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CREATION OF A PROCEDURAL NARRATIVE WITHIN THE FICTIONAL UNIVERSE OF DC COMICS

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Abstract: The generation of narratives from procedural methods is one of the paradigms present in digital media in our contemporaneity. In the present work, superhero narratives were analyzed and mapped, in order to create a procedural method that can autonomously generate a narrative within the fictional universe of *DC Comics* from the 1980s, present in comics and RPG books by Mayfair Games publisher. Based on the work of the narrative structuralist Vladimir Proop, a set of parameters was created for the composition of a procedural function for the definition of narratives within the aforementioned universe. To validate the method, a narrative was generated that was tested with representational game mechanics. The results of the experiment carried out showed the potential of the method, which can be used in other scenarios and with other databases to generate narratives.

Keywords: Narrative, Procedural Narrative, DC Universe.

INTRODUCTION

Narrative is an important factor in the development of human society. It emerged in the dawn of humanity and enables the transmission of knowledge, information, values and culture. Throughout its history, human beings sought a way to visualize and give life to their imagination, to see it happening, whether in the form of paintings, sculptures or literature. The human desire to represent and interpret their own perception, their view of the world, has driven art for centuries.

To understand the vast narratives and the structures they can assume, it is necessary to remember that there are many narratives that are part of our culture. Barthes (1971) cites that narrative is present, for example, "in myth, legend, fable, tale, novel, [...]". Narrative is, therefore, an integrated part of human culture, the two walk together and develop mutually.

For a long time, folklorists were faced with the fact of the similarity between the narrative schemes of the most diverse peoples, among whom one would hardly find traces of contact.

In ''Morfologia do Conto Maravilhoso'' (1928) work of Russian folklorist V.L. Proop constituted an Author's quest to analyze Russian fairy tales from a structural point of view. Propp (2006, p. 25) carried out his study based on a corpus composed of 100 narratives: tales 50-151 from the collection Russian fairy tales (1855-1863) published by Aleksandr Afanassiev (1826-1871) in 8 volumes with a total of 600 tales. Building on the work of other Authors such as Afanassiev, Wunt, Volkov, Aarne, Vesseolovsky and J. Bédier, Proop explored the motives of the analyzed plots and defined functions and their relationships for the linear narrative construction.

By function is understood the procedure of a character, defined from the point of view of its importance for the development of the action. The main conclusions he reached about roles were as follows:

- the functions of the characters are the fundamental elements of the wonderful tale;
- there are 31 functions, which do not necessarily appear in all tales;
- the order of functions is fixed;
- from the point of view of their construction, the stories follow the same model.

The character functions proposed by Proop are limited in relation to the narrative flow, as they were defined according to the narratives analyzed by the Author. Anyway, the notation used to present the function shows a way of defining the narrative flow that can be used to define computationally

programmable narratives. It is important to point out that Proop functions define the narrative flow, but they need characters and scenarios and the relationships between them to build a complete narrative.

In *Hamlet no Holodeck*, Janet Murray (2003) presents the four aspects that, according to her, define the digital environment. They are, the (1) participatory aspect, which refers to the possibility of interaction with the user, the (2) spatial aspect, which relates to the "navigable" character of the numerical content, the (3) encyclopedic, which deals with the practically unlimited storage and access to information in the digital medium and (4) the procedural aspect, which is the ability of the numerical medium to execute instructions autonomously.

Janet shows that this fourth aspect – procedurality – would be the main characteristic of digital media, fundamentally distinguishing them from other media:

> "*The most important element that the new medium adds to our repertoire of representational capabilities is its [procedural] nature, its ability to capture experiences as the systems of interrelated actions.*"

(MURRAY, 2003, p. 256).

The purpose of this article is to rescue the notation of the functions present in Proop's work, and apply them according to the narratives present in a given fictional universe, making them more specific structures and with subdivisions of functions. This procedure aims to create an algorithm that can create a feasible narrative in the chosen fictional universe. The universe chosen for

this work is the universe of *DC Comics[1]*, more specifically the canon universe published by the publisher between 1986 and 1989. As a database on events, characters, locations and technologies within the fictional universe, RPG books from the Publisher were used: *Mayfair Games[2]*, whose list appears in the bibliography of this work.

The use of algorithms to generate elements (whether these are any parts in the composition of a larger whole) in a combinatorial way is already common in electronic games, but their use in narratives is, in a certain way, emergent. In this case, we have a procedural narrative, where algorithms dictate the composition of elements contained in a previously delimited database to coherently compose a narrative (MATEASS & STERN, 2003). The quality of narratives generated by procedural methods has been the subject of some studies, as mentioned below.:

> "*Procedural Narrative Generation refers to the process of dynamically creating stories without, or in a reduced way, the need for a human Author. The ideal system would aim to provide an infinite set of interesting and diverse narratives at no cost to the system user. Developing systems like the one above, however, tends to be complex and costly, and often leads to narratives that are simple and of low quality.*"

(KYBARTAS & VERBRUGEE, 2014).

The structure chosen as the basis for the narrative proposal described was based on the mapping of narratives within the universe of superheroes, prepared by Neto [3] *et al* (1996), combined with a database published

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1. DC Comics is an American publisher of comics and related media, being considered one of the largest companies, linked to this branch in the world. The company is a subsidiary of Time Warner and owns the intellectual property of many of the country's most famous comic book characters, such as Batman, Superman and Wonder Woman. <http://www.dccomics.com/>.
2. Mayfair Games Inc. was a company in the *Role Playing Games* branch, which edited a series of books with the history of the DC Comics universe, atlas, list of characters according to its own rules system.
3. Aquiles Jorge Neto is the author of RPG books, and in the 1st RPG Workshop of SESC São Carlos in 1996, he wrote an article about the creation of narratives within the superhero universe, based on the universes of DC Comics, Marvel Comics and Image comics.

by *Mayfair Games*. The basis for creating the procedural structure has a theoretical scope following similarities with the functions defined by Propp in: ''*A Morfologia do Conto Maravilhoso*'', but includes characters and scenarios within the proposed functions.

WORLDNESS

What is interesting for this study in rescuing Proop's work is that it allows using a more specific structure of the functions' subdivisions. To create a procedural narrative within the *DC Comics* superhero universe, a macro structure with subdivisions will be used, with which we can build a more specific narrative for each theme, taking into consideration, what Proop defines as plots in contrast to the narrative functions. For this, it will be necessary to map the chosen fictional universe.

Lisbeth Klastrup and Susana Tosca (2004), known for their research on transmedia worlds, propose this classification to define what makes a fictional world a feasible world for its interactors, which they called *worldness*, composed of three aspects.

The **mythos** classifies the establishment of conflicts and battles in the world, as well as the presentation of typical characters. In this item are also included legends about objects and creatures characteristic only of that universe - it can be said that the "mythos" is the story behind all stories. A knowledge necessary to be able to interact with or interpret later events.

Topos classifies the establishment of the world in a specific historical period, its peoples and customs and details of space and geography, as a futuristic and technological world set on a desert planet; a medieval world with fantasy elements with a wild nature inhabited by raging beasts; or a criminal world hidden in the underworld within a huge diatopic urban environment where people use laser guns, etc.

The *ethos* classifies the ethics and morals of the world. How good and evil behave, for example, and what kind of behavior can be accepted as characteristic of this universe or not.

Mythos and *ethos* will help to recognize the recurring functions of the plot while topos will define the characters and places and this needs to be mapped punctually, generating a database with the main characters and places and later assigning the sphere of action. of characters and places.

With the main places, characters and stories of the plot mapped, the subdivisions of the functions can be assembled.

THE WORLDNESS OF THE DC COMICS UNIVERSE BETWEEN 1986 AND 1989

The fictional universe of DC Comics began in 1939, when its topos complements our reality with the first fictional city, Metropolis.[4], and the first inhabited planet outside Earth, Krypton [5], both linked to Superman comics[6]. In the 1940s, dozens of new fictional cities

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4. Action Comics Magazine #16 (September 1939). Metropolis is represented as the largest and most important city in the United States, located on the East Coast of that country.

5. Kal-El Magazine #1 (Summer 1939). Krypton, is portrayed as a planet of ancient civilization, of advanced technology, which became extinct due to its star having reached the level of "red giant". ".

6. Action Comics Magazine #1 (June 1938). Superman is a superhero created by comic book author duo Joe Shuster and Jerry Siegel. The character was born on the fictional planet of Krypton and was named Kal-El. He was sent to Earth by his father, Jor-El, a scientist, moments before the planet exploded. The rocket landed on Earth in the city of Smallville (translated in Brazil as Pequenópolis), where young Kal-El was discovered by the farming couple Jonathan and Martha Kent. As he grew up, he discovered that he had different abilities than humans, such as invulnerability, super strength and flight. When not in the traditional blue and red uniform, he lives as Clark Kent, a professional reporter at the Daily Planet in Metropolis.

emerged, such as Gotham City[7] and Keystone City[8] – linked to heroes:Batman[9] and Flash[10], being initially located in North American territory.

In the 1950s, fictional cities began to emerge outside the North American territory, such as Gorilla City. [11], located in some secret spot in the Congo forests, home to the villainous Gorilla Grodd [12]. Outside of planet Earth, many other planets also emerged in the 1960s, such as Planet Oa. [13], center of the universe and inhabited by the beings known as the Guardians of the Universe [14] Green Lantern Masters [15].

To add to the complexity of this scenario, the concept of multiple parallel dimensions appears in the 1960s in history: *Flash of Two Worlds*[16] where Flash (Barry Allen) meets his 1940s predecessor Jay Garrick (known in Brazil as Joel Ciclone). The parallel earths existed in the same space and at the same time (space-time), being separated only by the different molecular vibrations.

The solution of multiple parallel dimensions suited the heroes that emerged in the 1930s and 1940s (Golden Age), which somehow aged over time, and were re-released in the updated 1950s (Silver Age). Within the DC Universe, Earth 1 would be home to the Silver Age heroes, the aging Golden Age heroes would inhabit Earth 2, as well as other realities such as Earth 3, Terra Prime, and Terra S. Dimensional plurality began to cause a lot of confusion for readers, which led to an event known as Crisis on Infinite Earths.

The event was published as a series of comic books in twelve issues in 1986. It was characterized as an epic saga in the fictional universe of DC Comics and reached the most important characters published by it. The work was written by Marv Wolfman and drawn by George Perez. The series' title was inspired by previous crossover stories involving the Parallel Earths of the Multiverse, such as "Crisis on Earth Two"

7. Batman Magazine #4 (Winter 1940). Gotham City is represented as a large North American city where there are high levels of crime and corruption located in the state of New Jersey.

8. Flash Comics Magazine #1 (January 1940). Keystone City is represented as a North American city located in the state of Pennsylvania.

9. Detective Comics Magazine #27 (May 1939). Batman is a superhero created by writer Bill Finger and artist Bob Kane. His secret identity is Bruce Wayne, an American billionaire, playboy, business mogul, philanthropist and owner of the Wayne Enterprises corporation. After witnessing the murder of his parents as a child, Wayne swore revenge on criminals, an oath tempered by a sense of justice. Wayne then trains himself, both physically and intellectually, and creates a bat-inspired character to fight crime.

10. Flash Comics Magazine #1 (January 1940). The Flash is a superhero created by writer Gardner Fox and artist Harry Lampert. Nicknamed the scarlet speedster, the Flash possesses "super-speed", can move at superhuman speed, including the ability to run and move extremely fast, use superhuman reflexes, and violate certain laws of physics. even exceed the speed of light.

11. The Flash Magazine #106 (May 1959). Gorilla City is a hidden city in the wilds of Africa, home to a race of super smart gorillas.

12.The Flash Magazine #106 (May 1959). The character was created by John Broome and Carmine Infantino, and is an evil, super-intelligent gorilla who gained mental powers after being exposed to radiation from a meteorite.

13. Green Lantern Magazine vol 2 #1 (August 1960). One of the oldest planets in the universe, located at its center. Oa serves as home and headquarters for a race of powerful humanoids who called themselves guardians of the universe.

14.Green Lantern Magazine vol 2 #1 (August 1960). The Guardians of the Universe were created by John Broome and Gil Kane, and are immortal founding characters and leaders of the Green Lantern Corps, which they run from their homeland Oa at the center of the universe. They have an elderly, small, blue-skinned appearance with large heads and white hair.

15. All-American Comics #16 (July 1940). The Green Lanterns are superheroes who possess a ring of green with special powers, which gives them great control over the physical world. The ring was considered the most powerful weapon in the galaxy, creating complex plasma objects according to the mind of its wielder, limited only by two things: the Green Lantern's willpower and the color yellow, where the ring has no effect whatsoever (problem caused by an impurity in the original source that generated the rings).

16. Magazine: The Flash #123 (Setembro de 1961).

and "Crisis on Earth Three".

In the context of the setting in which it is inserted, the story was of fundamental importance for the publisher, as it would have eliminated the concept of the Multiverse, which was based on creating Parallel Earths with different heroes or alternative versions of the publisher's famous heroes. The events reverberated simultaneously in all of the publisher's superhero magazines at the time. This type of event was repeated by DC in other later opportunities, such as in the Legends series and the Millennium saga.'

Between 1986 and 1990, RPG publisher *Mayfair Games* compiled the topos, *ethos* and *mythos* of the post-Crisis DC universe into a series of books, which are listed in the bibliography of this article. These books were linked to a system of rules developed by the publisher aimed at the universe of superheroes, which parameterized the powers, alien races, magical beings and technologies present in the scenario. Two books that stand out are listed below:

- *The Atlas of the DC Universe* (KUPPERBERG, 1990): presents a comprehensive guide to the organizations and locations that make up the DC Comics universe. The Atlas provides maps and history of the cities of the United States, the countries of the Earth, planets, and the dimensions that make up the multiverse, being of fundamental importance to delimit the tops of this universe;
- *Who's Who in the DC Universe* (WEBSTER, 1992a) (WEBSTER, 1992b) (NYSTUL *et al.*, 1992): in three volumes, it presents a complete guide to the characters, alien races and technologies of the DC Comics universe,

being fundamental for the mapping of the *ethos* and part of the *mythos* of that universe.

In addition to the books mentioned, it is important to note that specific books by groups (such as Justice League, New Titans and Suicide Squad) and organizations (such as HIVE) were important in mapping the *worldness* of the analyzed scenario.

PROCEDURAL NARRATIVE

The mapping of DC narratives and the database generated by this process create the possibility of numerous arrangements in its elements for the creation of events, narratives and even new elements. Taking advantage of the potential size, the creation of algorithmic combinations within the proposed field presented a viable alternative.

The procedural creation of elements is already a reality in the field of electronic games and has been used to create the most varied parts of the final product. Its broad concept is made explicit in "Procedural Content Generation (PCG) in games refers to the creation of game content automatically using algorithms." TOGELIUS et. al, <2011>[17].

More specifically, content creation in a procedural way is defined as follows:

> "We can therefore tentatively redefine PCG as the algorithmical creation of game content with limited or indirect user input. Note that this definition does not contain the words "random" and "adaptive", as PCG methods could be both, either or none." TOGELIUS et. al, <2011>[18]

In the case of visual, sound, mechanical or even low-impact narrative elements, this procedure boils down to algorithms applicable in a system in which the interference of the Author and the receiver is presented in a

17. " Procedural content generation (PCG) in games refers to the creation of game content automatically using algorithms.
18. "We can therefore experimentally redefine PCG as the algorithmic creation of game content, with limited or indirect user participation. Note that this definition does not contain the words "random" and "adaptive", as PCG methods could be both one or neither".

superficial way. However, in the field of generating narratives in a procedural way, the case presents itself differently.

> "Within the domain of story, the concept of procedural narrative is one that is often discussed. *Façade*, a game by Michael Mateas, is an interactive story that attempts "procedural authorship" (2003). It uses player input (typing responses to character prompts) to determine story "beats," the small sub-plots in the overarching narrative. Within each beat the characters react to the player's input and transition to the next beat. Each beat is only a few seconds long, facilitating intermixing of beat and allowing more divergent paths. New beats are chosen based off of the player's input or lack of input. In *Façade*, the player can not only play through a different experience in two consecutive play sessions, but is entertained with a system that directly reacts to his choices in the game (Mateas & Stern, 2003)." FORT, Travis L.,2005 [19]

Thus, it becomes essential to adapt and adapt viable forms of the elements presented above for the creation of a model where their combinations create narratives coherent to the mapped world.

CREATION OF THE PROCEDURAL STRUCTURE

With the objective of creating a narrative structure that could be generated in a procedural way, it was necessary to meet two main points, the development of the mechanism capable of generating this narrative and the construction of a database capable of feeding this structure.

In the first sections we present the theoretical materials that served as a basis for the development of the proposed procedural structure, and in this section the ways in which these materials were applied and what were the results obtained will be presented, presenting in detail the structure and functioning of the mechanism. developed.

A meticulous choice of what kind of narratives would be generated was necessary, given the materials we had available, we chose to generate superhero narratives based on the DC universe. We had access to the *Mayfair* books on the DC narrative universe that was chosen, for the amount and detail of the information that could compose our database, and for the construction of the procedural structure we counted on the work of NETO et al., 1996, in a discussion about the characteristics of the superhero universe as support for the creation of narratives suitable for RPG.

According to Neto, different comic book series each have a different focus and objectives. In order to classify them better, he grouped the main themes in his work and defined them as "genres", and within the genres he separated some characteristic elements that are repeated and defined as "characteristics". Table 1 shows the genres, while Table 2 presents the characteristics of these genres, according to Neto's classification.

Based on the structures proposed by Neto (1996), it was possible to define important characteristics for the composition of the *mythos* and *ethos* of the chosen fictional universe, since the Author proposes which "characteristics" are related to each "plot", these relationships are presented in Table 3.

After having defined the guidelines necessary to generate a narrative set in the

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19. Within the field of storytelling, the concept of procedural storytelling is often discussed. Façade, a game by Michael Mateas, is an interactive story that attempts "procedural authorship" (2003). He uses inputs (typing responses to character) to determine narrative "beats", the small sub-plots in the overarching narrative. Within each beat, characters react to player input and transition to the next beat. Each "beat" is only a few seconds long, facilitating the mixing of the "beats" and allowing for more divergent paths. New beats are chosen based on player input or lack of input. In Façade, the player can not only play through different experiences in two consecutive game sessions, but enjoy a system that reacts directly to their in-game choices. our translation.

Secret wars	The characters are fighting an enemy or a situation that the majority of the population is unaware of, or does not understand. They operate outside the law and can be pursued by the police. Characters cannot wait for any recognition or reward. In this type of campaign, the characters alternate hunting and hunting conditions.
Watchmen	In this genre, the characters are together to fight an opposing force, performing rescues and rescues.
Emergency / Search	The characters form a team that is hastily assembled to face a common enemy, or solve an emergency. They have to deal with the difficulties of their mission and against their own personal differences.
Attack Team	The characters form an elite unit in the service of others (they can be government agents or mercenaries), their missions are against specific targets. The characters don't have much freedom of action, their basic function is enter-knock-exit.
Resistance	The characters are in a place dominated by some tyrannical force, they use their abilities to try to depose the government, which in turn tries to exterminate them. The population may or may not support them, think of your group as being super guerrillas (like the French resistance in WW2).
Explorers	There is a region to be explored, out of obligation or due to some kind of shipwreck, this is the characters' mission. Each adventure presents a setting, and the characters are travelers being greeted sometimes with friendship and sometimes with distrust and hatred. Each change of scenery implies a completely new situation.

Table 1 - Superhero Narrative Genres.

Source: (NETO *et al.*, 1996).

Superior Opposition	Antagonists are more powerful, or more numerous, have more resources, and may be rulers of some area or part of powerful institutions.
Archvillain	The main antagonist is not within direct reach, either because he has an unknown identity, there is no evidence to arrest him or he is above the law in some way.
Wanted	The characters are wanted by some security forces, and they find themselves in a situation where they can't get outside help.
Obey orders	Somehow the characters are committed to some individual or organization, having to obey higher orders.
Investigation	The characters need to accumulate information and at least some of that information is not easily accessible, or perhaps some rival is competing with the characters turning the investigation into a race.
Code of honor	Characters are bound by a sort of code of honor or a vow, which limits your actions. Usually something that forces them to follow the classic superhero pattern: protect the innocent, uphold the law, follow the justice system, not kill and defend the world from any internal or external enemies.
Hidden enemy	The enemy does not come forward openly, he focuses on planning, lurking, until he finds the right moment to act and maybe even tries to infiltrate a traitor among the characters.
Internal Conflicts	The characters, or at least some of them, can't stand each other. Differences in ideologies, methods, beliefs, etc.; turns the group into a powder keg. This is not to say that the characters hate each other, just that they prefer to work with others; but something very important forces them to swallow their colleagues.
Running against time	The characters have to fulfill a task, and time is against them and the delay can have drastic consequences.
Enemy of my Enemies	There are other forces in the game besides the characters and their antagonists. These forces are neither allies nor enemies of the characters but can help or attack them according to the situation.
Secret Identities	Characters have to hide their identities for one reason or another (the most common reasons are to protect their families from retaliation).

Table 2 - Characteristics of Superhero Narrative Genres.

Source: (NETO *et al.*, 1996).

Table 3 - Genres and their Characteristics in Superheroes Narratives.

Source: Author.

universe of superheroes, there were still the necessary elements to feed it randomly to create narratives in a procedural way, so a systematic survey of Mayfair Games materials was carried out in order to catalog this information. and create a database capable of filling in the "characteristics" pointed out in Neto's plots, with that the following tables were generated.

In addition to the characteristics of the Plots, it was necessary to catalog the possible heroes or anti-heroes that would be interpreted by the players, the criterion for choosing these characters, unlike the other elements cataloged for the *topos*, was not taken from the books, but from the cards created by *Mayfair*, used to support books.

The letters quickly and briefly describe some of the most iconic characters in this universe as in figure 1, bringing the mechanical definitions of each character necessary for an RPG game, thus leaving the books as material for deepening, bringing more complete narrative elements for consultation. when necessary. The use of the cards also guided the choice of possible initial situations that will be seen below.

We selected for players to interpret as their game characters only those who made up the same teams of heroes or anti-heroes, thinking again about the issues of narrative coherence so that when generating the narrative, the player characters were part of the same team.

Having the worldness defined and cataloged in the form of a database, it was possible to structure the Proop functions in order to fit the functions to the "Storylines" and "Characteristics" of the proposed universe, some more generic functions such as **I**: brand (experience), **J**: victory, **K**: damage repair were kept in their original form, while other functions were adapted to reflect our

Earth
Atlantis
Antarctica - Continent - Fortress of Solitude

North America
- Canada
- U.S
  • Belle Reve Prison
  • the Coast City
  • o Gotham City (City, Arkhan Asylum, Batcave)
  • the Metropolis (City, Cadmus, Lexcorp)
  • o Smallville (City, Kent-owned)
  • The new york

Mexico
South America - Argentina - Brazil - Colombia
Central America - Devil's Island
Africa - South Africa - BialyaGorilla City - Qurac
Europe - Germany - Austenburg - France - Great Britain - Markovia - Modora - Vlatava - Zandia
Asia - China - Japan - India - Tibet - Soviet Union - Moscou - St. petesburg
Intergalactic Worlds
- The Citadel - Daxam - Korugar - Thanagar - Tamaran
Extra-Planar Worlds
- Apokolips - Azarath - Hell - Dimension of Dreams - New Genesis - Phantom zone - "Pocket" Dimension

Table 4 - Locations in the DC Universe.

Source: Authors.

	Character	Places	Enemies
1	Black adam	*New York*	Captain Marvel, Justice League
2	Ares	*Earth*	Wonder Woman
3	Blackfire	*Thamaran*	New Titans
4	Brainiac	*Intergalactic Worlds*	Green Lanterns, Justice League
5	Joker	*gotham city*	Batman
6	Darkseid	*Apokolips*	Green Lanterns, Justice League, Teen Titans, Superman
7	Despair	*Intergalactic Worlds*	Green Lanterns, Justice League
8	Exterminator	*Earth*	New Titans
9	Gorilla Grood	*Gorilla City*	Justice League
10	Lex Luthor	*metropolis*	Justice League, Superman
11	Ocean master	*atlantis*	Aquaman, Justice League
12	Ra's Al Ghul	*Earth*	Batman
13	Sinestro	*Intergalactic Worlds*	Green Lanterns, Justice League
14	Starro	*Intergalactic Worlds*	Green Lanterns, Justice League
15	The Brain	*Earth*	New Titans
16	Vandal Savage	*Earth*	Justice League

Table 5- Archvillains.

Source: Authors.

	Character	Places	Enemies
1	Rock block	Earth	Justice League
2	Silver banshee	Great Britain	Justice League
3	Captain Cold	Earth	Flash, Justice League
4	clay face	gotham city	Batman, Justice League, Superman
5	Chronos	Earth	Justice League
6	Mad Hatter	gotham city	Batman, Justice League
7	Charade	Gotham City	Batman, Justice League
8	Joker	Gotham City	Batman, Justice League
9	Two face	gotham city	Batman, Justice League
10	Straw man	gotham city	Batman, Justice League
11	Exterminator	Earth	Justice League, Teen Titans
12	Reverse flash	Earth	Flash, Justice League
13	Poison ivy	gotham city	Batman, Justice League
14	Lex Luthor	metropolis	Justice League, Superman
15	Wolf	Intergalactic Worlds/Earth	Justice League
16	Khan manga	Intergalactic Worlds	Green Lanterns, Justice League
17	Major Force	Earth	Captain Atom, Justice League

18	Toy Master	metropolis	Justice League, Superman
19	metallo	metropolis	Justice League, Superman
20	Parasite	Earth	Justice League, Superman
21	Penguin	gotham city	Batman, Justice League
22	Sollomon Grundy	Earth	Justice League, Teen Titans
23	black streak	Atlantis	Aquaman, Justice League
24	King Kobra	Earth	Batman, Justice League, Robin
25	star sapphire	Intergalactic Worlds	Green Lanterns, Justice League
26	Vandal Savage	Earth	Justice League

Table 6 - Villains of the DC Universe.

Source: Authors.

1	Ajax the Martian
2	Aquaman
3	Batman
4	Cyborg
5	deadman
6	Spectrum
7	Guardians of Oa
8	Jason Blood/Etrigan
9	John Constantine
10	Metron
11	Oracle
12	Doctor Fate
13	Superman
14	Phantom Stranger
15	Zatara

Table 7 - DC Universe Mentors.

Source: Authors.

1.	Government
2.	Secret Society a. The. blood brotherhood b. League of Assassins c. black circle d. Conglomerate e. Hive f. Sentinels of Magic
3.	Corporations a. STAR Labs b. Cadmus project c. Lex Corp d. Wayne Industries
4.	Opposing League a. Suicide squad b. brotherhood of evil c. evil legion

5.	Intergalactic force
	a. Female Furies
	b. Cosmic Hunters
	c. dominions
	d. khundios
	e. Daxamites
	f. DurlaniansLanternas Verdes
6.	Magic Force
	a. kings of hell
	b. trigon
	c. Sentinels of Magic
	d. Swamp monster
	e. and. DeathSandman
	f. Mxyxplk

Table 8 - Superior Opposition in the DC Universe.

Source: Authors.

1.	Oath of Vengeance
2.	Code of Conduct
	a. League Statute
	b. Suicide Squad directives
	c. Statute of the New Titans
3.	Oath of Valor

Table 9- DC Universe Characters' Code of Honor.

Source: Authors.

1.	Green Lanterns
2.	Justice League
3.	New Titans

Table 10 - Group of Heroes of the DC Universe.

Source: Authors.

1.	Suicide Squad
2.	Brotherhood of Evil
3.	Legion of Doom

Table 11 - DC Universe Villain Group.

Source: Authors.

1.	Unite clues to identify opposing force
2.	Inhibit terrorist action
3.	Join clues to identify plan
4.	Join objects to solve problem
5.	Find lost character
6.	Find lost object.

Table 12 - Investigation.
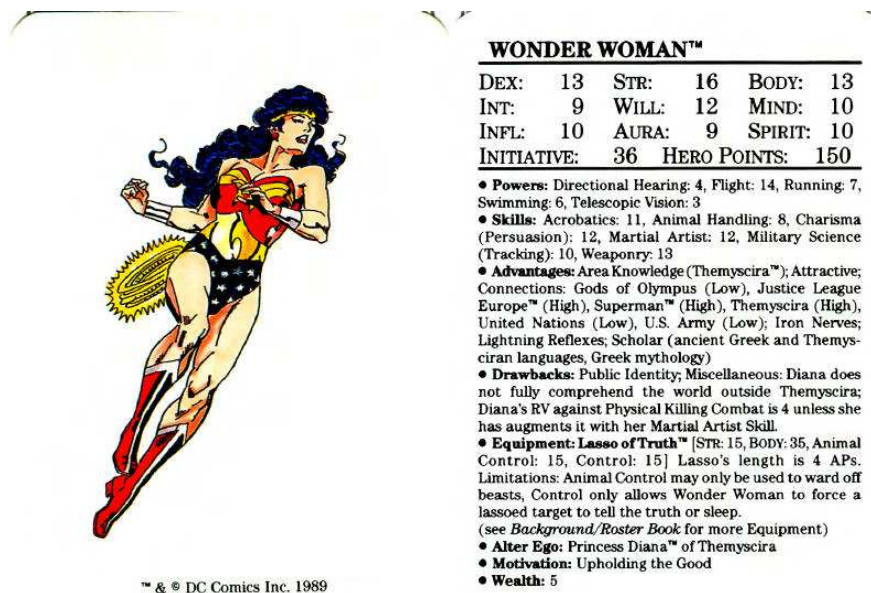
Source: Authors.

Figure 1: Wonder Woman. Source: <http://new-wonder-woman.blogspot.com.br>.

objective, for example, Initial situation (α): (**α**1 Justice League **§ (A,B) § (tops), α**2 Titans **§ (A,B) § (tops), α**3 Suicide Squad **§ (A,B) § (tops**⁾**).**

Following are the functions generated for the project:

Plot/Theme: DC Comics Superheroes

Initial situation (α)
    α1 Justice League **§ (A,B) § (tops)**
    α2 Titans **§ (A,B) § (tops**⁾
    α3 Suicide Squad **§ (A,B) § (tops)**

A: *damage/deficiency*
    A¹ secret wars § $^{(D1,D3,D4,D8,D9,H1,H2)}$ § (↑²,↑³)
    A² watchmen § $^{(D2,D3,D4,D5,D7,D9)}$ § (↑¹)
    A³ Emergency / Search § $^{(D3,D6,D7,D9,H2)}$ § (↑¹,↑²,↑³)
    A⁴ Attack Team § $^{(D2,D4,D6)}$ § (↑¹,↑²,↑³)
    A⁵ Resistance § $^{(D1,D3,D6,D8,H1,H2)}$ § (↑¹,↑²,↑³)
    A⁶ explorers § $^{(D1,D3,D4,D7,H2)}$ § (↑²,↑³)

B: *mediation, moment of connection (Mentor)* § $^{(tops)}$

C: *start of reaction (game start)*
↑ **:** *hero's departure* § $^{(tops)}$
    ↑¹ Earth
    ↑² Galactic
    ↑³ extra planar

D: test (donor submits hero to test)
    D¹ Wanted § $^{(H1)}$
    D² obey orders
    D³ Investigation § $^{(F1,F2,F3,F4,F5,F6)}$
    D⁴ code of honor § $^{(F7,F8,F9)}$
    D⁵ hidden enemy § $^{(H2)}$
    D⁶ internal conflicts
    D⁷ Running against time
    D⁸ Enemy of my enemies
    D⁹ Secret identities

E: *reaction (narrative development)*

F: *object/goal transmission*
    F¹ To join clues to identify opposing

force § [H1,H2]

F² To inhibit terrorist action
F³ To join clues to identify plan § [H1,H2]
F⁴ To join objects to solve problem
F⁵ To find lost character
F⁶ To find lost object
F⁷ Oath of Vengeance
F⁸ Code of conduct
F⁹ Oath of Valor

H: *Fight against evildoer*
H¹ Superior opposition § [topos]
H² Archvillain § [topos]

I: *mark* (experience)
J: *victort*
K: *damage repair*

Optional
↓ : *return*
Pr: *persecution*
M: *hard task*
W: *reward*

It is important to demarcate the §: connections (action that interconnects two other functions), which link each function to maintain the coherence of the narrative line, some sub-functions may exclude or enable other functions and subdivisions in their sequence. With all the sub-functions and connections defined, it is then possible to generate a procedural narrative line to be followed as a narrative within the analyzed universe. In the following chapter we will show an experience with a narrative generated through the proposed model.

PROCEDURAL EXPERIMENT PERFORMED

To choose the protagonists of the narrative, the set of cards previously presented in the material of the second edition of the RPG DC *Heroes* by *Mayfair* Games was used, these were shuffled and drawn, and the following heroes were chosen: Aquaman, Black Canary, Flash, Ice and Wonder Woman.

After that, the dice rolls were made to randomly define the "Plot" that would be used, and the specifics of its "Characteristics", the generated narrative is detailed in Table 13 in textual form and in Table 14 as a formula.

To apply the proposed model, tables created from the mapping described above were used. Such tables presented results for rolling N-sided dice, where the result presented at random would be used to compose the narrative using the structural base already delimited. Possible inconsistencies/ inconsistencies regarding *worldness* were eliminated in previous applications to better define the proposal.

Each element of the table was associated with a probability of occurrence in the procedural narrative. This table is available in the file <http://200.136.243.12/ narrativaprocedural/Topos_UniversoDC. pdf>, the percentages from 1 to 56% were defined, for example, from the scroll of two dice, the first being six-sided for ten and the second being ten-sided for unity, in order to reach 56%. The results found were the values 2 and 1, respectively, which resulted in the value 21, which indicated that the narrative takes place in South America, more specifically in Argentina.

The first roll was related to the choice of the "Genre" of the narrative, given by Table 3 and by function A of the proposed structure based on Propp. Having six possible plots, a 6-sided dice (1D6) was rolled for this choice, obtaining a 5, which culminated in the plot choice: **Resistence**. Subsequently, each characteristic was chosen with subsequent rolls of the dice. The *ethos* and *mythos* are available in two documents, available at <http://200.136.243.12/narrativaprocedural/ Ethos_UniversoDC.pdf> and

Plot: Resistence
Characteristics: Superior Opposition: Hive (HIVE) Archvillain: Ocean Master Wanted: Beehive Investigation: Find lost object Internal Conflicts: Canary and Ice Enemies of My Enemies: Aquaman

Table 13- Plot and its Characteristics in the Procedurally Generated Narrative.

Source: Authors.

α^1 $\underline{A^5}$ $\underline{B}$ $\underline{C}$ ↑^{1} { $\underline{D^1}\underline{E}$} $\underline{H^1}$ $\underline{H^2}$ $\underline{I}$ $\underline{J}$ $\qquad$ {$\underline{D^3}$ $\underline{F^6}$} $\qquad$ {$\underline{D^6}$} $\qquad$ {$\underline{D^8}$}

Table 14- Procedurally Generated Narrative Formula.

Source: Authors.

<http://200.136 .243.12/narrativaprocedural/ Ethos_e_Mythos_UniversoDC.pdf>. rolls are performed to choose the plot and its characteristics, the topos and characters of the narrative, is available at <http://200.136.243.12/narrativaprocedural/ aplicacao_proposta.mp4>.

From then on, a narrative was applied in an RPG game with the students of the discipline, Virtual Interactive Narratives, linked to the Graduate Program in Image and Sound at UFSCar.

The generated narrative took place in Argentina, the Justice League received a distress call coming from a small coastal village, investigating the group of players discovered a Hive base of operations in the place that tried to prevent the activities of the heroes, after defeating the agents. from the Hive the group discovered what was happening in the place and rescued some of the local heroes who had been kidnapped by the Ocean Master, who had joined forces with the Hive to execute a great evil plan and

the local heroes could stop him, however for him one of these heroes, El Gaucho (Figure 2) was not captured and managed to warn the League that he ended the villain's plans.

During the consultation of the material for the composition of the adventure, official DC heroes and villains from Argentina were used, as in figure 3, which demonstrates the importance of the consolidated database for a better use of the procedural mechanism, some of these characters had, in addition to descriptive material, also stat values for the *Mayfair* RPG system, which was very helpful for the experience.

After the activity, the students developed reports described from the point of view of their characters in the game. Activity reports were generated after the playful activity by players, and are available in the following files:
<http://200.136.217.194/narrativapro cedural/Relatorio_Aquaman.pdf>
<http://200.136.217.194/narrativapro cedural/Relatorio_MulherMaravilha.pdf>

Figure 2: El Gaucho Source: <http://pt-br.dc.wikia.com/wiki>.

Figure 3: Super Malon Source: <http://pt-br.dc.wikia.com/wiki>.

CONCLUSION

The components and possibilities of procedural narrative creation were presented in this study, using tools such as the randomness proposed by rolling the dice in combination with narrative structures such as Propp's. Its applicability becomes clear when achieving an interactive procedural narrative for a role-playing game (which in turn generates new narratives through the participants).

However, this is an initial model that still does not use the procedural power of the digital medium, its implementation combined with an extensive database referring to the universe in question, could open doors to countless possibilities. Complementing the database using an encyclopedic platform fed by fans of the universe could also bring an even greater flow of coherence to the narratives developed, in addition to enabling a bigger *feedback* by users. Within the application of the narrative generated as an RPG game, it was necessary for the game's narrator to fill in several narrative gaps, but the digital proposal can indicate a path to more complex constructions that take more advantage of the computational capabilities, starting from the analyzed narrative structures and consolidated by the referenced authors.

Thus, the use of a vast database combined with a human food system, if well implemented, could extrapolate the problem of simple or low quality narratives, as it would generate an endless number of variables for the possible plots and components presented in this study. Adding this potential to a program capable of calculating the proposed variables in real time, we would have a high quality platform capable of generating narratives in the proposed universe. Because using the means already described, it was possible to analyze the good correlation of the characteristics of the plot within the application carried out, its cohesion with the *worldness* of the DC Comics Universe and see how the structures fit together in a very complementary way.

The *worldness* served to build the proposal database, the *mythos* and *ethos* helped to map the functions and *topos* functioned as a database with information relating to places and characters to be placed within the functions while the narrative structure created the line to be followed by the story. This way, a procedural narrative macro structure was created based on the chosen fictional universe, capable of generating a narrative rich in interrelation and with high reusability value. Still in relation to this, the availability of information related to the mapping of the *worldness*, presents itself as a limiting factor to the narrative.

Such a proposal can be applied to other fictional universes, as long as a mapping of *worldness,* in addition to the possible plots within the chosen setting, providing that the universes are presented clearly and are mapping passive, thus generating components for the presented structure. We reaffirm here that the proposal of this study achieved what was expected, demonstrating a simple structure and easy implementation; also opening doors to a computational bias where its potential can be exploited in a more fruitful way to reach a more complex level and, in a way, with greater narrative quality.

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