

# Morphological study of the video games

Julian ALVAREZ

IRIT/LARA

Universities of Toulouse II & III  
FRANCE

alvarez@irit.fr

Damien Djaouti

LARA

University of Toulouse II  
FRANCE

daminous@gmail.com

Rashid Ghassempouri

LARA

University of Toulouse II  
FRANCE

rashid.ghassempouri@gmail.com

Pr. Jean-Pierre JESSEL

IRIT

University of Toulouse II  
FRANCE

jessel@irit.fr

Pr. Gilles METHEL

LARA

University of Toulouse II  
FRANCE

methel@univ-tlse2.fr

## ABSTRACT

The aim of this article is first to present V.E.Ga.S., a tool which intend to classify video games, study their nature and to corroborate hypothesis by a pragmatic approach. It consists in studying a significant number of video games in order to index their composition of elementary "game bricks". Basing our study on this bricks and crossing them, we try to classify and study video games. In a second time, this paper presents the classification deduced from the results of V.E.Ga.S.

## Categories and Subject Descriptors

K.8.0 [General Games] (ACM Computing Classification Scheme):

## General Terms

Experimentation, Standardization, Theory, Verification.

## Keywords

Bricks, Experimental Methods, Gameplay, Game design, Video Games, Morphology, Taxonomy.

## 1. INTRODUCTION

On the very first pages of his pioneer work, Propp<sup>1</sup> postulates that to really get to know what is a folktale, we have to study all the aspects in order to establish a classification (p.11 & 12). In the same way, the idea of this paper is to study video games and try to found out a classification. Classify video games is not something new. The brothers Le Diberder<sup>2</sup> as well as Stéphane Natkin<sup>3</sup> have already proposed classifications. But in all this classifications although they act as references; we rapidly have found slants or absences. That's what Matthieu Letourneux<sup>4</sup> denounces in his article "The question about the style of video games." (p.40 & 41). He means that all classification is condemned to be outdated, because the technological evolution offers constantly new perspectives. We are thus in front of a paradox. Because in accordance with Propp it's essential to classify in order to understand: "The accuracy of the further study depends on the accuracy of the

classification." (Translated from French). How be able to make a definition of a video game if its classification is rapidly wrong?

It seems at this level of the reflection that Propp offers a key to try to answer the paradox: "Although there is a place for the classification as a basis of every research it must be the result of a further study. Or, we observe the opposite situation: Most of researchers start by classifying, thus introducing facts, when in fact, they should rather deduce." (Translated from French).

These sayings invite us to approach the classification of video games in a different manner. Maybe, if we follow the methodology of Propp, we will manage to create a classification being able to be adapted to video games? Maybe we will realize that the aspects of video games don't evolve?

To follow the methodology of Propp thus implies to establish a classification that will be deduced by a "preliminary further examination". This approach of a "analytical study" has to be run in a "formal and abstract way " and will lead us to find recurrent "functions" that composes the element that is studied (p.27).

In order to manage a "preliminary further examination" of our video games, we have chosen the approach made by the game designers Katie Salen and Eric Zimmerman<sup>5</sup>. Because their "fundamental principles" are elements you can put together in order to manage any game, they are similar to the "functions" of Propp, which are combined in order to make up any tale.

Thus, in order to adhere to the "formal and abstract" study of Propp, we only retain in our study "the fundamental principals" being in touch with the "outside" as it defined by Winnicott<sup>6</sup>. At last as underlined by Salen and Zimmerman, we will play the video games, because the theoretical approach is not sufficient: "A game design education cannot consist of a purely theoretical approach to games. This is true in any design field." (p.11).

Following this methodology we have elaborated V.E.Ga.S. (Video Entertainment & Games Studies) tool<sup>7</sup>. It is dedicated to the morphologic study of video games in order to classify, study their very nature and corroborate hypothesis in a pragmatic approach.

We will first define the experimental approach of V.E.Ga.S. and see how the video games are indexed and analysed. In a second

time we will present the classification obtained by this way. All along these two parts, we will also try to transmit our way of thinking.

## 2. V.E.Ga.S. EXPERIMENTAL APPROACH

### 2.1 First approach: The classification by interactivity

At the very start, we have tried to realize an experimental study with the following principle: Draw a tree structure in which should be classed video games according to their interactivity and check if at the end of each branch the principles of the game are the same. For example, for the branch representing the 4 arrows on the keyboard, will we always find games similar to Pacman? If that were to be checked, then yes, the interactivity would make the game, if not, it would be different.

This first experimental approach has rapidly shown its limits to obtain a classification. It has nevertheless given some encouraging results in pointing out the way of new ingredients to be found. We thus decide to continue to develop the number of parameters to study.

This experiment has shown us this observation<sup>8</sup>:

**The interface alone do not permit to classify video games.**

### 2.2 Protocol of the second experimental step

Because "The interface alone do not permit to classify video games", additional elements now have to be found out.

The "fundamental principles" defined by Salen and Zimmerman, are elements you can put together in order to construct any game, that is similar with the functions of Propp who are combined in order to make up any tale. Using this "fundamental principles" seemed to be a good track to follow in our research. But which are those "fundamental principles"?

« Who are those fundamental Game Design ? They include understanding design, systems, and interactivity, as well as players choices, actions and outcome. They include a study of rule-making and rule-breaking, complexity and emergence, game experience, game representation, and social game interactions. They include the powerful connection between the rules of a game and the play that the rules engender, the pleasures games invoke, the meanings they construct, the ideologies they embody, and the stories they tell. »(p.6).

Thus, in order to be faithful to the "formal and abstract" appearance of Propp, we only retained in our study "the fundamental principals" being in touch with the "outside" as defined it Winnicott: The formal criterions of the design, the systems , the interactivity, the actions, the results and the rules of the game as a hardware and a software point of view. The « Systems » terms approached in a formal way such as Salen and Zimmerman define it (p.51) can be integrated for us in « the rules of the game». For each one of these fundamental principles, we thus made corresponding the following fields:

\* **Design:** « Design is the process by which a designer creates a context to be encountered by a participant, from which a meaning emerges » (p.47). While remaining "formal",

we decided to index the following fields for each game to try to circumscribe these first "fundamental principles": **Title, Author, Categories, Date, Editor, Link, Graphics, Country, Platforms, Public, Support.**

\* **Interactivity :** In front of the peripheral devices who permit the interaction of the video games, like the joysticks, guns, dance mats, eyes toys etc... it seems wise to start by taking away the displays and set up a limit to the standard equipment of Macintosh or PC : The keyboard and the mouse (the model that has been chosen is with two buttons and a scroll wheel). Out of that a list of many possibilities has been defined. First for the mouse, we take the default buttons configuration (Click to the left = action, click to the right = options), we have retained those:

- Click on elements
- Move the mouse with a click (drag)
- Double Click
- Repeated Clicks
- Click on the right (click on the left + touch "ctrl" on Mac Os)
- Click on the screen
- The length of the click
- The mouse roll over zones in order to set off actions
- Move the mouse
- Move the mouse in a special way (fast movements or reproductions of distances)
- Turn the scroll wheel
- Special click (Serrated roller, Left + Right...)

And for the keyboard, we have retained what follows:

- Top, Bottom, Left and Right arrows
- Special keys (Space, Enter, Tab, CTRL, Alt, Command, Esc and Delete)
- Other keys (Alphanumeric, punctuations, symbols, functions...)
- Alphanumeric data capture
- Combination of keys
- Press repeatedly
- Laps of time of the keys concerned

\* **Actions + Rules of the Games + The results:** These three elements immediately refer to the notion of "function" in the very sense of computer science. A function is defined by an entrance, a processing and an exit. We consider here that "the actions" are what the player gets as instructions on the interface. "The game rules" let us know how to proceed. Once the treatment executed, the function returns "the results". Software developers often use the term of "briques" (bricks) to designate small modules of autonomous programs. Their approach is that in order to create different applications, we just have to assemble different combinations of bricks (in accordance with "the blocks" of Salen and Zimmerman). In the same way, we specify that the combinations of the bricks of

the games have to be in accordance with the rules and the aims of every video game (the term of "game" refers to the notion of "game rules" leaning on the saying of Gilles Brougère). This third "fundamental principal" is related to "the functions of Propp and will be developed in the next chapter.

### 2.3 The "game bricks"

Propp specifies 4 rules in order to define the functions of Russian Tales (p.31 to 33):

\* «1 - The permanent and constant elements of the tale are the functions of the characters, whoever they are or whatever are the manners of their functions to be filled. The functions are the fundamental constitutive parts of the tale »: In the context of the video game that signifies that whatever is the "design" and "the interactivity" of the game, the "game bricks" are always identical.

\* «2 - The number of the functions of the fairy Tale is restrained »: Which implies in the context of the video game, that there are probably a limited number of game bricks.

\* «3 - The succession of the functions is always the same ». This third rule in the context of the video game implies that the player has to make choices (Salen et Zimmerman p. 33 and Gilles Brougère p. 52) and thus has to activate different successions of functions, which leads us to apprehend it otherwise: For each video game that we are studying here corresponds one combination of game bricks.

\* «4 - All the Fairy Tales belong to the same form concerning their structure. ». This last point would perhaps make us able to elaborate a classification of video games according to their combination of game bricks.

The game bricks that we have identified are based on games studied at the very start of our research, and we specify that this is just an approach and therefore we do not pretend to present a final list. One of the points not yet defined concerns the cognitive aspect. Thus, if we propose a game brick "MEMORIZE" with the following description: This brick tests the short term memory of the player. For example, he has to tell which element that has disappeared on an image observed just before." Do we here describe the rules of the game or are we describing the process of knowledge of the player in order to obtain an aim consisting just to show an object? We think that the last option is the good one. We thus have tried to eliminate in every brick the cognitive aspects to respect the "formal" aspect imposed by the methodology of Propp. This step is also consolidated by the remark that Sébastien Genvo<sup>9</sup> underlines when he mentions Jacques Henriot: "No structure in itself is play-some: the game is above all a question of intention." (Translated from French - p.11).

We therefore present the second schedule of brick games<sup>7</sup>, which we define today as "intentions" of external elementary game rules ("external" meaning: "do not consider the cognitive aspect", referring to the "inner" aspect of Winnicott)

- 01- Brick "ANSWER":** This brick invites the user to give an answer entering a datum or pointing out one. For example: (questions, test, questionnaire of multiple choices, choice of dialogues in a game of adventure....). If the number of answers becomes important, we have a game of "location" like, "Where is Charlie?" or the game of "Find the differences between two pictures"...
- 02 - Brick "MANAGE":** This brick invites the player to manage resources in order to reach a target. For example the quantity of petrol necessary for a car to go as far as possible, or munitions in a Shooting Game, or troupes in a Strategy Game or further on first material in a Game of economic simulation for example...
- 03 - Brick "HAVE LUCK":** This brick invites the player to defy the chance. (Game of jackpot for example).
- 04 - Brick "SHOOT":** This brick invites the player to touch an element situated at a distance. For example in the game of "Space Invaders", the player has to shoot a missile in order to touch a vessel of the enemy; It includes as well the big family of FPS or Game of Shooting with the target to move on the screen...
- 05 - Brick "CONSTRUCTION/CREATION":** This brick requires creativity (on the opposite of a puzzle that has to be reproduced) and asks the player to put elements together, construct, create special elements or not, colour, draw after motifs or geometric elements or not. This brick is also applies the sound dimension;
- 06 - Brick "BLOCK":** This brick defies the player to block an enemy or an element pointed out. This brick can also forces the player to maintain one or several elements in a precise place or state (stability....).
- 07 - Brick "DESTROY":** Game of destruction of the elements/enemies. And games where you have to collect or catch elements. These elements can be fixed or moving or both alternately
- 08 - Brick "MOVE":** Game where you have to move/drive/pilot an element or a person.
- 09 - Brick "AVOID":** Brick inviting the player to avoid elements/obstacles/enemies/adversaries.
- 10 - Brick "POSITION":** This brick defies the player to position elements at very special places or key positions.
- 11 - Brick "TIME":** This brick invites the player to pass a test within a time that is limited or as fast as possible;
- 12 - Brick "SCORE":** This brick invites the player to make scores. Credits, Real or virtual sums of money are assimilated to a score.

If none of these Bricks is in accordance with the software game, it means that it is a "TOY" or a brick that have not yet been classified.

How class the aspects of a "game"?

We propose for example "Galaxian"<sup>10</sup>. The very idea of this game is to invite the player to pilot a ship and to destroy another ones with it. "To pilot" imply the brick 09 "MOVE". But the player also has to fire on enemy ships. This implies the brick 04 "SHOOT". And to destroy them, brick 08 "DESTROY". it is not over. The player also has to avoid the enemy fire back. This implies the brick 10 "AVOID". In this game we also have to imply the brick 13 "TIME", because the player has to destroy all the enemies before they reach his ship. Finally, the game invites the player to make scores. Collecting bonus allow to make a higher score. This will thus imply the brick 14 "SCORE".

In order to represent the aspects of the "Galaxian", we thus have combined the following "game" bricks: "SHOOT"+ "DESTROY"+ "MOVE"+ "AVOID"+ "TIME"+ "SCORE".

This combination is confirmed by the diagram of "Galaxian" that Raph Koster made<sup>11</sup>. In its diagram we can find the same elements: "Get highest score"(SCORE) + "Kill enemy"(DESTROY) + "Position token"(MOVE) + "Press fire button"(SHOOT) + "Don't get hit"(AVOID) + "Move" (MOVE). Raph Koster precise that "Vertical time was time" (TIME).

This correspondence is for us a good point and encourage us to continue on this way.

## 2.4 Positioning the database

If we cross all these fields, we have several billions of combinations. The idea of a Data Base type MySQL added to PHP program language is imperative at this level. And this technology will also permit a more complex manipulation of the data in order to edify personalized tables by crossing the desired data. Moreover the data of the base could as well be transferred to a software of statistic processing in order to work out new dimensions. V.E.Ga.S is born. It's the name of this data base.

## 3. THE CLASSIFICATION DEDUCED FROM THE RESULTS OF V.E.Ga.S.

We have now made the inventory of 588 Games and time has come to discover the first results. Of course, these results cannot be considered as being representative or significant. The number of Games is too weak and the sample are not yet refined. The results here shown have to be confirmed and have to be considered as indications. They are intended to prove the performance of the tool V.E.Ga.S. at the present level of the design.

### 3.1 A big variety of families

Nevertheless, what do we note when we see the first results (Table 1)?

First of all V.E.Ga.S. designs to us a big number of "families". At this level we mean "family": a unit of games that have the same combination of game bricks.

301 families are indexed for a total of 588 games. These families have at this very moment few members: In 68 % only one title is indexed. For the 32 % left, the groups are principally constituted of less than five titles. Only 21 families exceed 4 titles.

This number of families is related to the total number of theoretical combinations. It exceeds 4 millions concerning the interfaces but only 8191 concerning the game bricks. (We here specify that these numbers of combinations are in reality smaller, because they don't take into account here the probable incompatibilities between some bricks). Knowing that the maximal number of combinations of the game bricks only represent 0,19 % of these of the interfaces, we then thought at the phase of indexing the games that we would obtain even less families and that every one would contain much more titles. We relied on that fact in order to get an outline of a classification. We now realize that this project failed. And we are beware at this level that we are following the wrong pathway to index the games.

**Table 1. Summary scedule of Game Bricks" indexed by V.E.Ga.S**

Total Number of Games in V.E.Ga.S.	588
Number of Game Bricks being indexed	13
Number of families of Game Bricks that have been found	301
Number of possible combinations of Game Bricks	8191 (In theory)
Number of Game Bricks families containing 1 title	205 (68,10%)
Number of Game Bricks families containing 2 titles	41 (13,63 %)
Number of Game Bricks families containing 3 titles	15 (4,98 %)
Number of Game Bricks families containing 4 titles	19 (6,31%)
Number of Game Bricks families containing more than 4 titles	21 (6,98%)
Number of Game Bricks families exceeding 10 titles	4 (1,32%)
Number of Games composing the 21 families exceeding 4 titles	172 jeux (29%)
Number of "interfaces" families	124
Number maximum of possible "interfaces" combinations	4.189.185 (In theory)

Results supplied by V.E.Ga.S. (July 2006)

### 3.2 Mismatching games families?

V.E.Ga.S. not only shows an important number of game families, but several of them regroup games of different categories/genres. For example we will find in the same family:

- A Platform game, "Kong" (Clone of Donkey Kong), an Arcade game "Frogger" and a Race game, "Trackmania Nations ESWC" (Race Game of Cars against the time).

And further on in another family:

- A Beat'em up, "Comix Zone", a FPS "Doom" and a classic Platform game,"Jazz jack Rabbit";

It will maybe seems amazing at first and will at the end bury our research of video games classification, but if you approach , you will notify that all these games are what Chris Crawford<sup>12</sup> names: "Sensorimotor Challenges". These games are a challenge of sensorimotor of the player, like rapidity and dexterity. These games that are separated by the themes, the graphics or the sounds, or further on the interfaces, they have nevertheless in common to offer to the player the same "type" of aims and of challenges.

According to the fact that we now raise a schedule board of 21 of the biggest families indexed by V.E.Ga.S. and we will then check out to see if the games in there offer similar objectives (Table 2). This table presents in abscise first the game bricks composing the games of the different families, and then the titles of representative games. It ordinates the 21 families with the number of games that compose them are positioned. A

letter of the alphabet allows the identification of each family. What does this table show to us? In fact, it confirms that for each of the 21 families the objectives are homogeneous. We thus find 5 families (A,C,H,K and Q) that regroup Reflection

**Table 2. Brick game combinations composing the 21 greater families indexed by V.E.Ga.S (July 2006)**

	Answer Avoid	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						Drag and Drop quiz
B - #2 Fam of 5 games													Autoroute (Basic car drive game)
C - #3 Fam of 5 games									X				Memory, Crossword and Text adventure
D - #4 Fam of 5 games				X					X				Fly eating (Catch flies with a static toad)
E - #5 Fam of 5 games				X					X				MechWarrior 3, Interstate 76, Prohibition
F - #1 Fam of 6 games				X					X				Commando, MDK, Abuse
G - #2 Fam of 6 games													Paint activity, Music Sampler...
H - #3 Fam of 6 games													Quiz games
I - #4 Fam of 6 games				X					X				Call of Duty, Tomb Rider, Earth Worm 2
J - #1 Fam of 7 games				X					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													Spider, Slalom (Basic ski simulation)
M - #2 Fam of 8 games									X				Space Invaders
N - #1 Fam of 9 games													Pacman
O - #2 Fam of 9 games													Snake
P - #3 Fam of 9 games									X				Street Fighter 2
Q - #4 Fam of 9 games													Memo-U (A kind of quiz game)
R - Fam of 11 games				X					X				Double Dragon, Micromachines 2 et 3
S - Fam of 16 games				X					X				Doom, Descent, Duke Nukem 3D
T - Fam of 17 games				X					X				Asteroids
U - Fam of 19 games													Frogger, Trackmania

games. Then we have the family G, that regroups Artistic games, which are more "toys" than "games". At last, the 15 remaining families are "Sensimotors" games.

But what appears rapidly to us when we study these families of Sensorimotors is the presence of game bricks that are systematically in duo. Thus "Move" goes always with "Avoid" (Symbol "O") and "Shoot" with "Destroy", (Symbols "X"). What does it means?

### 3.3 « DRIVER » and « KILLER »

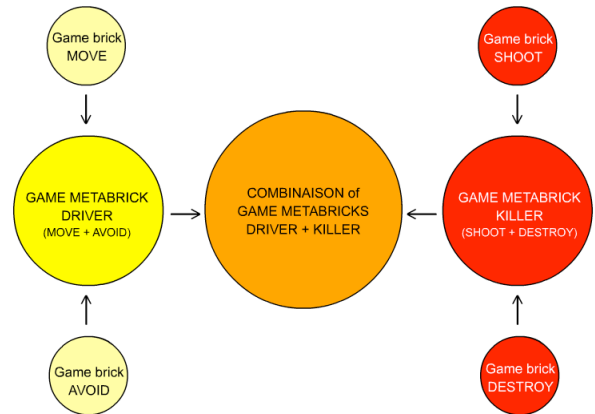
The combinations of games composed by the B, L, N, O and U families contain only the couple of "Move" and "Avoid".

When we study all these games we realize that their common challenge is to steer an element with skill and to avoid to touch other elements. We then decide to call "DRIVER", the duo or "metabrick" formed by "Move" and "Avoid".

In the same way, we will call "KILLER", the "metabrick" formed by the duo of "Shoot" and "Destroy". And in fact, the very essence of these games composing the family D, the only one which contains this duo, is to eliminate elements by shooting them!

Following the same logic, because we find the both metabricks "DRIVER" and "KILLER" in the whole games which compose the families E, F, I, M, P, R, S and T, we will name those ones "DRIVER - KILLER" (Figure 1);

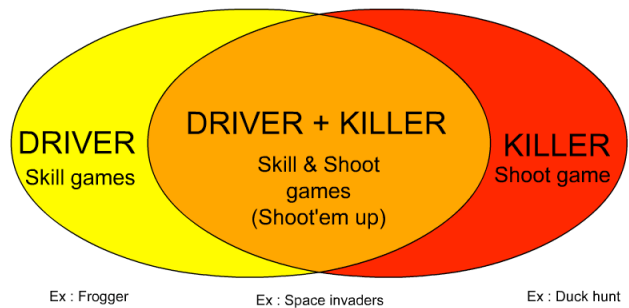
Construction of GAME METABRICKS



**Figure 1 : Schedule that shows the manner of how the brick games are put together in order to form "metabricks"**

This name seems suitable to the very nature of the challenge proposed by the games of these 9 families: Steer an element in order to destroy other ones!

DRIVER = "Move" + "Avoid"  
KILLER = "Shoot" + "Destroy"



**Figure 2 : Comparison of Metabricks and genres of Video Games**

Figure 2 compares the different metabricks that we just have identified with the usual genres used to index the video games. Thus, we can approach the "DRIVER" with the "Skill games" like "FROGGER" (Sega/Gremlin/Konami), and the "KILLER" with "Shoot games" like "Duck hunt" (Nintendo). The "DRIVER-KILLER" put the two genres "Skill" and "Shoot" together as "Shoot'em up" does. A representative game is then the famous "Space Invaders" (Midway/Taito) for instance.

All right, but the table 2 shows that other game bricks enter as well into the composition of different games. There are even those differences of combinations that distinguish the families. What is it about that?

### 3.4 Families that have to be simplified

Let us study the details of the combinations composing the families of "DRIVER-KILLER". We have:

- Family E = DRIVER + KILLER + Manage + Position + Time + Score
- Family F = DRIVER + KILLER + Collect + Manage + Position + Score
- Family I = DRIVER + KILLER + Collect + Manage + Position + Time
- Family J = DRIVER + KILLER + Collect + Score
- Family M = DRIVER + KILLER + Time + Score
- Family P = DRIVER + KILLER + Position + Time + Score
- Family R = DRIVER + KILLER + Collect + Position + Time + Score
- Family S = DRIVER + KILLER + Collect + Manage + Position + Time + Score
- Family T = DRIVER + KILLER + Score

Ralph Koster suggests in his grammar of gameplay to consider "Time" as an entire dimension. Thus, "Time" does not enter into the composition of a game as an "objective" in the same way as a brick "Avoid" for instance and rather compels the game. Concerning the brick "Score", it is an indication of the performance of the player. In this context we can simplify the combinations of our families by removing "TIME" and "SCORE". We thus obtain only 6 families:

- Family E = DRIVER + KILLER + Manage + Position
- Families F & I & S = DRIVER + KILLER + Collect + Manage + Position
- Family J = DRIVER + KILLER + Collect
- Families M & T = DRIVER + KILLER
- Family P = DRIVER + KILLER + Position
- Family R = DRIVER + KILLER + Collect + Position

The brick "Collect" has now disappeared and became equal to "Destroy"<sup>9</sup>. If we replace "Collect" by "Destroy", knowing that "Destroy" is already present in the metabrick of "KILLER", then we can simplify even more our families. Then there will be no more than 3:

- Families E & F & I & S = DRIVER + KILLER + Manage + Position
- Families J & M & T = DRIVER + KILLER
- Families P & R = DRIVER + KILLER + Position

We will now check on the table 2, if the kinds of games representing every family of these 3 groups are homogeneous:

Concerning the "EFIS" group we have: "MechWarrior 3", "Interstate 76", "Prohibition", "Commando", "MDK", "Abuse", "Call of Duty", "Tomb Raider", "Earth Worm Jim 2", "Descent" and "Duke Nuken 3D".

We now have a big concentration of the FPS and the games that can be considered as the forerunner of this kind of games

("MDK", "Prohibition" and "Commando"). By the way we notify the game "Interstate 76", which combines FPS and the car racing. Isn't it a good representative game of the duo



Figure 3: The game of "Interstate 76" is a good illustration of the composition of "DRIVER - KILLER"

"DRIVER - KILLER"? This game, however, shows the close relation between the genre of games FPS and most of the games of car racing (figure 3). At last, there is the game of Earth Worm 2 (Platform game with avatar able to shoot) that you may approach to the game "Commando" but with a profile point of view. A part from this cosmetic aspect and the kind of games, we realize that all these games have in common above all to invite the player to chase the enemy and to choose the weapon in order to shoot on him.

Concerning the "JMT" group, where we only have the combination of "DRIVER + KILLER", we have classed: "Xenon 2", "JDar", "Space Invaders" and "Asteroids". Here we only have Shoot'em up. That has already been shown in the figure 2. If we now make abstraction of the design of games in order to compare this second group with the previous one, we will realize that the challenge is a bit different: The player is not invited any more to chase the enemy, the last one comes instead constantly towards the player in a automatic way.

At last concerning the "PR" group, we have: "Street Fighter 2", "Double Dragon" and "Micromachines 2 and 3". The first one is a "Fight game", the second one a "Beat'em all" and the last one a "Car racing game". At first this kind of games seems different. But if you make abstraction of the graphics, you will realize that in all these games, the "Shoot" is put away to the benefit of "Position". What is really important here is to advance with the avatar in order to confront the enemy by contact (Hit the enemy, push away the opponent cars....).

We will realize here that every one of these 3 groups of families contain really games with the same challenges, even though the general design of the video games might make believe the opposite. That belongs to the fact, that the genre often consider partly the forms of the games, which is on the contrary of our study.

### 3.5 Four rules about metabricks

What is then the influence of the game bricks on the metabricks?

We realize that our 3 groups of families maintain all a strong common challenge that is the "DRIVER - KILLER". Nevertheless, this groups present variants in the way of handling this head challenge. The "EFIS" group with the bricks "Manage + Position" invite the player to chase the enemy and to choose the appropriate weapon in order to face him. The "JMT" group is only based on "DRIVER - KILLER", the enemies are continually and automatically brought in great numbers onto the player. At last the group of "PR" with the brick "POSITION" invites the player to face his enemies in a struggle man to man. We now realize clearly that the addition

of game bricks to the metabricks will create variants into their challenges.

We are now able to deduce at this level, the four following rules:

- 1) Are called "metabricks", the combinations of two game bricks supplementary that make a challenge.
- 2) To add a game brick to a metabrick will give to the challenge carried by this one, a variant which does not alter its very nature.
- 3) If we add several game bricks to a metabrick, the second rule is right as long as the combinations of game bricks don't form another metabrick.
- 4) Associate the metabricks lead us to associate their respective challenge.

### 3.6 Inventory of all the families

Until now we have focalized on the 21 families assembling the largest part of the games. But there are 280 more left in the field of V.E.Ga.S. Which are they?

The table 3 shows us the composition of all the families being indexed in V.E.Ga.S. after that we have applied the levels of simplification as we have seen in the previous chapter.

This schedule reveals to us that a major part of the families are combinations including in a large part the metabricks "DRIVER" or "KILLER" or also the combinations of "DRIVER - KILLER" ( $39 + 15 + 21 = 75$  that represents about 46 % of the whole families that have been indexed).

**Table 3. Distribution of game families after simplification**

Number of Game Bricks families	301
After simplification, number of families left	164
Number of "DRIVER" families	39
Number of "KILLER" families	15
Number of "DRIVER - KILLER" families	21
Number of families which contain : Move, Avoid, Shoot or Destroy	58
Number of families without : Move, Avoid, Shoot and Destroy	18
Families which contains errors or "Toy" brick	13

Results supplied by V.E.Ga.S. (July 2006)

We will further on realize that about 35 % of the families are combinations containing one or several bricks among "Move", "Avoid", "Shoot" and "Driver". Nevertheless, these combinations don't form the metabricks of "DRIVER" or "KILLER".

Facing to this large collection of 81 % of the families, we have a small collection of about 11 % representing the combinations that don't include none of the four bricks "Move", "Avoid", "Shoot" nor "Destroy".

At last, the 8 % left are the composition of families representing the "Toy" brick or are data entry errors. For the moment we won't correct those ones in order not to distort the results being shown up till today. This group is thus kept away from our study.

What do we learn from these 3 collections of families?

When we study the games of the large group of the metabrick families, then we realize that for each of them they represent challenges "Sensorimotor". This is in accordance to the four rules about metabricks of the previous chapter.

On the other hand the other two groups of families offer games and challenges heterogeneous. This is also in an accordance to the four rules about metabricks, because the absence of metabricks that have been identified don't provide a homogeneous classification of the challenges.

At this level we then have to explore these two groups of families in order to try to discover if there are other metabricks in order to complete our classification.

### 3.7 Discovery of "GOD" and "BRAIN"

When we examined the different games in V.E.Ga.S. we have found the duo of bricks "Manage" and "Create" into games like "Simcity". This challenge designs the idea to use for the best the resources in order to construct elements. As "Simcity" is a "God games", and as it has allowed us to identify this duo, it seems logical to us to call this metabrick "GOD".

This metabrick has been indexed 13 times in the 76 families of our last groups, but also 6 times in the group of "sensorimotor" families: 3 sequence of the "DRIVER + GOD" and 3 sequences of the "DRIVER + KILLER + GOD". To which kind of games could those combinations correspond? The games of "Warcraft 2" and 3 as well as "Starcraft" (Blizzard) are for example games of this last combination.

At last, the duo of "Answer + Avoid" has equally been found because it was automatically associated to all the "Quiz games" of the database. We thus have named it "BRAIN" because that type of challenge concerns our memory and sometimes our capacity of reflection.

Up till today we thus take into account 4 metabricks, "DRIVER", "KILLER", "GOD" and "BRAIN". These ones could of course be combined to one another (DRIVER + BRAIN, GOOD + KILLER, BRAIN + DRIVER + KILLER., etc....) and even join other brick games in order to obtain a variety of challenges ( DRIVER + Position, BRAIN + Move...). These possible combinations are thus reduced from 8191 to 15 if you take account to the fact that these 4 metabricks are for sure not more than one thousand if we include all the variations of the challenges.

Maybe there are other metabricks to discover? Mathematically with the nine game bricks (Answer, Avoid, Block, Create, Destroy, Get Luck, Manage, Move, Position and Shoot) we have a possibility of 45 duos. We then have to sort out the impossible challenges and then we should obtain the list of metabricks to be discovered in the games that exist today and why not to be tested as new kinds of gameplay.

We do think that a fifth metabrick, "TACTIC" with the duo "Position" + "Block" could be a good candidate. But up till today we cannot confirm this because V.E.Ga.S. has not indexed enough of games in order to permit the identification for sure.

## 4. CONCLUSION

All along this article we have tried to detail our methodological study in order to adjust a classification of video games. This experimental approach has done encouraging and coherent results particularly with the discovery of the metabricks "DRIVER", "KILLER", "GOOD" and "BRAIN" and the 4 rules in association to them. Our study requires nevertheless a refinement concerning the definitions of our game bricks. Some bricks still have too large

definitions, like the "Answer" brick. We thus consider a second version of our tool V.E.Ga.S.

First the quantity of games to index must be larger to permit us maybe to discover or to confirm the existence of new metabricks. But we also must be able to obtain more formal results and evaluate our subjective part when indexing games. How are we going to proceed? There are two ways of strategy to be followed at the same time. The first one concerns the "quantity" and the second concerns the "quality".

Concerning the aspect of "quantity" we want to open V.E.Ga.S. and to request a contribution within the same logic as "Wikipedia.org". The very idea is that a lot of persons could index identical games. In that way, we could make an average of the bricks being checked off for every title and then deduct a level of reliability.

Concerning the aspect of "quality", the idea is to reduce in the definition of game bricks a big part of " subjectivity". In order to help us, we will base our research on the studies of Raph Koster and also Stéphane Bura<sup>13</sup> who at present are finalizing a grammar of gameplay and a formal manner to represent it.

V.E.Ga.S. is accessible on the following address:

<http://www.bigarobas.com/ludovia/vegas/>

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