The nature of gameplay: a videogame classification

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ABSTRACT
This paper is part of an experimental approach aimed to raise a videogames classification.
Being inspired by the methodology that Propp[3] used for the classification of Russian fairy tales, we have cleared out **recurrent diagrams within rules** of videogames, named "Game Bricks". The combinations of these different bricks will allow us to represent a **classification, in accordance to their rules, of all the videogames**.

In this article we will study the real nature of these bricks, especially the link they seem to have with **two types of game rules**: the rules that allow the player to "manipulate" the elements of the game and the rules defining the "goal" of the game. We will then study the relation between these bricks and the gameplay. These questions will help us to propose an hypothesis about the **nature of gameplay.**

Keywords
Videogames, classification, game, play, rules, gameplay.

1. INTRODUCTION
This paper is part of a global experimental approach aimed to study the nature of videogames, especially by trying to define **what "gameplay" is**. The first step of our methodology is to elaborate a **classification suited to videogames**.

Put it into an extreme, we could consider videogames as an **interactive application**, entering into **interaction with a player**:

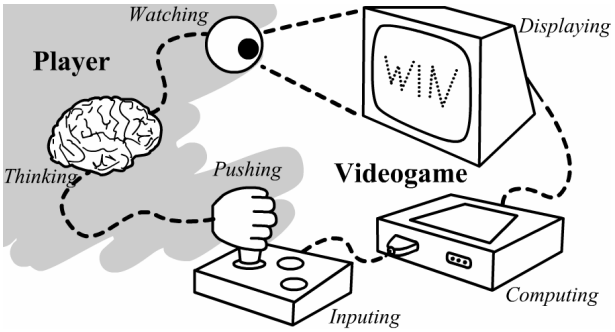


Figure 1. Player & Videogame interaction cycle

According to Chris Crawford[1] the interaction between a player and a videogame could be perceived as a dialogue: ***"A cyclic process in which two active agents alternately (and metaphorically) listen, think and speak."***
Figure n°1 illustrates this cycle of interaction between the two agents.

In the context of this paper, we will focalize on the **"computer" side** of the cycle and thus we won't consider the player aspect within the construction of a gaming situation.

The target of this approach is first to **identify formal data**, concealing the knowledge and psychological aspects of the player. The next idea is to study these data in order to **deduce a classification** of videogames.

We have been inspired by the works of Vladimir Propp[2] in his study of the Russian Fairy Tales during the beginning of the twentieth century.
Facing similar problems, like the impossibility for the researchers at the time to make an objective study of the inherent mechanisms of the Russian Fairy Tales, Propp has chosen a **formal deconstruction**.
Starting from a hundred of Fairy tales, that he has analysed this way, he has been able to identify recurrent narrative structures and has thus deduced a classification of Russian Fairy Tales.

We have also been influenced by the works of Katie Salen & Eric Zimmerman[6], who led us to focus our study on **videogames rules** : *"Looking at games rules means looking at games as formal system, both in the sense that rules are inner structure that constitute the games and also in the sense that rules schemas are analytic tools that mathematically dissects games."*

By isolating the "computer" part of the videogame interaction cycle, we obtain a simple structural diagram *(figure 2)* composed of **three parts**: the **"Input"**, peripheral devices allowing the user to make his choices, theses last ones being evaluated by the rules of a **"Compute"** part, in order to produce a "result". This result is then communicated to the player by the **"Output"** peripheral device.

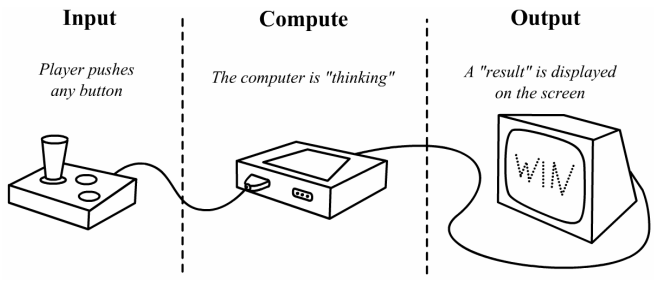


Figure 2. Structural parts of a videogame

In order to continue our paradigm, we will **concentrate on the "rules"**, in order to use a definite approach of videogames, because the computer manages this part alone.

According to this approach, we have studied until today the rules of **588 videogames** of all kinds and from all times. All these data have been indexed in a database called V.E.Ga.S. *(Video & Electronic Games Studies)*.

Our previous researches[11][12] have shown **strong recurrences in the whole of the videogames rules**. These recurrences are exposed in the first part of this article.

In the second part we will analyse these recurrences and try to identify the eventual structures that could be related to the challenges that games propose.

2. A VIDEOGAME CLASSIFICATION

2.1. Game Bricks

In accordance to the methodology of Propp, we have developed a tool that will allow us to repertory and to analyse a large corpus of videogames, in order to observe eventual recurrent aspects likely to become criterions of a classification.

We have taken into account a period as large as possible, in order to **limit the impact of technical evolution** on the results we may observe.
Our tool, named "V.E.Ga.S." is composed of a database where games are indexed and represented by different kinds of metadata: title, author, inputs devices, graphics, etc...

With this tool and a list of 588 videogames we have proposed a first step of the development of a classification criterion: we have emphasized the **"Game Bricks"***(figure 3)*, **the "fundamental elements" whose different combinations seem to correspond to different rules and goals of a videogame** ("Game" aims to the "game rules" notion, referring to Gilles Brougère).

After analysis[3] we notice that **every "Game brick" corresponds to a "recurrent diagram" in 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 collides with Ghost, then destroy Pacman"
- "If Spaceship collides with Enemy's shot, then destroy Spaceship".

We notice a very **strong similarity** between these rules and we can consider therefore that they are built on the following diagram:
"If player element collides with an opponent element, then there is a negative feedback towards the player element."

This diagram is thus the definition of a "Game brick", the AVOID brick. Actually we have identified eleven "Game bricks", all built upon the same principle:

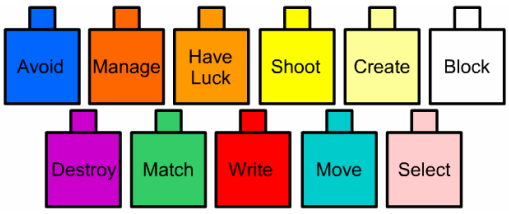


Figure 3. Game bricks discovered up today

For example, the **Game 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 like **"Need for Speed"**: 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 "destroyed", just like a dot eaten by Pacman.

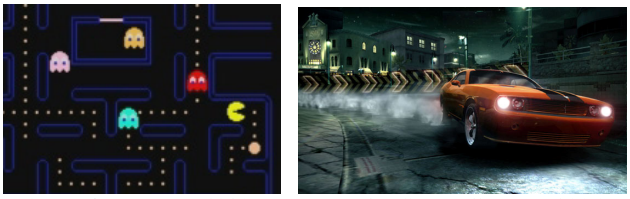


Figure 4. Pacman (1980) and Need for Speed Carbon (2006).

Nevertheless, even within their rules, **these two games are different**: the movement and thus the "MOVE" brick has two dimensions in "Pacman", but three in "Need for Speed Carbon", the number of checkpoints to pass in the last one is much smaller than the numbers of dots that Pac-man has to swallow and the movement of the elements to avoid is different in the two games…

These differences between these two example games are the issue of **different implementations of "rule diagrams"** from the bricks they are sharing, but are also due to the use of **rules which are not covered by the bricks**: in order to obtain an efficient classification we couldn't make a brick for every existing rule diagram.

We thus had to **limit the number** of Game bricks, trying to identify the **most recurrent** rules diagrams, studying the games in our corpus. Anyway, the Game bricks are aimed to allow the representation of the diversity of challenge one can find among videogames.

Besides the recurrent factor, we also took in account the rule nature: we have concentrated our efforts on representing the rules **related to the actions of the player** with the "Game Bricks", meaning we focused on rules related to the game goal and to the means of reaching it.

Being inspired by the works of Raph Koster[7] and Stéphane Bura[8] who both try to elaborate a grammar of videogames in the shape of diagrams, we have formalised **diagrams as definitions of our bricks**.

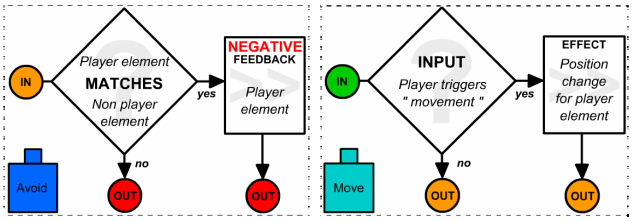


Figure 5. Definition diagrams for AVOID and MOVE

The structure of these diagrams is based on the "**rules structure**": one or several "**triggering conditions**" (If) associated with one or several **effects** (Then).
The "If...Then" structure of a rule reminds obviously the algorithmic scheme used in computer science, as studied in a previous article[3].

2.2. Metabricks

Nevertheless, the number of "total combinations" obtainable with these different bricks is still rather large, but we have noticed that **some couples of bricks were often found** in a great number of games.

As an example, you will find below a table recapitulating the 21 families featuring more than 4 games (a family featuring games with the same game bricks combination).

We will point out in this table that the brick **AVOID** is, exempt from two exceptions, always associated to the brick **MOVE**, and that the brick **DESTROY** is always associated to the brick **SHOOT**.

We named those couple of bricks **"Metabricks"** and after the study of games that have one or two of these metabricks, we have given them names that are rather meaningful: MOVE and AVOID becomes the **"DRIVER"** metabrick, and the association of SHOOT and DESTROY becomes **"KILLER"**.

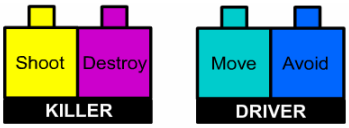


Figure 6. The two identified Metabricks

These "metabricks" seems to us empirically related to the challenges proposed by these games. Anyway they are the second component of our classification: they permit to classify the families. Those families are obtained by the use of "Game Bricks", the first component of our classification.

Families that have **identical metabricks** but got some **different bricks** seem to present a **variation of the same challenge**.

For example, the families of the games "Pacman" and "Frogger" have a difference concerning the DESTROY brick: Pacman has to swallow pastilles and thus to destroy them, while the Frog has only a busy road to cross.

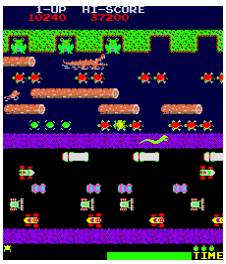


Figure 7. Frogger = DRIVER

Figure 8. Interstate'76 = DRIVER+KILLER

To summarize, we have identified "Game Bricks" that represent **"recurrent rules"** within videogames. Based on these bricks, we have elaborated a **classification based on groups of videogames into "families" having identical combinations of "Game Bricks".**
These **families can be regrouped** by the presence or not of some pairs of bricks named "MetaBricks".

Table 1. The 21st largest families indexed by V.E.Ga.S.[13]

	Answer	Avoid	Collect	Create	Destroy	Get Luck	Manage	Move	Position	Shoot	Time	Score	Toy	Representative games of the family
A - #1 Fam of 5 games		O						O						Quizz based on "Drag&Drop"
B - #2 Fam of 5 games		O						O						Autoroute (Classical racing game)
C- #3 Fam of 5 games														Memory, Crosswords, Textual adventures
D - #4 Fam of 5 games					X					X				Fly eating (eat flies with a frog)
E - #5 Fam of 5 games		O			X			O		X				MechWarrior 3, Interstate 76, Prohibition
F - #1 Fam of 6 games		O			X			O		X				Commando, M.D.K., Abuse
G - #2 Fam of 6 games														Paint activity, Music Sampler...
H - #3 Fam of 6 games		O						O						Quizz-like games
I - #4 Fam of 6 games		O			X			O		X				Call of Duty, Tomb Raider, E.W.J. 2
J - #1 Fam of 7 games		O			X			O		X				Xenon 2 : Mega Blast, J'Dar 2
K - #2 Fam of 7 games														Craps game, The secret number
L - #1 Fam of 8 games		O						O						Spidzer, Slalom (Basic ski simulation)
M - #2 Fam of 8 games		O			X			O		X				Space Invaders
N - #1 Fam of 9 games		O						O						Pacman
O - #2 Fam of 9 games		O						O						Snake
P - #3 Fam of 9 games		O			X			O		X				Street Fighter 2
Q - #4 Fam of 9 games														Memo-U (A kind of quizz game)
R - Fam of 11 games		O			X			O		X				Double Dragon, Micromachines 2 & 3
S - Fam of 16 games		O			X			O		X				Doom, Descent, Duke Nukem 3D
T - Fam of 17 games		O			X			O		X				Asteroids
U - Fam of 19 games		O						O						Frogger, Trackmania Nations

3. TOPOLOGY OF A GAME

In order to fully analyse the results of our quantitative study, we also have studied the morphology of a videogame in a qualitative way.

We started from the definition of a game according to Katie Salen and Eric Zimmerman[6]: ***"An activity with some rules engaged in for an outcome".***
Salen and Zimmerman consider thus a game as an activity defined by two elements: the **rules** and the **result**, the latter one coming from a previous goal.

3.1. « 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 is practised as well as a videogame and as a sport, the universe would be composed by different elements featured in a match: players, pitch, goals and ball.

All these elements are submitted to **the "rules" of the game**, alike the elements that constitute our own universe are submitted to physical and behavioural laws.
From a soccer point of view these rules are physical rules governing the movement of several elements, like the gravity applied on the ball and the players, but also the game rules indicating that only the goalkeeper is allowed to touch the ball with his hands.

These rules seem to determine a **"field of possible actions"** that may happen when there is a match.
When there is a world cup organized by the FIFA, these rules are coming from different origins, like the physics and the official rules of the tournament,
On the other hand, in a soccer videogame like "Pro Evolution Soccer" they are all coming from the same and only source: the creators of the game, who have written all by themselves the whole rules featured in their game.

3.2. « An outcome »

According to the definition described already, a game proposes an **outcome**. Talking about an outcome means **judgement of the player performance**. But in order to judge, you **need a reference**. In the game the references depends on **the goal** the players have to reach.

Concerning soccer, the goal of the game, identical for every team, is to bring the ball into the goals of the opposing team. The "goals" 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: you simply have to announce the end of the game, its outcome, when some conditions are fulfilled.

Within the soccer example, the game is "reseted" when the ball enters into one of the goals, and the score of the team that thrown the ball is increased by 1. Even though a match is finished after 90 minutes, the game outcome doesn't depend only on the time: it's the team with the highest score under this time that is the winner.

The judgement allowing the outcome of the game is thus tied to the goal of the game, which is to throw the ball into the opposing goal.

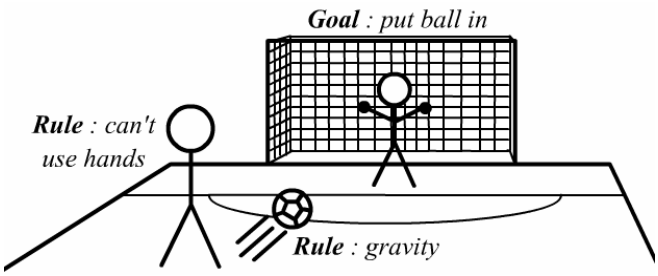


Figure 9. Elements, rules and goal in soccer

3.3. Different kinds of rules

If the target of the game is also a part of the game rules, does it means that there are **different "kinds" of rules?**

The work of Gonzalo Frasca seems to indicate to us, in particular his typology of the different kind of rules [7]:

- **"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.

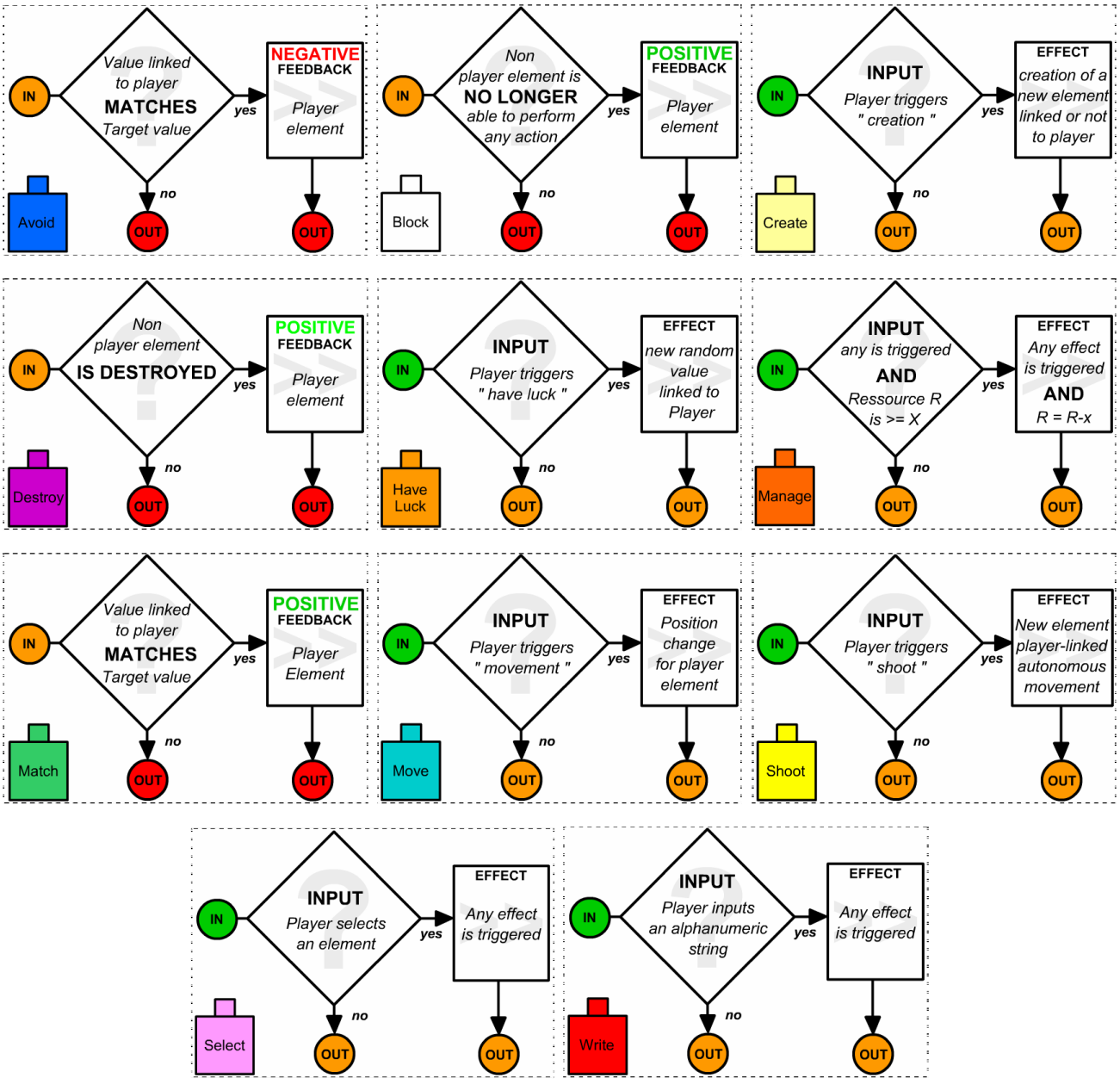
For now we will put aside the "Metarules", but we realize that in the whole of the game rules, we will find some rules concerning the definition of a goal, and other rules defining means to reach it.

If different kind of rules exists, and if "Game bricks" are based upon "rule diagrams", we can ask the following question: **on what kind of rules are the bricks based on?**

4. BRICKS AND GAMEPLAY

4.1. Game + Play = GamePlay?

In order to find which kind of rules the bricks are based on, let's analyse the definition diagrams of each brick:



We notice the bricks CREATE, DESTROY, HAVE LUCK, MANAGE, MOVE, SHOOT, SELECT and WRITE all features a **reference to the videogame's Input within its triggers**.
On the other hand, the AVOID, BLOCK, DESTROY and MATCH bricks all features **a feedback within its effects**, the feedback being send by the videogame's Output.

We could then **divide bricks into two categories**, according to whether they have one or the other of these characteristics.

The **first category** of bricks seems to work out a principle that one would formulate in the following way: *"to listen to Input and consequently to carry out modifications on the game elements"*.
The **second category** would rather correspond to: *"to observe the game elements and to return an evaluation of the quality of the preceding modifications"*.

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

But, from our point of view, the difference between these two categories of bricks is also **relied to the difference** between the two terms **"Play"** and **"Game**".

Indeed, the bricks of the first category being related to the Input, they can be connected to the word "Play", whereas the bricks of the second category, dependent on the goal and by extension to the Output, would approach more a concept related to the word "Game".

Following these observations, we would divide bricks in the following way:

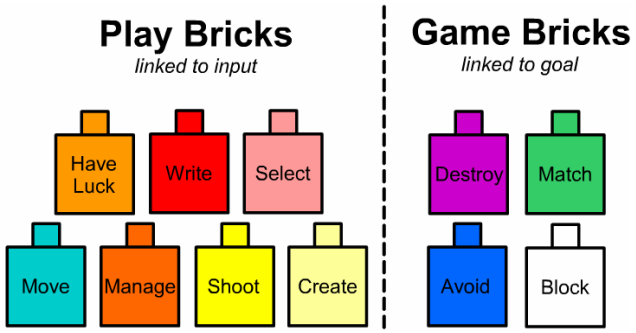


Figure 10. « Play » or « Game » related bricks[13]

The difference between bricks of the two categories appears all the more clear by the fact that **they are not in direct relation between them**.
Indeed, the two categories of bricks **"interacts" trough the "game elements"**: the **"Play" bricks modifying** them, and the **"Game" bricks observing** the modifications made by the first ones.
We could then extend the "videogame structural diagram" (figure 2) by **detailing the "Compute" part,** where the rules are located:

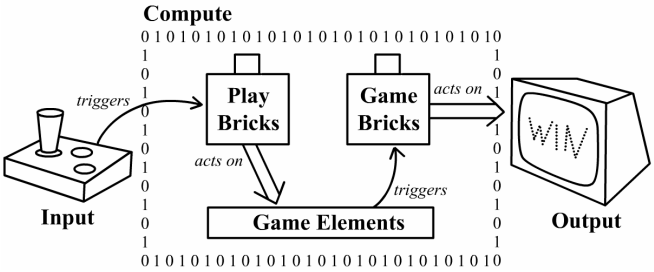


Figure 11. Bricks interaction with Input and Output

The term of "Game brick" does not seem any more adequate to indicate the whole of bricks, but only the subset of bricks from the second category. **We must use another term**, which seems obvious here: we will indicate now the whole of identified bricks as **"GamePlay bricks"**.

More than a simple denomination change, this term returns to an important question, that many researchers and professionals wonders: **"What is Gameplay?"**

Gameplay is empirically seen as a **central element** within a videogame, and seems closely **related to the game quality** in the mind of many players. If the question of its nature seems then of capital importance, it is however a concept which **remains to be defined**.

Searching for a definition of gameplay, let us synthesize the points studied until now:
We identified a whole of **recurrences in the rules** of videogames, recurrences formalized in the forms of "bricks". After analysis we observe **two types of bricks**, corresponding to two "standard diagrams" of rules:

- Rules **listening to Input** and acting on the game elements consequently, baptized **"Play bricks"**.
- Rules observing the state of the game elements and returning to the player an **evaluation of his performance**, baptized **"Game bricks"**.

May the association of "Play bricks" with "Game bricks" be the spirit of gameplay?

A draft answer to this question may come from the two Metabricks presented in the chapter 2.2, namely DRIVER and KILLER. If we analyse them, we notice that t**hey are composed by a "Play brick" associated to a "Game brick**":

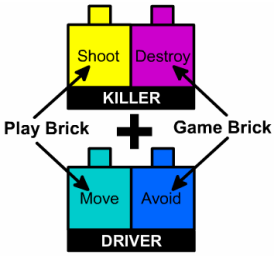


Figure 12. Play brick + Game Brick = Metabrick

We would be attempted to say that if the "Game Brick" refers to an **objective to reach**, the "Play Brick" seems to **represent a mean** (or a constraint) in order to reach this objective.
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**, by projectiles that the player can **shoot or throw**.

As these metabricks represents pair of GamePlay bricks being identified in a large group of games, **the hypothesis about the nature of gameplay seems promising**.

4.2. A Typology of Videogame Rules

Anyway, this typology of « Play » and « Game » rules **seems incomplete**. We can't find here the "metarules" category proposed by Frasca, but as this kind of rules are dedicated to the modification of the game rules, we can consider them as "meta game rules" instead of "game rules".

Nevertheless, there is still a **missing kind of "game rules"**: the rules making the game elements moves, such as I.A. scripts or Physics laws.

The answer to this problem may be the following: all these rules **share a common kind of "effect"**, namely modifying the state of the game elements.
As "Play" rules features the same particularity, we may include these rules in our "Play" category. But "Play" rules share another feature: **these rules are connected to input, whereas our "missing rules" are not**.

The kind of triggers featured in these “missing rules” seems close to those used by “Game” kind of 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” don’t seem to be fully connected with either “Play” or “Game” kinds of rules, but share similarity with both of them.

We should then create an **additional rules category** in order to include these missing rules in 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 the following topology of game 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**, allowing the « game world » to evolve by itself.

These three kinds of rules aren’t in direct relation, they are “communicating” through the game elements.
We can now extend our last diagram in order to illustrate the way this typology of rules works:

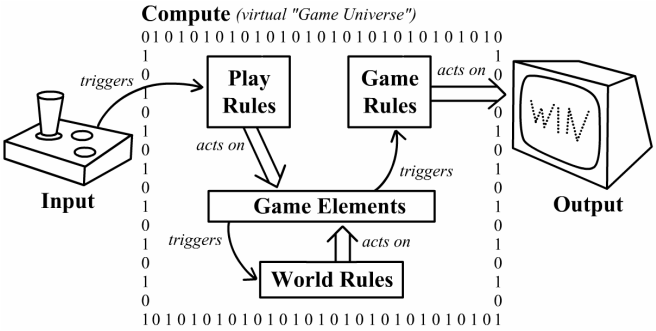


Figure 13. Typology of Videogame Rules in action

4.3. Paidea or Ludus ?

During our work of indexing the videogames in V.E.Ga.S., we wondered **how to index games like “Sim City”**, that don't feature an “explicit goal to reach”.

Reading the works of Gonzalo Frasca [8], we have found a very interesting chapter about the fact that there seem to be **two kinds** of “applications empirically labelled videogames”: **those who offer an objective to accomplish, and those who don't**.

Referring to the works of Roger Caillois [9], Frasca then suggests the two following definitions:

Paidea *is "Prodigality of physical or mental activity which has no immediate useful objective, nor defined objective, and whose only reason to be is based in the pleasure experimented by the player".*

Ludus *is a particular kind of paidea, defined as an "activity organized under a system of rules that defines a victory or a defeat, a gain or a loss."*

Related to the previous definitions, **“Sim City” belongs to the category of “Paidea**”. By the way, “Sim City” doesn't correspond to the definition of a game according to Salen & Zimmerman: the authors of “The Rules of Play” actually **defining as a game the applications corresponding to Frasca‘s definition of “Ludus”**.

Nevertheless **we have indexed “Paidea” games** like “Sim City”, “The Sims” or further on “September 12th”, marking them with a special “Toy” brick, because of their absence of explicit objectives proposed to player.

If we reconsider the games featuring the “Toy” brick, we will realize **that they only features “GamePlay” bricks of the “Play” category**, which seems just right because games like “Sim City” don't define any goal to reach.
We then could return to the definitions of Frasca and make the hypothesis that, from a rules point of view, the **definition of a “Ludus” game should be to features "Game bricks" on the opposite of a “Paidea” game.**

This hypothesis seems to be **true in our 588 games**, but we should now use a **bigger corpus** of games in order to verify this hypothesis.
The ability to index a way larger corpus is actually one of the goals of the next version of V.E.Ga.S.

5. CONCLUSION

Being inspired by the methodology that Propp used for its fairytales classification, we have started a **quantitative analysis of videogames**. This methodology allowed us to **elaborate a classification based on “recurrent diagrams of games rules”**, those one being formalized into an element called "GamePlay bricks".

In relationship to the works of Frasca and Callois, these bricks can be of two kinds:

- **« Game »:** if the rule diagram is directly **related to the goal** of the game, especially in the shape of a feedback in the rules effects. In this case, the rule is characterized by a trigger based on the state of the game elements, and an effect linked to the **videogame’s Output**.
- **« Play »**: if the rule diagram is **independent from the goal**. The rule is then characterized by a trigger based on the **videogame’s Input**, and an effect targeting only the game elements.

We would then state as hypothesis that “Gameplay” is, at least within the videogame rules, **composed by both “Game bricks” and “Play bricks”**.

Further on we have been able to identify pairs of “Game bricks” that have **been found recurrently** in our games corpus.
We have named these recurrent pairs "Metabricks", these latter being **composed by “Play brick(s)” associated to “Game brick(s)”**.
These metabricks led us to think this hypothesis is very promising.

In addition to “Play” and “Game” rules, we propose a topology of videogame rules featuring a third kind of rules: **“World rules”.** This kind of rules allows the “virtual world” of the videogame to evolve without any player intervention.

It also seems possible to **verify in a quantitative way** the statement first developed by Caillois, who says **two types of gaming applications exists**: “Ludus” games, proposing a result and thus a goal to reach, and “Paidea” games, featuring no explicit objectives.

We thus state as a hypothesis that the definition of a “Paidea” game, at least according to their rules, should be the **absence of “Game bricks”**, in the **opposite of a “Ludus”** game which should features both “Play bricks” and “Game Bricks”.

We now have to **verify these hypotheses** by following the **two approach** of our methodology, which are a qualitative approach associated to a quantitative approach.

Concerning the **qualitative approach**, we have to pursue the analysis of the different types of videogame rules in order to complete or extend the **"Game Rules Typology"** draft proposed in this article.
We are therefore going to continue the development of an “experimental game”, named **“GamB.A.S”**, which first prototype was exposed in a previous article[3].
The aim of this game is to allow one to **observe the interaction between the different videogame rules**, it will thus allow the player to enable/disable any of its rules and display the resulting gameplay.
For now it is only **based on rules coming from diagrams** that define the “GamePlay Bricks”, which allow us to **verify the hypothesis on the real nature of the gameplay**.

About the **quantitative approach**, we now have to study a **much larger corpus**.
As we have modified our videogame indexation tool, named V.E.Ga.S., we are now able to propose a **collaborative version of our videogame classification**, freely accessible on Internet.
This new version adds the possibility to collect and compare a **larger number of evaluations** concerning the bricks combination for each game, in order to **minimize the subjectivity** introduced by a “reverse-engineering based” analysis of the games.

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

http:///www.gameclassification.com

GREETINGS

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[13] A side note about the different bricks we have identified. Since the first paper presenting the first version of V.E.Ga.S., some bricks have been modified. The table *(Table 1)* is based on the first set of brick because it is extracted from the first version of Vegas. 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 in two bricks: SELECT and WRITE. More detail on the bricks modifications is presented in [3].