

Towards a classification of Video Games

Djaouti Damien¹ and Alvarez Julian² and Jessel Jean-Pierre³ and Methel Gilles⁴

Abstract. This paper is part of an experimental approach aimed to raise a video games 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 video games, named "Game Bricks". The combinations of these different bricks will allow us to represent a classification, in accordance to their rules, of all the video games.

In this article, we will study the real link between these bricks and the rules of video games, through realisation of an experimental "brick-only" based game.

1 INTRODUCTION

The idea of classification of video games is not a new idea of course. Le Diberder brothers[4], or Stephane Natkin[5] have already raised classifications. But, in all these works, even though they are references, we have rapidly found absences or slants. These facts are denounced by Mattieu Letourneux[6] in his article "The question of the kind of video games": To him, any video game classification is condemned by its very nature to the obsolescence, because games technological evolution also modifies the chosen criterions.

How define what a video game is, if its classification is rapidly wrong?

Being inspired by the Propp's methodology[3], we have exposed in a previous article[1] the genesis of this project that leads to the development of "V.E.Ga.S", a tool to index and analyse video games.

With this tool and a list of 588 video games we have proposed a first step[2] of the development of a classification criterion: we have emphasized the "Game Bricks"(figure 1), the "fundamental elements" whose different combinations seem to correspond to different rules and aims of a video game (the term of "Game" leads to the notion of "game rules" referring to Gilles Brougère).

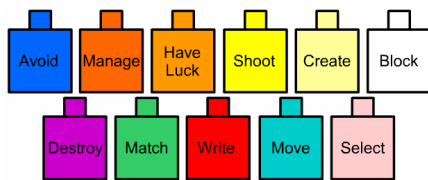


Figure 1: The Game Bricks known up today

The number of "different combinations" thus obtained was rather high, but we have noticed that some pairs of bricks, named "Metabricks" (Figure 2) were recurrently found in a large number of combinations. After analysis [2], we have realized that these

"MetaBricks" really seemed to outline an encouraging path towards a classification of video games.

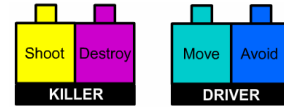


Figure 2: The two MetaBricks discovered up till today

To summarize, we have identified "Game Bricks" that represent "tasks to carry out" within the video games. Based on these bricks, we have updated a **classification based on groups of video games into "families" having identical combinations of "Game Bricks"**, these families could be regrouped by the presence or not of some pairs of bricks named "MetaBricks".

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 "POSITION" because you have to reach each dot's spatial position to destroy it.

But you can also find these Bricks in the race game like "Need for Speed": MOVE a car, AVOID opponents, and POSITION 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 3: From the outside, nothing seems to rely Pacman (Namco 1980) and Need for Speed Carbon (E.A. 2006).

As both games feature the same bricks, they are **classified in the same family**, one of the game families featuring the "DRIVER" MetaBrick (MOVE+AVOID).

There are nevertheless problems left to be resolved, that we wish to solve to make an improved analysis tool.

We have to try to **reduce the part of subjectivity** which appears during the valuation of a video game. Two complementary approaches appear then to us:

- **A quantitative approach**, which notifies several entrances for each game, thanks to contributions.

¹ IRIT, Toulouse III & LARA, Toulouse II, France ; daminous@gmail.com

² IRIT, Toulouse III & LARA, Toulouse II, France ; alvarez@irit.fr

³ IRIT, Toulouse III, France ; jessel@irit.fr

⁴ LARA, Toulouse II, France ; methel@univ-tlse2.fr

- **A qualitative approach**, which eliminate at the most the subjective aspect of the definition of the "Game Bricks".

On the other hand, the definitions of some bricks like ANSWER are in a lack of precision. This problem is due to the fact that we are still not able to fully answer the question: "What do really the bricks represent concerning the video games?"

The aim of this article is thus to propose a formal definition of "Game Bricks".

At first we will introduce an experimental validation work about bricks, followed by thoughts about the very nature of the bricks and their relationships to the rules of video games.

These two steps will allow us to propose a positive definition of the bricks, considered as criterions among a classification of video games in accordance to their rules.

2 EXPERIMENTAL VALIDATION

2.1 Specifications

In order to test the pertinence of our bricks, we have elaborated an application and the target is to help us to see how, on a data basis, the "Game Bricks" are put together in a video game.

Ideally, it would be an application allowing us to add or remove "Game Bricks" in order to be able to observe the impact on the game. This stage implies a finite definition of the bricks, in order to be able to insert them in a program.

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

With the idea to handle the rules of a video game on a data basis, we have thus thought of a **game representation model in an algorithmic way**.

We have been inspired by the works of Michael Thielscher [9] in "the General Game Playing", who creates programs for games being able to play games with rules that are initially unknown. His team has developed in particular a language, the GDL (Game Description Language), which allows representing a game in a logical way by describing its rules and its initial state.

We have also been very inspired by the "games creation softwares", like those created by Clickteam [10]: "Klik n'Play", "The Games Factory" and "Multimedia Fusion". These softwares are an aid in the creation of video games: they withdraw the technical part and allow the Game Designer to focalize on the rules of the game, the graphics and the sounds, as well as the control of the interfaces. The construction of levels and game scenes (level design) is also easier by using these tools.

2.2 Conceptual representation of a game

We rely on the definition of a game according to Katie Salen and Eric Zimmerman [11]: "**An activity with some rules engaged in for an outcome**".

Katie Salen and Eric Zimmerman thus consider a game as an activity defined by two elements: The rules and the result, the last one according to a previous goal.

2.2.1 The game rules: "some rules".

If we consider that a video game takes place in a virtual universe and that it is composed by several "elements", in a large point of view, then these different elements are submitted to "rules", in accordance to the game like the elements composing our own universe which are governed by physical and behavioural rules.

For example, the universe of the game "Pong" is composed by the following elements: The racket of the player, the adverse racket and the ball. The area of the game (the size of the screen) can also be considered as an element, even though it doesn't have a graphical representation, it does "exist" within the rules of the game.

These elements are submitted to different rules like "Each frame, the ball element moves according to an (x;y) vector", or further on, "if the ball touches a racket, then its vector of movement (x;y) becomes (-x;y)".

Analysing this last rule, we will realise that it is composed by two parts:

- **The "trigger"**: "if the ball touches a racket, "
- **The "effect(s)"**: "then its vector of the movement (x;y) becomes (-x;y)".

We will call **"targets"**, the elements to which are applied those rules.

We will notify a similitude between this conceptual representation and the algorithmic or even programming on the whole: a condition ("if") driving to the production of a succession of instructions ("then").

2.2.2 The objective of a game: "an outcome"

In the same logic, the aim of a game can also be described by its rules, for example by Pacman: "if all the pastilles have been eaten, then the level is "won"". It is all about a rule having an effect corresponding to "the game has been won" (moving up to the following level, end of the game...), associated to a condition formalizing a target to be obtained.

At this level, we consider that it's logic to include "the objective of the game" into "the whole of the game rules", the "Game" part of a video game.

2.2.3 Conceptual Diagram

We will then obtain a model permitting us to describe a game by enumerating the elements of its universe, elements applied to the whole of the rules, including the objective of the game.

These rules are composed by different triggers and effects (figure 4).

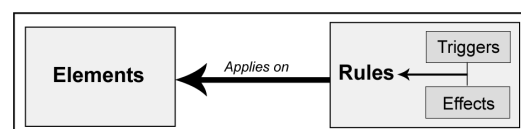


Figure 4: Conceptual diagram of a game

2.3 The modifiable game: "Gam.B.A.S."

Starting from this design, we have programmed a whole of "elements", "triggers" and "effects". The elements position is randomly chosen, we do not include any aspect of level design in this experimental game for now.

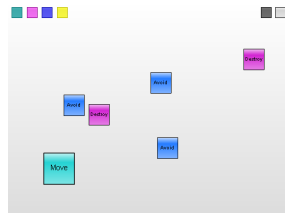


Figure 5: Gam.B.A.S. (Game Bricks As Switches)

Further on, we have programmed triggers like "Always", triggered on every frame, "MouseDown", triggered when you push the left button of the mouse, or even "Collision", when two elements collides.

These triggers are linked to one or several effects such as "CreateElement", "DestroyElement" or also "Move Element" applied when the condition of the trigger is "true".

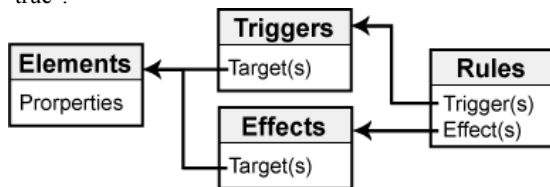


Figure 6: Simplified Class Diagram of Gam.B.A.S.

We have then been able to gather these elements, triggers and effects in order to realise basic video games: a game where you have to collect some elements and avoid others, recalling "Pacman", or even a game where you have to destroy elements that you don't have to touch, shooting on them, recalling the famous "Space Invaders".

2.4 The very nature of "Game Bricks"

At this stage, we have decided to set up in these "games" the "Game Bricks", based on the logic diagrams being defined in the "Specifications" phase (see 2.1).

In order to simplify, we will not set up neither the bricks of "TIME" and "SCORE", nor the brick of "TOY" because of a lack of satisfying diagrams.

We then realized that the "POSITION" brick is composed by a "Collision" trigger between two elements with spatial coordinates. The "SHOOT" brick features a "CreateElement" effect, and the brick "DESTROY" is composed by a "DestroyElement" effect applied to every element of the scene except of those relied to the player.

We finally observe that it is possible to build our bricks by assembling elements based on the previous definitions: the triggers and the effects.

These two being "the construction elements" of the rules, we realise that the "Game Bricks" can thus be translated into "game rules".

We also notice that the bricks definition diagrams can **not be translated directly into rules**: actually, there are within these definitions "areas of liberty", especially about the elements that are targeted by the rules. For example the definition diagram of the "Move" brick specify its effects are applied on "element relied to the player", but it doesn't specify the number of these elements: Is it about one unique piece or a whole army of mutant orcs?

The translation of definition diagrams into rules needs to answer this kind of questions.

2.5 Statement of the experiment

For the needs of this experiment we had to:

- **Define a model of the representation of a game**: a universe composed by elements to which rules are applied.
- **Define "elements of construction" for the game rule**: they are composed by two elements, the "triggers" and the "effects".
- **Establish definition diagrams** for Game Bricks.

At this stage we will define the "Game Bricks" as **"a canvas of rules"**, a diagram to follow in order to build a rule or a group of rules in a video game.

Nevertheless, if we observe the games obtained by the successive realisation of different bricks, even though they unquestionably remind us the basic principles of the classified games, we realise that **we don't obtain precisely one of them**.

For example, after having activated the bricks of the game of "Pacman", it seems that there still is a "lack of rules" compared to the original game: there are no "special dots" that make the "ghosts" edibles, the ghosts/elements to avoid don't move.....

We finally realise that **all the rules of a game are not covered by the bricks**. This "no-exhaustiveness of the video game rules" finds its answer in the objective of bricks, which intend to be a criterion to a classification, but will return to this point further on.

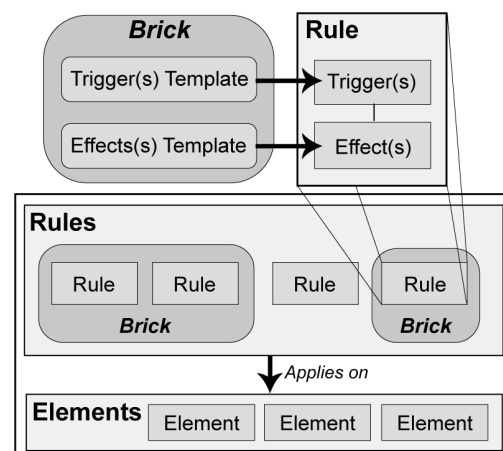


Figure 7: Conceptual view of a game: rules covered by a Brick are created from its template, unlike uncovered rules.

3 A VIDEO GAMES CLASSIFICATION ACCORDING TO THEIR RULES

The objective of the study of the "Game Bricks", according to the previous articles [1] and [2], is to achieve a definition of criterions for a classification of the Video Games. The "Game Bricks" should thus be these criterions, as their association into "Metabricks" will allow us to obtain "families" recalling those of the Russian tales classification by Propp[3].

The works on the very nature of "the Game Bricks" described previously have permitted us to achieve the following observation: **the bricks represent "diagrams of game rules"**, translated into rules by the specification of "areas of liberty" present in their definitions.

These "areas of liberty", generally relied to the elements targeted by the rules or "feedbacks" definitions, have been included intentionally within these bricks.

Actually, a precise definition for an effect like "the Pacman element moves 15 pixels north" or "the Pacman element moves 12 pixels east", yet matches exactly to the rules of Pacman, but would be completely unusable for a classification : the number of rules and thus of bricks would be extremely large with such precise definitions.

The combination of bricks allows us to represent the whole of the games being indexed, but it doesn't represent them in an exhaustive manner: numbers of rules are not included in the definitions of the bricks.

It's a choice made in order to **limit the number of the bricks**, and thus the criterions of our classification in order to enlarge the performance of it.

We therefore have concentrated our efforts on representing the rules related to the actions of the player with the "Game Bricks".

In accordance with the methodology described by Propp[3] and his classification, we have decided criterions of our classification, the "Game Bricks" form the video games : we have **observed indexed games**, and we have identified "recurrent rule diagrams". These different "rule diagrams" are, as it has already been said,

the definition of the "Game Bricks".

The bricks we have identified at present are the issue of 588 games being indexed in a first version of V.E.Ga.S. and are the result of **an iterative approach**, as former versions of bricks were created from smaller corpus[1].

The differences between games featuring the same bricks, strictly concerning the rules, are coming out from these two **choices of limitation of the precision of the bricks** with the aim to obtain a relevant classification.

For instance, within the limits of the game rules, we notice great resemblances with the game of "Pacman" and a racing game such as "Need for Speed Carbon": in both games you have to move an element (Pacman/car >> "MOVE" brick), and avoid others (Ghosts/Rivals >> "AVOID" brick) that it is possible to destroy ("DESTROY" brick), and finally passing by several succeeding spatial positions (Swallow dots/Pass the checkpoints >> "POSITION" brick);

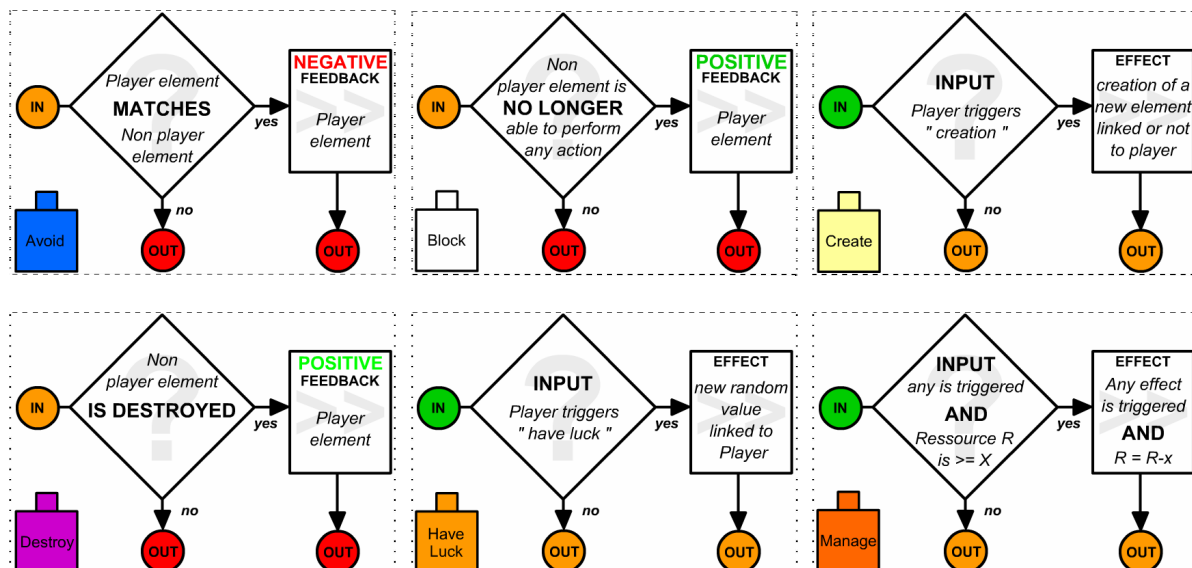
Nevertheless, even within their rules, these two games are different: the movement and thus the "MOVE" brick has two dimensions in "Pacman", but three in "Need for Speed Carbon", the number of checkpoints to pass in the last one is much smaller than the numbers of dots that Pac-man has to swallow and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

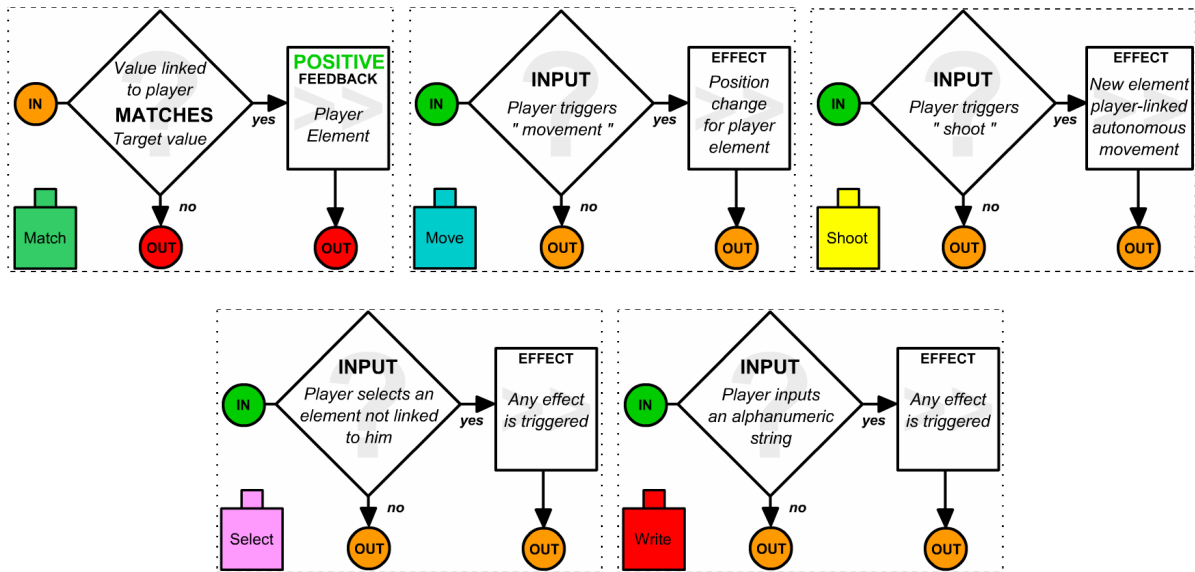
These differences between these two example games are the issue of different implementations of "rule diagrams" from the bricks they are sharing, but are also due to the use of rules are not covered by the bricks, as the frequency of these rules in our corpus were to weak for us to index them as a "rule diagram" in a "Game Brick".

4 GAME BRICKS DEFINITIONS

We will here introduce the diagrams of the different "Game Bricks" that we identified up till today.

These bricks will be used as criterions of classification in a further version of V.E.Ga.S., our tool of video game indexation and analysis.





According to the former version of bricks[2] we notify the disappearance of the "ANSWER" brick, because its definition was too large, and which intend to be replace by two new bricks : "SELECT" and "WRITE". We also notify the removal of the "SCORE", "TIME" and "TOY" bricks, which weren't directly related to rules, and an enlargement of the definition of the "POSITION" brick which becomes the "MATCH" brick.

5 CONCLUSION

We hope that we have clarified by this article **the very nature of "the Game Bricks"** having been clear about the choices at the time of their construction in the target to use them as **criteria of a classification of video games according to their rules;**

Answering the article by Matthieu Letourneux, "The question of the kind of video games"[6] that points out the short life of the video games classifications due to the lack of "no-evolution criterions", we consider that **the game rules of the video game seem to be an interesting criterion** by the fact of its obvious redundancy between different games. We also notify that this aspect of the video game doesn't seem to be submitted to an evolution as quick as the one concerning for example the control devices or the graphic aspects, which make "the rules" particularly interesting for a classification criterion.

We can nevertheless establish a relationship between the "The game rules" and the "middleware". The "middleware" corresponds to different "engines" (game, graphics, physics, sounds...) sold separately and that permit the creators not to reprogram the redundant parts of their different games.

These games engines are generally distributed with the pre-programmed rules, rules that you will find in the important lines in all games of the same "kind", according to the classifications by the specialized press (Shoot'em up, FPS, RTS,...)

We consider this as a **real example of the small variation of "game rules"** between the games considered as being the "same style", when these same games offers different graphics or controls.

This article helped us to reconsider what is a "Game Brick" in accordance to a game: **a rule diagram**, or more precisely "recurrent game rules diagrams". We realize then, that the choice of the creation or not of a brick relies on **the evaluation of the pertinence of the diagram** as well as the definition of its "areas of liberty". As we previously have explained, the bricks that we have identified up till today are the result of **an heuristic approach from 588 games**. We pretend neither to have identified all the bricks, nor to have identified the more pertinent diagrams.

We are aware of the fact that the planned increase of our indexed games will lead to an refining of the bricks definitions, or maybe even be the discovery of new bricks or meta-bricks.

The "Game Bricks" showed in this article, along with their definitions, will be used as **criteria for the classification being included in the second version of "V.E.Ga.S"**. As we have mentioned in the introduction, we wish to decrease the part of subjectivity during the evaluation of the games, done by the human being, thanks to an approach of quality as well as a quantitative approach.

While **the current paper is a part of the qualitative aspect**, the quantitative aspect is related to **the opening to the public of our V.E.Ga.S database**. We will thus apply for a **contribution** concerning the inventory and the evaluation of the games, the bricks featured in a game will then be chosen according to the statistics of the different evaluations that the game received.

You may offer, evaluate or get informed about a game in the online version of our classification:

<http://www.gameclassification.com>

Nevertheless, it is obvious that a game is not made only of rules, it also features a graphic aspect, interfaces, and a content. Talking about content, the work presented here get a broader meaning when focused on "Serious Games".

In its article "From Visual Simulation to Virtual Reality to Games", Mike Zyda[13] proposes the following **definition for Serious game**: "*A mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.*" (p. 26)

In other words, the vocation of Serious Game is to invite the user to interact with a data-processing application whose intention is to combine at the same time teaching, training, communication, or information aspects, with ludic mechanisms based on video game. The purpose of such an association is thus to **give attractive shapes or plots (Game) to didactic contents (Serious)**.

This definition raises the following question: **What is the impact of these Game rules on the Serious and Educative content?**

The current article was focused on the **"Game" part** of Serious Games, and need to be related with the work on the **"Serious" part** presented in our second paper [12]. This second article started from the **analysis of five Serious Games areas**: Edutainment, Advergaming, Edumarket Games, Political Games and Training games.

This analysis led us to conclude that these Serious Games are composed of **two main categories**:

- Serious Games **based on simulation** which present a "world", with its "rules" and where there is no objective imposed by the application.
- Serious Games **based on video games** which propose a "world", with its "rules" and implemented objectives that the user has to reach.

We can observe both categories of Serious Games seem to take place in a **"virtual world with its rules"**, thus we can see the role of the "rule analysis" work presented here.

But we can also notice that some Serious Games features an "objective to reach", whereas the first category, based on simulators, doesn't impose any objective.

Can the "Game Bricks" be applied on the "Game" part of both Serious Games categories?

Or does the lack of objective of the first category imply its games will use a different set of bricks?

We will try to work on these questions on our future works.

6 GREETINGS

The authors wish to thank **Jean-Yves Plantec** and **Martial Bret** from the "Iode" Society, for their point of view concerning the notion of "Brick", as well as **Stéphane Bura**, Art Director at 10Tacle Studios, who have let us know a great number of references.

We also wish to thanks a lot **Annika Hammarberg** for the translation of this paper from French to English, and **Rashid Ghassempouri** for his general help and thoughts in the earlier works about this game classification.

7 REFERENCES

- [1] Alvarez, J., Djaouti, D., Ghassempouri, R., Jessel, J.P., Methel, G., V.E.Ga.S.: A tool to study morphology of the video games, Games2006 Portalegre - Portugal (2006).
- [2] Alvarez, J., Djaouti, D., Ghassempouri, R., Jessel, J.P., Methel, G., Morphological study of the video games, CGIE2006 Perth - Australia, (2006).
- [3] Propp, V., Morphologie du conte (1928), Seuil, (1970)
- [4] Le Diberder A. et F., Le Diberder F., L'univers des jeux vidéo, Ed. La découverte, (1998)
- [5] Natkin S., Jeux vidéo et médias du XXI^e siècle, Vuibert, (2004)
- [6] Letourneux, M., from the Genvo, S. book : Le game design de jeux vidéo, L'Harmattan, (2005)
- [7] Koster R., A Grammar of Gameplay, <http://theoryoffun.com/grammar/gdc2005.htm>
- [8] Bura S., A Game Grammar, <http://users.skynet.be/bura/diagrams/>
- [9] Thielscher M., Game Description Language, <http://games.stanford.edu/language.html>
- [10] Clickteam, Game Tools, <http://www.clickteam.com/>
- [11] Salen K. and Zimmerman E, The Rules of Play, MIT Press (2003).
- [12] Alvarez, J., Rampnoux O., Jessel, J.P., Methel, G., Serious Games: just a question of posture?, AISB'07 Newcastle - Scotland (2007), to appear.
- [13] Zyda M., From Visual Simulation to Virtual Reality to Games, IEEE Computer Society, 2005