PLAY, GAME, WORLD: ANATOMY OF A VIDEOGAME

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ABSTRACT

This paper is part of an experimental approach aimed to study the nature of videogames. We will focus on videogames rules in order to try to understand the anatomy of a videogame.
Being inspired by the methodology that Propp used for his classification of Russian fairy tales, we have cleared out recurrent diagrams within rules of videogames.
We then analyzed these rules diagrams by using the definition of a game drawn by Salen & Zimmerman, which led us to propose a definition for the nature of gameplay.
Through an additional analysis, we will be able to propose a typology of videogames rules which extends the typology proposed by Frasca.

INTRODUCTION

This paper is part of an experimental approach aimed to study the nature of videogames, through the definition of what "gameplay" is. The first step of our methodology is to elaborate a classification suited to videogames.

We could consider videogames as applications interacting with players:

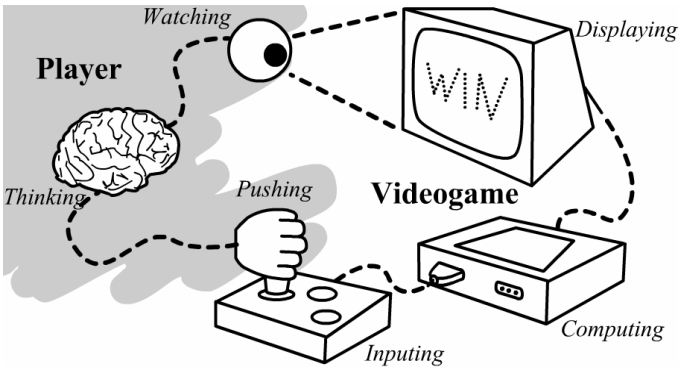

Fig. 1. Interaction cycle involving a player and a videogame

Among the variety of available definitions suited to "Interactivity", we will refer to the one proposed by Chris Crawford[1]: ***"A cyclic process in which two active agents alternately (and metaphorically) listen, think and speak."***

Within this paper, we will focus on the "machine" side of the cycle: for now, we won't study the player's role in the construction of a gaming situation.

If we isolate the "computer" part of the videogame interaction cycle, we obtain a simple structural diagram divided into three parts *(figure 2)*: **"Input"**, a collection of devices allowing the user to express choices. These choices are then evaluated by the rules of the **"Compute"** part, in order to produce a "result". This result is finally communicated to the player through **"Output"** devices.

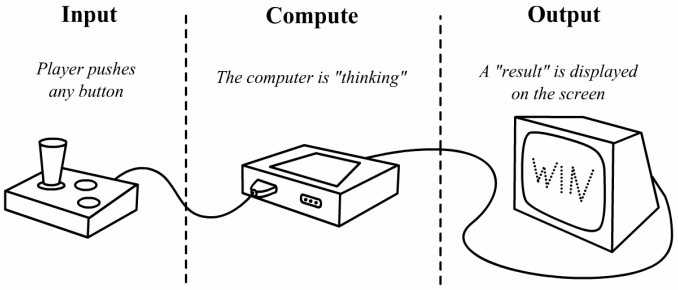

Fig. 2. Structural parts of a videogame

Our approach is deeply influenced by the work of Propp[5], who raised a formal classification of Russian fairytales.
As the usefulness of narrative concepts to study videogames is still controversial, please notice that we only borrowed the methodology from Propp's studies, not his results.
Indeed, Propp's methodology can be viewed as an interesting way to study any corpus from a formal level of analysis.

We then chose to apply his methodology to videogames, in order to try to identify formal aspects in our corpus. We especially focused on the study of videogames rules, which are managed by the "Compute" part.

Our previous researches[3][4] have shown strong recurrences within rules of a large number of videogames. These recurrences are exposed in the first part of this article.
In the second part we will analyze these recurrences to try to draw a typology of videogames rules, as an additional step toward the analysis of videogame's anatomy.

A RULES-BASED VIDEOGAME CLASSIFICATION

Gameplay Bricks

In accordance to the methodology used by Propp, we have developed a tool, named "V.E.Ga.S." *(Video & Electronic Games Studies)*, that will allow us to index and to analyze a large number of videogames.
We hoped this tool could help us observe eventual recurrent aspects likely to become criteria of a classification.

We based our analysis on an as large time range as possible, in order to limit the influence of technical evolution on the results we may observe.

With this tool and a list of 588 videogames, we propose a first step for the development of a classification criterion: we have emphasized **"Gameplay bricks"**, a kind of "fundamental elements" whose different combinations seem to be able to cover the gameplay of videogames *(figure 3)*.

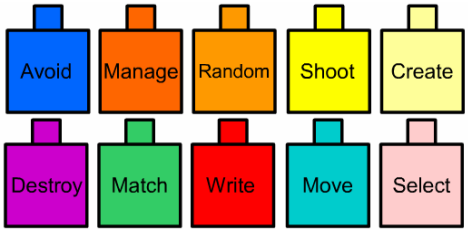

Fig. 3. The ten Gameplay bricks discovered as of now

After analysis[3] we noticed that every "Gameplay brick" represents a "recurrent diagram" within the rules of videogames.
For example, in two games such as "Pacman" and "Space Invaders" we will find the following kind of rules:

- *"If Pacman does not avoid ghosts, then destroy Pacman"*
- *"If spaceship does not avoid enemy's shot, then destroy spaceship"*.

We notice a very strong similarity between these rules and we can therefore consider they are both built on the following template: *"If player element does not avoid a hostile element, then there is a negative feedback towards the player element."*

Hence, this diagram is the definition of a "Gameplay brick", the AVOID brick. For now, we have identified ten "Gameplay bricks" built upon the same principle *(figure 3)*.

For example, the "Gameplay bricks" featured in "Pac-man" are: "MOVE", meaning player can move an avatar, "AVOID" for the Ghosts you have to avoid, "DESTROY" for the dots you have to eat, and "MATCH" because you have to match each dot's spatial position to destroy it.

But you can also find these bricks in a racing game such as "Need for Speed Carbon": MOVE a car, AVOID opponents, and MATCH on checkpoints you have to DESTROY. When reached, a checkpoint becomes "out of the game" and is not reachable anymore, so it can be considered as "destroyed" just like any dot eaten by Pacman.

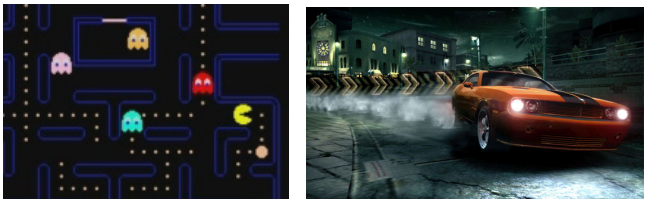

Fig. 4. Pacman (1980) and Need for Speed Carbon (2006).

As they feature identical "Gameplay bricks", "Pacman" and "Need for Speed Carbon" are gathered in the same family.

Nevertheless, if you look closely, these two games are still different: Pacman moves in two dimensions while you drive the car in a three-dimensional city, the way ghosts chase Pacman is different from opponent cars behaviour in Need for Speed…

Differences between these games are related to two issues:

- The **abstraction level required by the bricks**, which are built upon "rules template".
  For example the "Move" brick covers either 2D or 3D spatial movements.
- **Rules not covered by the bricks**: in order to build an efficient classification we couldn't make a brick for every existing rule template.

We then had to limit the number of Gameplay bricks, by trying to identify the most recurrent rules diagrams within our corpus.
Besides the recurrent factor, we also took in consideration the nature of rules: we focused our efforts on rules related to player actions, meaning we limited our classification to rules related to the game goal and to the means of reaching it.

Metabricks

Nevertheless, the total number of "combinations" obtainable through these bricks remains quite large.
Interestingly enough, we have noticed that some couples of bricks were found very often in a large number of games.

We named those couple of bricks "Metabricks" and after the study of games featuring one or two "metabricks", we gave them quite meaningful names: MOVE and AVOID became "DRIVER", while the association of SHOOT and DESTROY became "KILLER" *(figure 5)*.

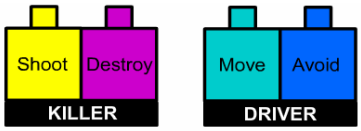

Fig. 5. The two identified Metabricks

These "metabricks" seems empirically related to the core challenges proposed by videogames. Hence, they are the second component of our classification: they can classify the families obtained through the use of "Gameplay Bricks".

Two families featuring the same metabricks but different additional bricks seem to present a variation of a same core challenge. For example, the families of the games "Pacman" and "Frogger" have a difference on the DESTROY brick: Pacman has to swallow pastilles and thus to destroy them, whereas Frog's only objective is to cross a busy road.

To summarize, we have identified "Gameplay Bricks" representing **"recurrent rules templates"** within videogames. According to these bricks, we have elaborated a classification based on "families" of videogames.
A "family" gathers games with identical "Gameplay bricks" combinations. These families can then be classified upon the presence of some pairs of bricks named "MetaBricks" in their bricks combination.

ANATOMY OF A VIDEOGAME

Our classification raised several "recurrent rules" within videogames, which seems to be an interesting first step to study videogames rules.
We will now focus on these "recurrent rules", and try to analyze them by looking back to the definition of a game.

Definition of game

We start the second step of our analysis with the definition of a game according to Katie Salen and Eric Zimmerman[2]: *"An activity with some rules engaged in for an outcome"*.
Hence, Salen and Zimmerman consider a game as an activity defined by two elements: **the rules** and **the result**, the latter one coming from a previous **goal**.

« Some rules »
If we consider that a videogame takes place in a virtual universe, we can also consider that this universe is composed by several "elements", in the broadest sense.

For example, in soccer, a game that can be played both as videogame and as sport, the universe is composed by the different elements featured in a match: *players*, *pitch*, *goals* and *ball*.

All these elements are then driven by the "rules" of the game, alike the elements that constitute our own universe are driven by physical and behavioural laws.
From a "soccer" point of view, these rules are the physical rules defining the movement of several elements, for example the gravity applied to ball and players.
But soccer rules also feature loads of "game rules", such as the one which specifies that the goalkeeper is the only player able to use his hands to hit the ball.
All these rules together seem to build a "field of possible actions" that may happen during a soccer match. Salen & Zimmerman call it *"the space of possibility"*.

« An outcome »
According to the definition above, a game proposes an outcome. Talking about an outcome imply judgment of the player performance. But in order to judge, you need a reference. In a game the reference is defined by the goal that the players have to reach.
For soccer, the goal of the game, identical for each team, is to bring the ball into the goal of the opposing team. The "goal" and "goalkeeper" words are thus very explicit.

As shown in a previous article [3], we could also consider the goal of the game as a rule, a special rule of course: this rule will simply have to state "endgame", by announcing the outcome when some conditions are fulfilled.

In our soccer example, the game is "reset" when the ball enters into one of the goals, and the score of the team who thrown the ball in is increased by one point.
Even though a match usually lasts 90 minutes, the game outcome isn't related to time only: the winning team is the team with the highest score after 90 minutes of play.

Hence, the outcome of a soccer play is tied to the goal of this game, which is to throw the ball into the opposing goal.

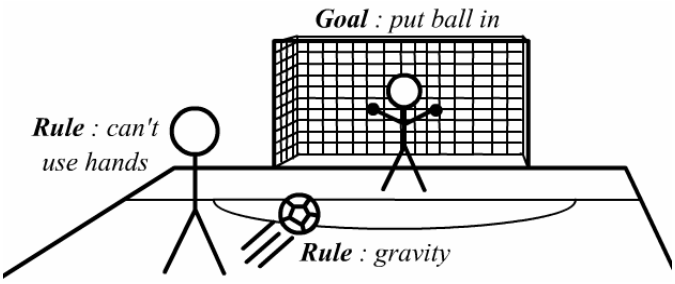

Fig. 6. Elements, rules and goal in soccer

Different kinds of rules
If the goal of a game is also a part of the game rules, does it means different "kinds" of rules exist?
The work of Gonzalo Frasca seems to indicate so, especially the typology of videogame rules he proposed [6]:

- *"Manipulation rules"*, defining what the player can do in the game.
- *"Goal Rules"*, defining the goal of the game.
- "*Metarules"*, defining how a game can be tuned or modified.

For now we will put aside the "Metarules", which leads us to the following conclusion: within rules of a game, some rules define a goal while other rules offer means to reach it.

As different kinds of rules exist, and as "Gameplay bricks" are based upon "rule templates", the following question emerges: *On what kind of rules are the bricks based on?*

Game rules and Play rules

After a close analysis of the "rules templates" which define the bricks[7], we observe that some characteristics are shared by several bricks. Indeed, we may divide them as below:

A first category of bricks seems to be based on a principle that one would formulate in the following way: *"to listen to Input and consequently to carry out modifications on the game elements"*.

A second category would rather correspond to: *"to observe the game elements in order to return an evaluation of the quality of the previous modifications*".

We here find principles very close to two of the types of rules evoked by Frasca: the first category approaches the definition of *"Manipulation rules"*, whereas the second one seems to be related to *"Goal Rules"*.

But, from our point of view, the difference between these two categories of bricks is tied to the difference between the two words **"Play"** and **"Game"**.
Indeed, bricks from the first category, as they are related to Input, can be connected to the word "Play", whereas bricks from the second category are tied to goal and by extension to Output, so are rather related to the word "Game" *(figure 7)*.

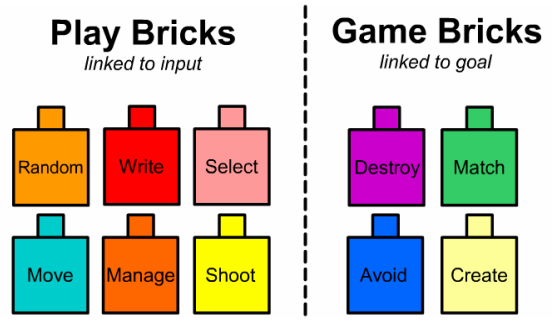

Fig. 7. « Play » or « Game » related bricks[8]

The difference between bricks of the two categories appears all the more clear when we consider that they are not in direct relation: the two categories of bricks "interact" trough "game elements": "Play" bricks modifies them, and "Game" bricks observes the modifications made by the first ones.

Moreover, if we look back to the "Metabricks", namely DRIVER and KILLER, we notice that they are composed by a "Play brick" associated to a "Game brick":

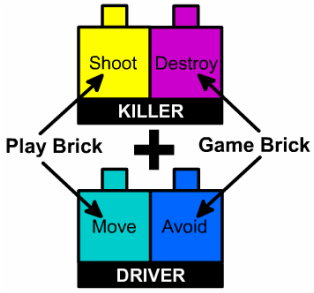

Fig. 8. Play brick + Game Brick = Metabrick

We therefore feel that the *"Game Brick" refers to a goal* to reach whereas the *"Play Brick" seems to represent a mean* (or a constraint) to reach this goal.
For example, DRIVER, asks the player to avoid colliding with some elements, and allows the player to move its avatar in order to do so. In the same way KILLER asks to destroy elements, though projectiles that the player can shoot/throw.

As these "Metabricks" represents pairs of "GamePlay bricks" that we identified in a large number of videogames, we propose the following definition of gameplay:
Gameplay emerges from the association of "Game rules", stating a goal to reach, with "Play rules", defining means and constraints to reach this goal.

An extended typology of videogame rules

So far, we have been able to identify two kinds of rules: "Play" and "Game", related to "Manipulation" and "Goal" kinds of rules proposed by Frasca.

But this typology seems incomplete. For example, we miss the "metarules" category proposed by Frasca. As this kind of rules is dedicated to the modification of the game rules, we can consider them as "meta game rules" instead of "game rules". Hence, we will temporarily exclude them from our typology, as we first intend to focus on "game rules".

Nevertheless, there is still a missing kind of "game rules": the rules able to automatically move the game elements, such as A.I. scripts or Physics engines.

The solution to this issue may be related to this observation: all these "missing rules" share a common kind of "effect" (action), namely modifying the state of the game elements.

As "Play" rules feature the same particularity, we may be tempted to include these rules in our "Play" category. But "Play" rules share another feature: they are connected to input, whereas our "missing rules" are not. Indeed, Physics or A.I. engines are able to modify the state of game elements, while not directly triggered by player inputs.

Moreover, the kind of triggers (conditions) featured in these "missing rules" seems very close to the triggers used by "Game" rules: they are both triggered by game elements.
But "Game" rules effects are connected to output, whereas our "missing rules" are not.

To summarize, our "missing rules" are not related to either "Play" or "Game" kinds of rules, but share similarity with both of them.
We should then create an additional rule category in order to include these missing rules into our rules typology.
The definition of this new category will be *"rules observing the state of game elements and modifying them accordingly"*.

We propose to call this new kind of rules **"World rules"**, as these rules allow the game universe to "live" by itself. Indeed, the "World rules" aren't related to player, whereas "Play" and "Game" rules are.

We are now able to propose an extended topology of videogame rules:

- **"Play rules"**, acting on game elements according to player's input.
- **"Game rules"**, watching the state of game elements in order to judge player's performance.
- **"World rules"**, running the simulation which allows the virtual game world to "come to life".

These three kinds of rules aren't in direct relation, they are "communicating" through the game elements.
We can even extend our "input / compute / output" diagram *(figure 2)* in order to illustrate the way this typology of rules works inside the "Compute" part:

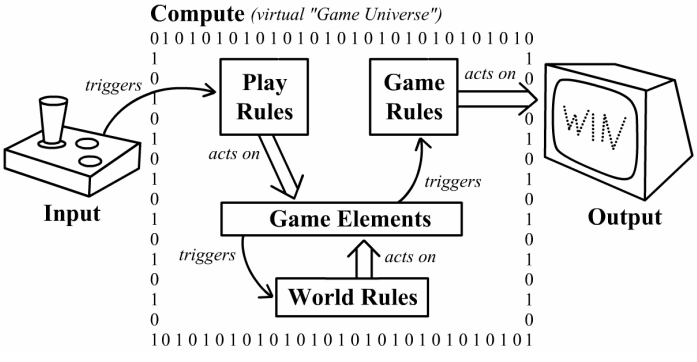

Fig. 9. Typology of videogame rules inside the "Compute" part.

CONCLUSION

In order to analyze the nature of videogames, our approach focuses on game rules.

Being inspired by the methodology that Propp[5] used for his fairytales classification, we started a quantitative analysis of videogames. This methodology allowed us to elaborate a classification based on **"recurrent templates of games rules"**. These templates are formalized into a fundamental element called "GamePlay bricks".

By gathering videogames sharing the same bricks into "families", we noticed that some pairs of bricks were used way more often than the others. We called this statistical association of two bricks "Metabricks".

The discovery of "GamePlay bricks" and "rules templates" which define them results in a promising step towards **a theoretical tool to analyse gameplay**.

Starting from "game design theory" researches conducted by Salen & Zimmerman[2] and Frasca[6], we then propose an extended typology of rules used in videogames, alongside with a definition of "gameplay" through videogames mechanics.

This theoretical model is aimed to **improve the comprehension of how a videogame is designed**.
However, as stated in introduction, this model is built after an analysis of the "mechanics"[9] of videogames, which means this article deals with a specific part of videogame studies: videogames as formal systems.

This formal apprehension of the nature of videogames is intended to lead to a different approach on game design.

Hence, the next step of our study will involve the implementation of the typology of videogames rules presented here into an "experimental game".
This game will present a clear distinction between each kind of rules, and will allow the player to easily add, remove or modify the rules through the manipulation of "GamePlay bricks".

We will also continue the "top-down" approach exposed in the first part of this article, through the improvement of our videogame indexation tool.
We are modifying it in order to propose a collaborative version of our videogame classification, freely accessible on the Internet.

You may then freely propose, evaluate or even consult information about any videogame on the following website:

http:///www.gameclassification.com

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[7] Djaouti D., Alvarez J., Jessel J.P., Methel G., Molinier P., "*The nature of gameplay: a videogame classification"*, Cybergames2007, Manchester - United Kingdom, 2007.
[8] A side note about the different bricks we have identified. Since the paper presenting the first version of V.E.Ga.S., some bricks have been modified. You will notice that the bricks TIME and SCORE were removed. The COLLECT brick was merged with DESTROY. The POSITION brick was extended in the form of MATCH. Last but not least, the ANSWER brick was split into two bricks: SELECT and WRITE. More detail on the bricks modifications is presented in [3].
[9] An obvious reference to the "Mechanics, Dynamics, Aesthetics" model presented in: Hunicke R. & LeBlanc M. & Zubek R., *"MDA: A Formal Approach to Game Design and Game Research"*, Nineteenth National Conference on Artificial Intelligence, 2004.