting that the core loop

itself did not change from the concept phase to the final released game.

CASE STUDY AS GAME ANALYSIS TOOL

We have been using the gameplay loop as pedagogic tool since 2006. We will cite the work we have done on *Metal Gear Solid 2* on PlayStation 2. The player is a special agent who is attempting to infiltrate an oil rig controlled by a sizable group of terrorists.

Figure 9 is one of the slides used in course to present the result of this analysis. It's focused on the main gameplay action: infiltration. The flowchart shows the difference between In Game Action (green shapes), Out Game Action (light green shapes). In dark green, we depicted non continuous actions, events like "Neutralize" an enemy or "Spot" a potential source of danger.

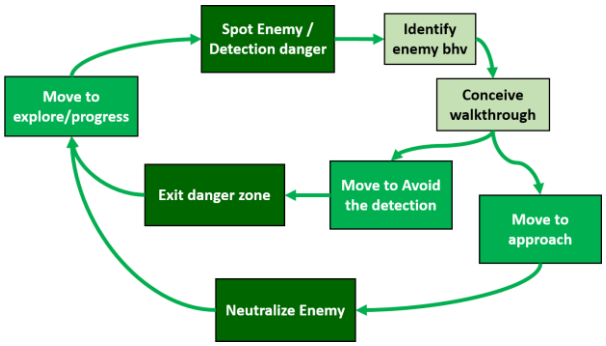

Figure 9: The infiltration gameplay loop in Metal Gear Solid 2

The game is not composed in this unique loop. It's necessary to 'zoom out' to see the connection between this gameplay loop and other ones identified in the game. Figure 10 shows the possible connections between three different gameplay loops, and includes the detection event (when the player is detected by patrolling enemies or cameras).

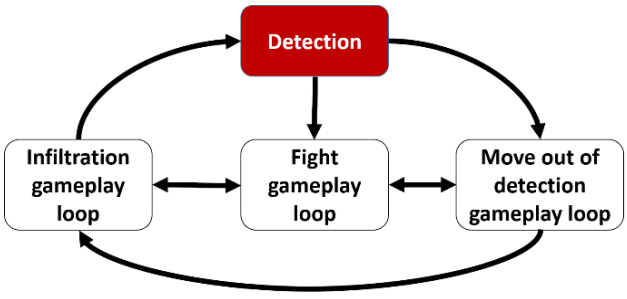

Figure 10: Macro view of gameplay, namely, the connections between three core loops in Metal Gear Solid 2

The demonstration of this analysis to the students was sometimes followed by an assignment. Students had to provide a gameplay analysis, including the gameplay loop of a chosen game. We evaluated how students applied In Game and Out Game action in their deliverables as well as their ability to provide a consistent loop.

CONCLUSION

This paper proposes an approach for the conception and visualization of gameplay. We formalized a tool, used it in two different cases of study, and received some promising feedback.

This gameplay loop model seems to be an efficient tool during the early stages of production. It helps to identify the core mechanics and to think about how other activities can support it or allow for variety.

Another positive element from a creative standpoint is the establishment of two action types (In Game and Out Game). This setup encourages game designers to spend time on two aspects during the conception work, which enriches early material. We also see that the early formalization of a core loop is helpful to define the preproduction priorities and to communicate internally about the game.

In terms of game analysis, we have learned that to extract the loop from the game, we need to play the game and then suspend playing while continuing to manipulate it. In other words, game analysis via gameplay loop opens up a space that alternates between active engagement in the game (trying to win) and suspended engagement which gives way active analysis. We also find that beginning with a minimalist scenario helps to establish an initial, competent version of the gameplay loop.

Team work or brainstorming sessions, either in analysis or design, are facilitated by the simplicity of the gameplay loop representation and the ease with which one modifies it. It's a methodology that is easy to communicate and can be quickly adopted by participants. It reveals a tangible way to visualize gameplay, including the cognitive aspect of it.

We have opted for a (very) micro representation of gameplay actions. If you 'zoom in' on an action, you have to describe a challenge. This choice allows us to have a precise core gameplay representation. But it's not as easy represent all of the possible actions of an entire game. Therefore, we were forced to use a 'zoom in/out' layered representation in our partial analysis. One of our next tasks involves the challenge of applying this method of analysis to an entire game, with each player activity is represented at the most micro level possible.

Compared to methodologies based on game design patterns or system design, gameplay loop tool has the benefit to focus on what the player engages in it to achieve challenges. Our future work are manifold. In educational serious game the gameplay loop can explicit if a particular action support a specific pedagogical goal. In collaboration with cognitive sciences, we can identify the nature of the requested abilities in each action of a game. And from a pedagogical point of view, we want the students to compare this approach with other methods, both in analysis and in project design.

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