

FRACTALS IN "ASSASSIN'S CREED"

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FRACTALS IN ASSASSIN'S CREED

Abstract

This essay explores the fractal narrative structure of the popular video game *Assassin's Creed* (2008). It theorizes a mode of fractal analysis of narration. It explores the existence of a political dimension to fractal aesthetics in *Assassin's Creed* in particular, which it claims is alert to important biopolitical insights concerning the situation of contemporary digital power. Drawing from Timothy Morton's analysis of hyperobjects, it argues that fractals pertain to vital contemporary political questions. Analysing Steven Shaviro's concept of modulation, the essay finds fractal analysis to be alert to contemporary questions of digital biopolitics. The essay claims that the fractal narrative structure of *Assassin's Creed* constitutes an innovative recognition of the biopolitics of video game playing.

Key words: fractals, narrative, video game, hyperobjects, digital power, modulation, biopolitics

Assassin's Creed is a popular action-adventure video game that was released in 2008 by the French publisher Ubisoft. It has since been adapted into a film starring Michael Fassbender and Marion Cotillard (Kurtzel 2016), as well as comics and novels, and has sold over 100 million copies worldwide. The game takes place in 2012, but centres on an ancient rivalry between two secret societies, the Assassins and the Templars. The premise of the game involves a virtual reality technology known as the Animus, which enables the game to frame its Crusade era narrative situation, and the rivalry between Assassins and Templars, as a digital virtual recreation. Created by mega-corporate conglomerate Abstergo Industries, which is secretly run by the modern day Templars, the Animus allows its users to re-live the experiences of their blood ancestors. The central protagonist of the game is Desmond Miles, a bartender from 2012 who is compelled to enter the Animus in order to relive the experiences of Altaïr, "an assassin during the time of the Crusades," who "belongs to a guild of assassins based

loosely on the Islamic hashshashin sect," and who is one of Miles's Assassin ancestors (Ruch 2008: 185). Abstergo's aim, in virtually recreating Altaïr's experiences, is to locate the ancient artefact known as the "Piece of Eden."

We claim in this essay that, not only does *Assassin's Creed's* self-conscious frame narrative involve a fractal structure with important political implications, but also that this identical fractal structure cyclically repeats itself, both as part of repetitive segments inherent to gameplay, and in the purely narrative elements themselves (contained in cutscenes). We claim these narrative elements to be both separate from and intertwined with the fractality of the gameplay – intertwined as they are cognizant of it, and separate as they are not interactive. We claim that every computer game involves some kind of a fractal structure just by the virtue of its media, but single out *Assassin's Creed* as an example of a game with a narrative both cognizant of its media's fractality (by repeating its patterns in non-interactive parts of the game, the cutscenes). We further suggest how the study of fractality in other media that use narration (text, film) might be a productive addition to critical method, paving the way for similar future inquiries.

Fractals are defined by their discoverer, Benoit Mandelbrot, as "geometric shapes that can be split into parts, each of which is (at least approximately) a reduced-size copy of the whole" (Horstemeyer 2012: 19–20). Other definitions are also in existence, many much more mathematical in nature¹ – however, the concept of self-similarity present on different scales seems to be agreed upon as the essential characteristic of a fractal, and will be used as such in this paper.

We argue that the scalar quality of fractals means that they are often political. A fractal pattern necessarily involves a replicating relation between scales. It is useful here to return to Louis Althusser's theory of "interpellation," by which Althusser theorizes the way subjects are made by social apparatuses (Althusser 1971). Interpellation theorizes how subjects are made as fractal replications of social norms. A web of disciplinary powers and organizations from the family to the police "hails" the subject, in Althusser's theory, forcing individuals to experience their obedience as a freely chosen aspect of their own person. This means, when used aesthetically, the scalar relations of fractals made into narrative structures often pertain to underworld assemblies of hidden or coercive power. Significantly, the methodology of Screen Theory developed by Colin McCabe, Stephen Heath and Laura Mulvey in 1980s used Althusser's theory to chart how the cinema spectator is interpellated to a subjective position by the screen images.

We locate interpellating political aspects in the video game's frame narrative, which are firmly tied to its fractal structure as the fractal structure's most visible, largest scale (taking the entirety of the game, from start to finish, to be visible). In *Assassin's Creed* there is self-conscious replication of the situation of digital gameplay, and the immersion of the player in the digital world with the narrative frame of Desmond Miles (the in-game game player), Abstergo and the in-game game console, the Animus, but also, on smaller fractal scales, it is replicated in narrative situations presented in cutscenes, and gameplay situations involving Altaïr's movement. Yet

1 Involving, for example, the "Hausdorff fractal dimension" (Mandelbrot 1983: 119) as a measure of fractality, also used by Efektari in his paper *Fractal Geometry of Literature*.

one must also recognize that videogames are unlike cinema in that they depend upon and demand "action" from the (human) gamer. For this reason, one might contrast Althusserian interpellation with Gilles Deleuze and Félix Guattari's concept "smooth space," which they directly link to Mandelbrot's fractal geometry: "Fractals are aggregates whose number of dimensions is fractional rather than whole, or else whole but with continuous variation in direction" (2005: 486). Fractals are smooth for Deleuze and Guattari because like rhizomes, they eschew vertical hierarchy. Like a rat pack or couchgrass, their growth or flow might be halted or severed at any point and yet continue to flourish in alternative directions. Counterpoised to the "striated" space of state power, smooth space involves a territory of the vector, the virtual, and the minor, such as the fenceless steppe forged by nomadic war machines:

a smooth, amorphous space of this kind is constituted by an accumulation of proximities, and each accumulation defines a zone of indiscernibility proper to "becoming" (more than a line and less than a surface; less than a volume and more than a surface) (Deleuze and Guattari 2005: 488).

Building from Deleuze and Guattari's claim that the game *Go* involves smooth space, Colin Cremin argues that videogamers creatively construct a smooth space in the action of gaming: "Play occurs in a smooth space between the striated lines of the game" (2016: 60). Opposed to interpellating models of state power, therefore, Deleuzoguattarian smooth space offers a vision of the fractal as a tool of liberatory becoming.

Usefully straddling these two extremes, Alexander Galloway has argued that videogames relate and repurpose in complex, creative and indirect ways to wider social forces, "Acts of configuration in video games express processes in culture that are large, unknown, dangerous, and painful, but they do not express them directly" (2006: 16). We find this "configuration" most accurately expressed in Steven Shaviro's concept of modulation, which we explore further below in relation to *Assassin's Creed*. As we argue, fractal aesthetics necessarily points to, or is implicated in, social power, while the making visible of fractal constructions can lead to new relations with smooth space. We claim in this essay that the game situation of *Assassin's Creed* constitutes an innovative fractal aesthetics, replicating and giving image to the digital interface at the level of narrative content (narrative), and demonstrating a link between the digital interface and social power. As we explore, this involves both a subversive politics of becoming alongside a biopolitical complicity with power in the game's aesthetics. In *Assassin's Creed*, the "medium is the message" to borrow Marshall McLuhan's influential aphorism, and both are fractals that replicate and recast the mediations of contemporary power.

1. Fractal aesthetics

Fractal geometry as a natural phenomenon was introduced and first described in Mandelbrot's *Fractal Geometry of Nature* in 1982, primarily as a "geometry of nature," of those "irregular and fragmented patterns around us" (Mandelbrot 1983²: 13). Despite the fact that there have been some recent attempts to describe certain

2 The quote is from the 1983 edition of the book, but Mandelbrot's discovery was made in 1982.

aspects of literary texts using the theory of fractals and statistics, the use of fractals in criticism, especially criticism of narrative texts and fictions, has not frequently taken questions of narrative complexity into consideration, nor recognized the political qualities of fractal aesthetics.

For example, in 2016, *The Guardian* reported of a statistical analysis carried out at the Institute of Nuclear Physics of the Polish Academy that "tested for revealing correlations in variations of sentence length, (which) proved to be governed by the dynamics of a cascade. This means that the construction of these books is in fact a fractal" (Flood 2016). Professor Stanisław Drożdż, a researcher at the Institute of Nuclear Physics of the Polish Academy has been quoted by *The Guardian* as stating that fractals:

...point to the hierarchical organization of phenomena and structures found in nature. So we can expect natural language, which represents a major evolutionary leap of the natural world, to show such correlations as well. Their existence in literary works, however, had not yet been convincingly documented. Meanwhile, it turned out that when you look at these works from the proper perspective, these correlations appear to be not only common, but in some works they take on a particularly sophisticated mathematical complexity (Flood 2016).

The research was conducted on canonical texts of world literature, including some canonical texts of English literature – such as Virginia Woolf's *The Waves* and James Joyce's *Finnegans Wake*.

The results of this study point to the way literary texts tend to have fractal organization on the level of sentence length. Even those texts that were written in the same language (for example, James Joyce's *Finnegans Wake* and Virginia Woolf's *The Waves*) have different graphs, that is, they show different fractal organizations, which arguably would not have happened if the researchers only discovered the fractal nature of language in general.

A similar research project was conducted by Ali Eftekhari at the Electrochemical Research Centre, in Tehran, Iran. He employed fractal geometry as "a modern mathematical approach and a new geometrical viewpoint on natural objects including both processes and structures... for (an) analysis of literature" (Eftekhari 2004: 1). For his corpus Eftekhari chose the works of William Shakespeare "as the most important items in western literature" (Eftekhari 2004: 1). He concluded that "by counting the number of letters applied in a manuscript, it [was] possible to study the whole manuscript statistically... It was demonstrated that there is a geometrical order in the structure of literature." He proposed a "novel method based on a basic assumption of fractal geometry... for the calculation of fractal dimensions of literature" (Eftekhari 2004: 1). As with the study conducted by the Institute of Nuclear Physics of the Polish Academy, Eftekhari focussed on easily quantifiable levels (sentences and letters) on which a quantitative analysis is possible.

In this essay, we examine the possibility of a fractal principle being identifiable not only on the easily quantifiable levels that can be investigated by statistical analysis, such as sentence length, but on the more complex and intangible level of narrative

construction, represented by what is usually termed as *narrative parallelisms*, *motifs*, *over-arching themes*, and similar terms. Even though, on some easily quantifiable levels, the fractal dimension of a structure can be determined by quantitative analysis and expressed by numbers, the principle of the fractal's expanding self-similarity is a relation of a structure to itself that can be arguably recognized without the need for any kind of quantitative analysis.

As results of repetition, or partial repetition, all parallelisms are arguably results of symmetry. Roman Jakobson thought many figures of speech (which, arguably, have been considered for much of history of literary criticism as that in the text which is literary and thus important, or especially imbued with meaning relevant to the analyst) to be just different forms of parallelism:

Poetic language consists of an elementary operation: the bringing together of two elements... The semantic variants of this operation are: parallelism, comparison (a particular instance of parallelism), metamorphosis (parallelism projected in time), metaphor (parallelism reduced to a point)... The euphonic variants of this process of juxtaposition are: rhyme, assonance, and alliteration (or repetition) (Jakobson 1973: 21).

Jakobson defines comparison, metamorphosis and metaphor all as functions of parallelism. This bears similarity with different functions of symmetry (i.e. reflection, rotation):

(...) symmetry is composed of two logically distinct components; invariance and transformation. To say that physical laws are invariant, we must specify the transformation that leaves the physical laws invariant. For rotation symmetry, the transformation involved is a rotation. For reflection symmetry, the transformation involved is a reflection (Zee 1986: 65-66).

In another text, Jakobson quotes Hopkins stating that "the artificial part of poetry, perhaps we shall be right to say all artifice, reduces itself to the principle of parallelism" (Jakobson 1966: 399). This is because, according to Jakobson, "on every level of language the essence of poetic artifice consists of recurrent returns" (Jakobson 1966: 399).

James Fox states of Jakobson's view of parallelism: "Parallelism, in this sense, is an extension of the binary principle of opposition to the phonemic, syntactic and semantic levels of expression. Rather than some form of deviation, poetic language is the most manifest and complex expression of binary opposition" (Fox 2014: 20). By stating that poetic language, "rather than some form of deviation [is] the most manifest and complex expression of binary opposition" (Fox 2014: 20), Fox claims that poetic language is based on regularity, rather than irregularity, and on symmetry rather than on a break in symmetry; that the symmetry of texts is just an extension or manifestation of the symmetry that can be found on the linguistic levels of language. Fractal patterns thus seem to be the basis of linguistics, or at least of Jakobson's highly experimental model of it, and aesthetics in part seems to involve bringing to light these basic conditions.

However, different fractal structures can also arguably be used in plot-structuring, which is seemingly less tied to linguistics' scales of text, and more with the symmetry of narrative progression. In his article "Infinite Proofs: The Effects of Mathematics on David Foster Wallace," McCarthy (2012) writes: "(...) as an organizing principle, the fractal has an intuitive logic: the best novels already have a fractionalized quality — each chapter, and indeed every paragraph and sentence, reproduce in miniature its central conflict and arc." Literary analysis in general almost always analyses that which is repeated (usually termed as 'motifs') and varied (partially repeated, contrasted, partially contrasted),³ to explore a larger theme (also present in some semblance in the motifs). These iterations on different scales of narration could be more systematically and more precisely described by employing a *fractal model of narrative structure*.

2. Introducing the fractal model of narrative structure

We propose to introduce and describe, using *Assassin's Creed* as an example, the fractal narrative structure model. We also aim to corroborate our claims that a fractal narrative model is a possible mode of plot-structuring by another case of fractal plot-structuring in literature.

An example of conscious (author-intended) use of a fractal narrative model is David Foster Wallace's *Infinite Jest*. Wallace is known for overtly exploring ties between mathematics and literature, such as in his book *Everything and More: A Compact History of ∞* , and plays with mathematical concepts in his works. Not only does he explore the ties between some mathematical concepts tied to fractals (mainly the mathematical concept of infinity, which is tied to fractals since "fractals have no characteristic sizes" (Efektari 2004: 2) and are thus effectively infinite), he also "has admitted in various contexts that he employed the Sierpinski Triangle as a structural narrative model for *Infinite Jest*" (Mullins 2014: 165). The Sierpinski Triangle is a type of fractal described by Falconer (2014: 24) as a fractal: "obtained by repeatedly removing (inverted) equilateral triangles from an initial equilateral triangle of unit side length". In his book, Falconer also features, in several images, the growth of the Sierpinski Triangle,⁴ and in that way he showcases how fractal construction is an easy way of constructing systems of growing complexity, something which also has been employed in modern videogame graphics for creating realistic complex environments,⁵ and, as we argue, is used in building narratives as complex systems. Videogame graphics engineers use fractal algorithms for the fast building of complex digital graphic environments, something which can be seen in a literal fashion in videogames such as *Fractal* (2010), or more recently, *Marble Marcher – A Fractal Physics Game* (2019), the latter of which is played "on a surface of evolving fractals."⁶ What such games also illustrate is how a seemingly simple concept such as a fractal can rapidly

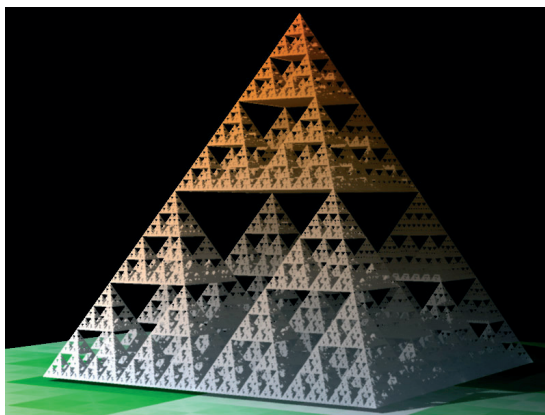
3 This is not at odds with fractals, as fractals are not necessarily homogenous entities that replicate their basic structure on every scale, as evidenced by such mathematical concepts such as *semifractals* (Lasota and Myak 1999: 307).

4 See Falconer (2014: 24).

5 See more at <https://ohiostate.pressbooks.pub/graphicshistory/chapter/19-4-noise-functions-and-fractals/>.

6 See more at <https://codeparade.itch.io/marblemarcher>.

construct very complex systems in which the starting point of fractal generation (the basic structure) is not necessarily any longer easily identifiable, so it is not anymore self-evident that the shape is in fact a fractal, something which can be easily concluded by observing Mandelbrot sets at different rates of magnification. Only at some rates of magnification it is possible to see the iteration of the initial, overall shape of the fractal in smaller parts of it – this is not always self-evident. Also, as evidenced by *Fractal* and *Marble Marcher*, fractal structures can be spatial, three-dimensional structures. It is the three-dimensional structure shown in Image 1 that seems to be more like the “pyramidal” structure of Wallace’s *Infinite Jest*. As Mullins writes:



A Sierpinski Triangle is an elementary, pyramidal fractal. Its construction involves, first, drawing a triangle; then, within the triangle one draws three triangles and within those three triangles another three triangles, and so on *ad infinitum*. The fractal nature of the triangle consists in its self-similar repetition (Mullins 2014: 165).

That Wallace thought of a **specific** fractal shape as the shape of his narrative, also points to the multitude of various fractal shapes, or as Falconer (2014: 24) writes: “Many other sets may be constructed using such recursive procedures.” What sets one fractal apart from another is their different **basic structures**, or that what is repeated and varied in the fractal. If instead of a triangle, some other shape was used in constructing the Sierpinski Triangle, the resultant shape would not have been a pyramid, but something else. Similarly, a text narrative structure and overall form arguably depend on what is repeated throughout it – the arguable basis of concepts such as genre and narrative themes.

A proposed method for identifying the text’s basic structure might be to look at what is repeated at different levels of narration. Again, in his article “Infinite Proofs: The Effects of Mathematics on David Foster Wallace,” McCarthy (2012) suggests a valuable method of identifying the **basic structure**: “as an organizing principle, the fractal has an intuitive logic: the best novels already have a fractionalized quality – each chapter, and indeed every paragraph and sentence, reproduce in miniature its central conflict and arc.” Since in a fractal, “the output of one operation becomes the input of the other” (Lesmoir-Gordon 2010: 151) and “this process of going round and round like a loop is called iteration” (Lesmoir-Gordon 2010: 151), the fractal narrative model thus seems to be best described as consisting of three ‘parts’ – **the basic structure, iteration and variation**. The **basic structure** is that which is repeated throughout the narrative (i.e. a motif), **the output of one operation that**

becomes the input of another, but also that which can be varied in different ways, changed by different modes of symmetry (i.e. reflection, rotation) while still being recognizable.

3. Fractal underworlds – identifying Assassin's Creed basic narrative structure

The narrative space that the Animus creates in-game from Desmond Miles's genetic memory is a world of the dead, and the plot takes place in "1191 AD, during the... times of the Third Crusade," according to the game's DVD cover. Everyone who Desmond meets as Altaïr is long deceased, thus making the world that the Animus generates a virtual, digital underworld. *Assassin's Creed* also seems to bear similarity to other underworld narratives by repeating on various scales the arguable **basic narrative structure** of underworld narratives, that is the descent (into the underworld) and the ascent (from the underworld) of the protagonist. Some examples for this are Ovid's Orpheus's descent into the underworld and subsequent ascent into the overworld in *Orpheus and Eurydice*, as well as Dante's *Inferno*.

However, while in Dante's *Inferno* there is the continuous fall, the descent of the protagonist (Dante himself) through circles of Hell (*Cantos* often finishing with Dante's usually helpless, compelled to fall into a lower circle), and as in Ovid's *Orpheus and Eurydice* we seemingly have one descent and one ascent), in *Assassin's Creed* the protagonist Desmond falls into the underworld and ascends from it **on multiple occasions and to different extents** throughout the game, not only as a part of the game's framing structure that involves descending and ascending from the underworld of the videogame, but also and mainly through various ascending and descending situations which Altaïr finds himself in, both as an integral part of gameplay (a "leap of faith" that central protagonist Desmond as Altaïr must at a critical stage perform, as well as necessary climbing and descending buildings particular to this game). This is also part of the game's particular use of cutscenes. Thus, in one cutscene, Desmond as Altaïr descends in and ascends from 'fake' death as he is stabbed by Al-Mualim with a poisonous blade meant to simulate death, and in another he also descends in and ascends from death by performing for the first time the **leap of faith**, another instance of **simulated** death. In the cutscenes following the deaths of his targets, Desmond again descends into and ascends from both a simulated death and a simulated afterlife. It might be said that Desmond truly descends into the simulated world of Altaïr's lifetime everytime a cutscene begins, as in that moment he is temporarily dead (bereft of control, as there is no interactivity), one with the machine (the Animus). In this way, the cutscenes in *Assassin's Creed*, as in every other game, are the ultimate revelation of the machine under the game, the nullification of the player in the machine. However, in *Assassin's Creed*, by adding the element of this nullification (death) being also expressed metaphorically, in its content, as Altaïr in these moments is always descending into death in some way when the cutscene begins, and ascending from it when it ends, the cutscenes become less binding and more liberatory – more like a Deleuzoguattarian smooth space – compelling the player to repeat constantly not only the fact of their bondage but also the self-awareness of their bondage. In this way, *Assassin's Creed* is different from other games in the way it shows its medium-inherent fractality in cutscenes on a metaphorical level, as a more purely narrative fractality.

Assassin's Creed is also reminiscent of Dante's *Inferno* in that Altaïr's assassination assignments have a hierarchical structure (from lower to higher ranking Templars, with higher rank being also associated with greater sinfulness), reminiscent of Dante's circles of Hell, with the lower-ranking criminals/sinners coming first and then the higher-ranking ones coming later. The helplessness with which Dante descends through Hell ("Let us go, for the long way urges us. So he put/Himself, and so he made me enter, into the first circle/Girding the abyss" (Canto IV, 22-24).), and his falling further down it while (by) being unconscious is mirrored in both Desmond and Altaïr being coerced into going along with their missions under threat of death. Also, Altaïr receives nine assassination missions (Al Mualim: "Nine men who need to die.") comparable to Dante's nine 'circles' of Hell. The game herein repeats the pattern of stratification used by Dante in the layering of the *Inferno* in the 'circles' of Hell, in which every circle is narrower than the previous one, until one comes to the bottom of Hell. In *Assassin's Creed*, the circling around the abyss is replicated by Altaïr going to the same cities but catching different, more important and more 'sinful' Templars as the game progresses. Interestingly, at the bottom, in Dante's structure, we find Lucifer entrapped waist-deep in a lake of ice, which might be taken not only as a concise summary of fractal patterning, but also as a vivid illustration and performance of the basic structure in a fractal narrative. Lucifer's punishment in Canto 34, 35-54 is effectively depicted to be a kind of a paralyzing loop. He tries to ascend to Heaven, so he fans his wings, but he is crying at the same time ("With six eyes he was weeping"). The tears form a lake, while his wings cool it ("by them Cocytus was frozen") into the ice that holds him captive. If he could either stop crying or stop trying to ascend to Heaven he would not be trapped in the ice. Just as the paralyzing loop by which Dante catches Lucifer, a fractal generates its own structure by triggering the scalar recapitulation of its own structure. The iterations of this entrapment repeat up through every layer of the *Inferno*, in fact, they **are** its structure. Similar to Dante's Lucifer generating Hell itself by its looping, fractal algorithm (since all the punishments in Dante's *Inferno* are eternally repetitive in nature), we have at the bottom of *Assassin's Creed* the Crusade wars induced hell, the traitor Al-Mualim who generates his virtual world via the 'Piece of Eden,' an in-game virtual reality device.

The exponentially stratified afterlife thus seems to be, not only fractalic in itself, but also an apt illustration for a secret, underground fractalic narrative structure, as well as an illustration of the nature of the video game's (as a form of media) underground computer code. As the space-generating loop is the basic structure, creating fractalic space by iteration, in *Assassin's Creed* it is the **descent-ascent** generated by the gaming console (and its in-game illustration/metaphor, the Piece of Eden), that is the basic structure, evoking also the 0-1 of binary code. Lucifer's loop generates the exponentially stratified Hell, just as Al Mualim generates the stratified underworld structure of *Assassin's Creed's* by leading Altaïr ever deeper into the conspiratorial plot of the digital recreation of the Crusades by a series of descents and ascents, until Altaïr reveals the abyss of Al Mualim's treason in the form of the Apple of Eden, the inner in-game game console. As self-reference to the gameplay situation, and unlike the Biblical fruit, the Apple of Eden catches its victims visually, as Al Mualim states

in reference to the Apple of Eden: "He who holds it commands the hearts and minds of whoever looks upon it. Whoever... 'tastes' of it as they say."

The framing device of the game is perhaps comparable to the 1x image of the Mandelbrot set – it might not be evident that *Assassin's Creed* has a fractal structure if examined only on that "rate of magnification," where the plot seems to be that Desmond descends into the underworld generated by the Animus at the beginning of the game, and ascends from it at its end. However, once it is examined more closely, comparable to higher rates of magnification of the Mandelbrot set, we see the "framing structure," more precisely described as an **descent-ascent**, repeated at "higher rates of magnification," that is, in lesser spans of game-narrative time – such is the case with the leap of faith, which lasts only a few seconds, with post-assassination cut-scenes which last several minutes, Altaïr going in and out of the Apple of Eden's influence in the fight with Al Mualim, lasting up to tens of minutes, and breaks and repeated immersions into the Animus by Desmond, potentially lasting hours.⁷

4. Fractal modulation

The material, contextual reactivity of fractals makes them useful as the basis of a critical methodology. Fractals observe both repetition and contextual sensitivity. They are codings of fixity that are reactive to the space they occupy, and so they entail inscriptive sensibility to the material and spatial bases of both repetition and historical change. They vary to a coded underlying fixity, as in Shaviro's concept of "modulation," which we develop more fully below. Because of the game's autoreferentiality (the Animus mimicking the game console and Desmond representing the human gameplayer) and the computer code binary being present as a "narrative rhythm," *Assassin's Creed* rewires the frame narrative as journey into the underground of the videogame, as an exploration of its medium. This becomes more explicit in the cutscenes in which Altaïr kills his targets. What is interesting is that these confessions cannot possibly have happened to the actual Altaïr whose history Desmond is reliving, because Altaïr is always attacked and pursued by his victim's guards immediately after making the kill. These visions thus seem to be more a synthesis of the information Altaïr gathered during investigations of his victims, compiled and then presented by the Animus in a special virtual space whose historical veracity remains unspecified. Interestingly, this seems to be the same transitional glitch-space which Altaïr/Desmond inhabit before the Animus loads a memory.

Both when a memory is loading and when Altaïr talks to his targets after stabbing them, we see glitches and algorithms on the screen that reveal the 'medium' of the Animus, reminding both Desmond and the human player that they are playing a game, and that the space around them is virtual. Likewise, with the space which Altaïr enters after stabbing his target, the victim can always explain himself standing up and talk unimpeded by his throat wound in this 'non'-space which we enter, or more precisely, which reveals itself, after Altaïr kills his target. It is also significant

⁷ The last two are variable because they are intertwined with gameplay time (which depends on the individual player's speed of completion of a particular section of the game).

that we can see the victim on their feet only after the human player responds to a 'glitch' in the Animus, further emphasizing 'the media' of the Animus. In all of these situations, the game gives the digital mechanism in terms of a glitching reference to the textuality of gameplay.

It is useful to consider this glitching alongside Shaviro's concept of modulation, which he discusses with reference to Grace Jones's music video "Corporate Cannibal":

The phrase "slave to the rhythm" starts out as a metaphor, but it has been literalized by the end of the song. The same disciplinary rhythm dominates everything, compelling us to move in accordance with its beat; we must breathe to it, dance to it, work to it, live to it, love to it. Rhythm isn't everything; it's the only thing (Shaviro 2010: 28).

Shaviro reads a politics of interpellation into the modulation of Jones's meaning, from a metaphorical injunction at the beginning of the song to a diagnosis of the dancefloor's recapitulation of her dominating rhythms. On one level, Corporate Cannibal's lyrics imitate (subverting and affirming) the soulless language of neoliberal politicians and corporations (Shaviro 2010: 29), of which *Assassin's Creed's* Abstergo is one. Yet Shaviro also detects a deeper politics of embodied recapitulations of capitalist rhythm: "Jones embodies capital unbound, precisely because she has become a pure electronic pulse" (Shaviro 2010: 29). The rhythm of Jones's video, the continuous modulation, is for Shaviro reference to the rhythm of slave labour: "(the) numbing repetition of work on the assembly line" (Shaviro 2010: 28) that harkens "back to the toil of slavery" (Shaviro 2010: 28). Fractals become political when they replicate and accelerate capitalist values beyond conventional bounds. In *Assassin's Creed* Desmond is meant to be used by Abstergo as a slave and then discarded and replaced when becoming a brain-damaged, burnt out zombi.

Something like the possibility of becoming, the freedom of the dance, is to be found in this modulation. An optimistic reading of capitalist fractals is offered by Emblemsvåg:

(...) fractals are selfsimilar (...) and that must also any successful system in society be in order to induce large changes—we cannot have an elitist system where some describe what is sustainably correct and what is not. Whether it is the baker, the welder, the clerk, the director, or the president, they must all through their behavior every day contribute in the correct direction (Emblemsvåg 2016: 18-19).

The self-modulating capitalist society achieves "correctness" in its democratic networking of fractal replication in this vision. Shaviro's modulation perhaps offers a necessary corrective to Emblemsvåg's optimism. Modulation means the changes that the inner rhythms of subjects undergo are both chosen and imposed. Sovereign subjects locate a becoming in a newly smooth space of unbound rhythm, both remaking digital systems alongside the construction of a new subject position, while at the same time, in another register, hailed and interpellated to the infrastructures and power structures of capital. As the disseminator of fractal patterns, capitalist

rhythm infects all living flesh. "Change the code and the body changes," Steen Christiansen writes of Shaviro's modulation. We are in our innermost being intimate productions of coding. But modulation also involves a swerve in the meaning of the code as it comes to name or feedback into its own productions, such as Jones's claim concerning the enslaving power of the rhythm. In reflection of its own rhythmic structure at the level of content semantics, the fractal's aesthetic work exhibits insightful or even resistant commentary concerning the specific infrastructural forms, spaces, technologies and media by which it is disseminated. Jones's music locks us into a slave-like recapitulation of capitalist biopolitical violence, but the transmutation of the impulsion to the smooth space of dance makes the self-conscious recognition of the fractal structure at the level of content semantics ("slave to the rhythm") simultaneously complicit and politically subversive. Our bodies dance and know (depressingly) they are mere cogs in the system, and yet joy at their physicality, at the smooth space that they can make here.

5. Fractal encounters

Gameplay is *Assassin's Creed's* equivalence to Jones's dancing. Immersion in technocapitalist digital power infrastructures in gaming is simultaneously complicit replication and ecstatic release. Perhaps here the question of the visibility of fractals is vital to their political potential. Useful as an illustration here are the way Timothy Morton's "hyperobjects" are "massively distributed in time and space relative to humans" (Morton 2013: 10). This means that any human being cannot gauge the full effects (in time) and proportions (in space) of such an object, making such objects, in effect, endless, inescapable to humans. On the other hand, a fractal has "no characteristic sizes. Fractal shapes are... independent of size." In that sense of having no 'set' sizes, fractals are 'endless' and 'inescapable': a hyperobject whose basic pattern is statistically knowable. Hyperobjects are, for Morton "nonlocal; in other words, any local manifestation' of a hyperobject is not directly the hyperobject" (Morton 2013: 10). This is similar to some local manifestations of a fractal, which are **not** the fractal, but its basic structure or a part of it. And as with Emblemssvåg's statistical charting of fractals, climatological science uses fractal projections to understand the hyperobject of global weather systems and their relation to carbon particles in the atmosphere and oceans. Morton writes under a graph representing statistical values that point to the conclusion that a 'global warming' is happening: "Global warming cannot be directly seen, but it can be thought and computed" (Morton 2013: 11). As a hyperobject, global warming can be made 'visible', with the help of statistics. We see from this example that the visualization of fractals has vast contemporary political significance concerning how to know and react to world ecological and political situations.

An aesthetics of the digital, exemplified by the glitches of *Assassin's Creed*, the slave-rhythm of Jones's *Corporate Cannibal*, and the data streams of *The Matrix* (1999), has in recent years sought to come to terms with scale and fractal replication. In one scene of *The Matrix*, for example, a character points to a number of computer screens showing endlessly flowing code and says "There is too much of information to decode the matrix." Likewise, similar to the recoding of the flesh experience of

the dancer in Jones's song, the player's immersion in the digital space itself takes a place in the narrative semantics of the game content of *Assassin's Creed*. In his online paper *Introduction to Game Time*, Jesper Juul argues that "most computer games project a game world, and to play them is therefore to engage in a kind of pretence-play: you are both 'yourself', and you have another role in the game world" (Juul). This is a basic duality of the human player and game character – by playing a game character, the human player is **both** himself or herself and the game character. The game is always an action set in motion by the gamer, and in turn setting the gamer in motion, as Alexander Galloway notes, "If photographs are images, and films are moving images, then video games are actions" (2006: 2). The domain of eyes has shifted to that of eyes working alongside muscles and thumbs (Galloway 2006: 3). As with Jones's corporate rhythms, the game forms an assemblage with the body. However, Ruch (2008: 189) notes that in a twist specific to the fractal aesthetics of the game, *Assassin's Creed* "employs a conceit whereby the player inhabits Desmond Miles directly, who is himself at the controls of Altaïr, his ancestor, via a machine called the Animus." The implication is that, not only is the human player both Desmond and Altaïr, but also **Desmond** is both 'himself' and Altaïr. Thus Juul's duality of 'player' and 'game character' becomes a triad in *Assassin's Creed* in the sense that there seems to be another game player (Desmond) who is a part of this basic player-game character duality that Juul establishes and, as such, presumably, also 'experiences' and interacts with the game. Machine actions anticipate and mirror operator actions. Forming an action assemblage with its player, and incorporating this relation into its own gameplay, *Assassin's Creed* offers an image of the crystal growth of its own codified fractal structure in the body of the gamer.

This triad results in a **layer** of the game that is positioned between the human player and Altaïr. The function of this mid-layer is both to centralize the computer game console in the game's narrative, and to fictionalize and mask it by explaining away the computer game as a 'historical' person's (Altaïr's) memories stored in Desmond's genes, processed by the in-game computer (or game console), a machine called 'the Animus.' That is, we have a kind of **flattening** of the two spaces, of the 'real' and the virtual. The extra-game reality gets its 'virtual double', or seems to get 'sucked in' the virtual space, in the form of 'the mid-layer' of the game. Additionally, the in-game virtual reality seems to be presented solely as the world created by the Animus. However, there is no real change of space between the two, both are equally virtual and equally a part of the game.

Furthering the claim that the game is at once revealing and masking itself as a game, the game's menu is only accessible through the in-game computer, the Animus, and presented as its interface. The levels are not numbered (i.e. level 1, level 2...) and are represented as Altaïr's memory sequences ('memory DNA timeline') named after his assassination targets' names, with the places of assassinations written under them. Instead of having the option of 'exiting the game' right away, the player must first 'exit the Animus,' so that even the conventionally extra-diegetic takes on a diegetic function. Also, instead of the game development team, there is 'the Animus development team.' When Desmond is in the Animus, Altaïr's deaths are explained as Desmond's (in actuality, the human player's) complete desynchronization with

Altaïr's memories. It is not possible for Desmond to die outside the Animus. Loss of health is masked as partial desynchronization and Altaïr's 'health bar' is masked as 'the synchronization bar.' Regaining health is masked as better synchronization with Altaïr's memories, that is, as a reward for mirroring him. This flow of the diegetic beyond its conventional boundary perhaps thus functions as the "corporate" rhythm does for Grace Jones, exceeding its allotted space so that its fractal assemblage with the gamer is made visible (we develop further this issue of visibility shortly). Disrupting the embodied fractal rhythm of the game, the disembodied sight asks the gamer to see the fractal assemblage that the gamer forms with the game.

Interestingly, it is not only in-game, that is, in the Animus, that Desmond mirrors Altaïr, he also mirrors him outside the Animus, or more precisely, the events outside the Animus mirror those inside it. For example, in Altaïr's narrative there are assassination assignments, usually in blocks of three, broken by trips to Al Mualim, Altaïr's 'Master,' during which Altaïr asks Al Mualim questions about his missions and Al Mualim seemingly gives truthful answers (Al Mualim's role as a bestower of knowledge is emphasized by these meetings invariably taking place in Al Mualim's library).

In Desmond's narrative, we have sessions in the Animus broken by 'breaks' given to Desmond by the Abstergo medical personnel during which Desmond asks questions and tries to learn more about his situation, especially from the research assistant, Lucy, who, true to her name, 'enlightens' Desmond about the reasons he is here. In Altaïr's narrative, we also have Altaïr demoted to the status of 'novice' because of disobeying Al Mualim and being given nine assassination assignments in exchange for his life, a chance which is given to him only because of his great inherent talent as an assassin, and similarly, Desmond being kidnapped and threatened with death if he does not comply and relive Altaïr's memories in the Animus, something which he is able to do only because of Altaïr being his ancestor, that is, because of an inherent trait. Altaïr's coerced descent into the underworld of crime and behind-the-scenes politics in Damascus, Jerusalem and Acre is mirrored in Desmond's coerced descent, both into the underground of his own genetic memory, and into the secret machinations of the Abstergo Corporation that holds him captive.

Ruch (2008: 185) argues that "the first narrative arc is played through and resolved dramatically; the second is left quite open." However, what Ruch identifies as the second narrative is arguably not left open. There is no 'boss fight,'⁸ as there is in what Ruch identifies as the primary narrative (in the primary narrative there is a 'boss fight' between Al Mualim and Altaïr). On the contrary, Desmond is left alone by his captors, entrapped in the room with the Animus. However, the game credits will not role until Desmond uses 'eagle vision' and sees the messages left by his 'brothers' (descendants of assassins previously held in the Abstergo facility) visible only to him, signifying that this change that Desmond undergoes, which enables him to communicate with those like him, was the goal of the secondary narrative. This is similar to the ending of Altaïr's narrative – the Apple of Eden he acquires after he defeats his former Master, Al Mualim, shows a projection of the planet Earth and

8 "A boss is a significant computer-controlled enemy" (Burt 2008: 66). A fight with a boss character (*a boss fight*) marks the end of a part of the game, the end of one level and the beginning of a next. *The final boss* is the main computer-controlled enemy in a game. *The final boss fight* typically marks the end of the game – the game ends shortly after the player successfully defeats the *final boss*.

on it marked locations of other assassins – that is, it is a map that enables him to someday perhaps achieve some kind of communication and unity with his brothers. The implication of all this seems to be that the human player, by finishing the game, is now somehow changed and ready for communication with others who have been similarly changed, transformed, overwritten, converted by the game to the **creed**, which is “Nothing is true and everything is permitted.” We argue what at first, seems to be a more traditionally philosophical message in the spirit of libertarianism, the Assassin’s creed, “Nothing is true, everything is permitted,” is actually referencing the nature of the virtual space which Desmond, and eventually, the **real** Altaïr, find themselves in – **nothing is true**, that is, everything is virtual and, no physical movements are possible, and **everything is permitted**, that is, in a virtual reality manipulations of space, time and movement are all possible, as evidenced by the creations of both the Animus and the Apple of Eden. The fractal replication at the level of aesthetic recognition has opened up a space of self-knowledge in the player. This assumed effect on the human player – that he or she somehow underwent the same moral transformation as Altaïr – remains hidden within the mid-layer of the game until the game’s end, by which the game strongly implies that it, the game, or more precisely, the virtual space generated by the game, has been translated into the extra-game reality and passed onto the human player by means of symmetry. This change, dependent on the contingent aesthetic recognition of fractal power, is comparable to Althusser’s theory of the “encounter,” which concerns moments of aleatory and contingent state changes in knowledge or substance, such as are exemplified by “the rain, the swerve, the encounter, the take [*prise*]” (Althusser 2006: 167). Althusser’s encounter, as Asad Haider describes, conceptualizes “a materialism based not on the remorseless inevitability of a structure, but on the contingency of an encounter between two elements, like atoms falling in the void in the ‘*clinamen*’ of Lucretius, which swerve to meet and create a world” (Haider 2018). As with the recognition of the aesthetic fractal of the system of replication which it reveals and with which it is complicit, the encounter names a new phase of knowledge; a modulation in the subject’s relation to his/ her fractal recapitulation of social apparatuses.

6. *Visible fractals: coding and modulation*

This making visible of the fractal patterns, emphasized, amongst other moments, in the eagle vision, the “Piece of Eden” and the enlightening Lucy, touches upon a fundamental aspect of the machine-player assemblage by which the game’s action unfolds with and through the body of the gamer. As Galloway writes, there is an interesting paradox in the cinematic interludes of videogames, such as the projection of planet Earth at the ending of Altaïr’s narrative,

what one might consider to be the most purely machinic or “digital” moments in a video game, the discarding of operator and gameplay to create machinima from the raw machine, are at the end of the day the most nongamic. The necessity of the operator-machine relationship becomes all too apparent. These cinematic interludes are a window into the machine itself, oblivious and self-contained” (2006: 11–12).

As we have argued, *Assassin's Creed* is similarly concerned to make visible the way its own fractal structure forms an assemblage with the gamer. The game is innovative as a fractal machine that shows its own fractals at work. In this sense, the game asks us to consider what Benjamin Bratton terms "The Stack": the web of interconnected digital networks in which we make our home and remake ourselves. The Stack is the total sum of hardware and software that encircles animal life and furthers the mineral extraction of the planet, and the changed ways of living and being that these enable (and demand). With The Stack we are made uncanny, and maintain an ever shifting relation to emergent ways of being: "alternative actors, agents, objects, machines, and ethics will surely come into view and will fill up another diagram with another distributed tension. These aliens both are and are not us" (2015: 352). A vision of our complicity and interconnection with technology, The Stack describes therefore a profoundly troubling smooth space, the site of both coding and becoming:

The interfacial totalities of our platform states, drawn from ambient signals of price and risk and faith and fundamentalism, decide sovereignty by extracting and extruding value from the ties that bind, their polarized multiplicities shimmering by fractal superimposition (Bratton 2015: 352).

It is this "fractal superimposition" we locate in fictionalized and rendered action in *Assassin's Creed*. The transformation the human player undergoes in gameplaying that the game makes visible seems best cast as a **mathematical transformation**, a symmetrical transformation, in the same category as Zee's reflection or rotation. As the symmetry repeats itself on two different, clearly delineated scales – onto the mid-layer (on Desmond) and then onto the extra-game reality (on the human player) – the transformation in question seems to involve a 'scaling,' and the resultant shape a fractal. Thus the structure of *Assassin's Creed* is fractal not only on the level of having two narratives spatially positioned one in the other, but also because of the expansion of parallelism on the next scale – from Altaïr's virtual space, to Desmond's 'real' space, and through Desmond's 'real' space onto the extra-game reality (Image 3). It is also significant that this transformation happens visually – the human player looks through the game's character's (Desmond's) eyes and thus becomes the reflection. As Shaviro describes modulation, in the videogame code is "the **only** thing" (Shaviro 2010: 28).

Visualizing fractals as "the only thing" in *Assassin's Creed* therefore involves both depicting a virtual new smooth space, and the recognition that the player always was entrapped in fractal complicity and replication of biopower. In considering this ambiguity, it is perhaps useful to contrast Shaviro's differentiation of **metamorphosis** and **modulation**. Shaviro states:

Metamorphosis implies 'the ability...to move laterally across categories' (Krasniewicz 2000: 53); but modulation requires an underlying fixity, in the form of a carrier wave or signal that is made to undergo a series of controlled and coded variations. Metamorphosis gives us the sense that anything can happen, because form is indefinitely malleable. But the modulations of "Corporate Cannibal" rather imply that no matter what happens, it can always

be contained in advance within a predetermined set of possibilities (Shaviro 2010: 13).

In Shaviro's view, the essential difference between modulation and metamorphosis concern the rate of change. In metamorphosis there is a definite break in the space between the old and the new state of a thing, whereas in modulation there is not a definite break in the space between the old and the new state of a thing. Elements of both are important in *Assassin's Creed*. As with Bratton's Stack, the game fractals enable the infinite variance of possible basic structures (which are not limited in their complexity) and variance in the rates of their iterations and variations. Yet, though involving important aspects of metamorphosis (not least its seemingly libertarian creed), we find *Assassin's Creed* places more of an emphasis on modulation. **The underlying fixity** that Shaviro identifies as the main characteristic of modulation is reminiscent of the fractal principle. There is a symmetrical, **virtual** underlying fixity to the fractal. The fractal also makes "a series of controlled and coded variations," and its scaling is reminiscent of "a carrier wave." This means, on the one hand, that modulation itself is therefore often fractal. Through his attempts to achieve a virtual reality, Al Mualim arguably only modulates others, that is, entraps them in a fractal structure, while Altaïr seemingly forces others to undergo a real metamorphosis, freeing them from the fractal structure. Religious imagery thus seems to be used in relation to Altaïr's and Al Mualim's respective ability and inability to 'give' an afterlife, again related to the underworld, and the **ascent-descent** basic structure. Altaïr seems to fulfil the religious promise of another world, in the sense of giving his targets a spatial break by killing them, even if that spatial break sends them into nothingness (as one of Altaïr's victims, Sibrand, seems to believe: "Nothing. Nothing waits."), while Al Mualim fails the religious promise of another world, because he refuses to give a spatial break to his victims – Al Mualim's afterlives are all fake afterlives that give no spatial break.

Vitally, the virtual historical space and the virtual digital coding brought to narrative scale in *Assassin's Creed* involve fractal recognition of the videogame digital medium, and with this the wider constitutions and containments of the subject that are daily brought about in encounters between subjects and digital media. *Assassin's Creed* intervenes in modulation by making visible the fractal coding. Al Mualim arguably uses modulation to enforce control over others as he, for example, with the help of the Apple of Eden, resurrects his dead Templar allies, which he previously had Altaïr kill, as virtual copies, to help him fight Altaïr. Also, Al Mualim modulates, or more precisely, replicates, himself in hopes of defeating Altaïr. Al Mualim using modulation to establish control is in line with Shaviro's statement that "the control society is characterized by perpetual modulations, dispersed and 'flexible' modes of authority" (Shaviro 2010: 6) – just as the Agents (oppressive sentient computer-programs) in *The Matrix* are all uncanny shapeshifters.

As Shaviro emphasizes, digital media are an important late capitalist modulation, whose algorithmic codings and harvesting of knowledge of the flesh are continually in the news at the time of writing (the ongoing Facebook / Cambridge Analytica scandal). Shaviro states that modulation "is a basic characteristic of digital processes in general. All digital video is expressed in binary code, and treated by means of algorithmic procedures, allowing for a continual modulation of the image" (Shaviro

2010: 15). That the biopolitical "rhythm" of digital coding (which often is performed by fractal algorithms) is both an Althusserian encounter and "the only thing" is given recurrent prominence in the game's much repeated *Creed*: "Nothing is true, everything is permitted." Referencing primarily the nature of the virtual spaces which Desmond and Altaïr find themselves in, in which the virtual recreation simulates its own glitching, *Assassin's Creed* reveals the fractal biopolitical assemblages of its own binary code.

References

- Alighieri, D. (1996). *The Divine Comedy of Dante Alighieri – Volume One: Inferno*. Trans. and ed. Robert M. Durling. Oxford: Oxford University Press.
- Althusser, L. (1971). "Ideology and Ideological State Apparatuses (Notes towards an Investigation)." *Lenin and Philosophy and Other Essays* (pp. 127–188). London: Verso.
- Althusser, L. (2006). *Philosophy of the Encounter: Later Writings, 1978-87*. Eds. Francois Manthéron and Oliver Corpet. Trans. G.M. Goshgarian. London: Verso.
- Assassin's Creed*. (2008). Ubisoft.
- Bratton, B. (2015). *The Stack: On Software and Sovereignty*. Cambridge, Massachusetts: MIT Press.
- Burt, A. (2008). "No More Heroes: The Killer Boss Guide." *GamePro*, 235, 66-9.
- Cremin, C. (2016). *Exploring Videogames with Deleuze and Guattari: Towards an Affective Theory of Form*. London: Routledge.
- Christiansen, S. (2016). "Metamorphosis and Modulation: Darren Aronofsky's BLACK SWAN." Eds. Shane Denson and Julia Leyda. *Post-Cinema: Theorizing 21st Century Film*. Falmer: REFRAME Books.
- Deleuze, G & Guattari, F. (2014). *A Thousand Plateaus: Capitalism and Schizophrenia*. Trans. Brian Massumi. University of Minneapolis: Minnesota Press.
- Eftekhari, A. (2004). *Fractal Geometry of Literature: First Attempt to Shakespeare's Works*.
<available from <https://arxiv.org/pdf/cs/0408041>>
- Emblemsvåg, J. (2016). *Reengineering Capitalism*. Switzerland: Springer International Publishing.
- Falconer, K. (2014). *Fractal Geometry*. UK: John Wiley & Sons.
- Flood, A. (2016). "Scientists find evidence of mathematical structures in classic books." *The Guardian*. 27th January 2016. <available from <https://www.theguardian.com/books/2016/jan/27/scientists-reveal-multifractal-structure-of-finnegans-wake-james-joyce>> (1/2/2018).
- Fox, J. J. (2004). *Explorations in Semantic Parallelism*, Canberra: ANU Press.
- Galloway, A. (2006). *Gaming: Essays on Algorithmic Culture*. Minneapolis: University of Minnesota Press.
- Haider, A. (2018). "A New Practice of Politics: Althusser and Marxist Philosophy." *Verso Blog*. 28 March 2018. <available from <https://www.versobooks.com/blogs/3713-a-new-practice-of-politics-althusser-and-marxist-philosophy>> (31/3/2018).

- Horstemeyer, M. (2012). *Integrated Computational Materials Engineering (ICME) for Metals*. New Jersey: John Wiley & Sons.
- Jakobson, R. (1966). "Grammatical Parallelism and its Russian Facet." *Language*, 42, 399–429.
- Jakobson, R. (1973). *Questions de Poétique*. Paris: Editions du Seuil.
- Juul, J. *Introduction to Game Time*. <available from <https://www.jesperjuul.net/text/timetoplay/>> (4/8/2017).
- Kurtzel, J (2016). *Assassin's Creed*. New Regency Pictures, USA.
- Lasota, A.; Myak, J. (1999). "Fractals, Semifractals And Markov Operators." *International Journal of Bifurcation and Chaos*, 9, 2 (pp. 307–325).
- Lesmoir-Gordon, N. Ed. (2010). *The Colours of Infinity: The Beauty and Power of Fractals*. Springer-Verlag: London.
- Mandelbrot, B. (1983). *Fractal Geometry of the Natural World*. New York: W. H. Freeman and Company.
- McCarthy, K. (2012). "Infinite Proofs: The Effects of Mathematics on David Foster Wallace." *Los Angeles Review of Books*. <available from <https://lareviewofbooks.org/article/infinite-proofs-the-effects-of-mathematics-on-david-foster-wallace/#!>> (1/31/2018).
- Morton, T. (2013). *Hyperobjects - Philosophy and Ecology after the End of the World*. Minneapolis: University of Minnesota Press.
- Mullins, R. D. (2014). "Theories of Everything and More: Infinity is Not the End." In: Robert Bolger, Ed. *Gesturing Toward Reality: David Foster Wallace and Philosophy* (pp. 221–243). London: Bloomsbury Academic.
- Ruch, A. (2008). *Creed, Code and Culture – Assassin's Creed as Videogame Legend*. <available from http://www.academia.edu/347790/Creed_Code_and_Culture_Assassins_Creed_as_Videogame_Legend> (4/8/2017).
- Shaviro, S. (2010). "Corporate Cannibal." In *Post-Cinematic Affect* (pp.11–34). Winchester: O-Books.
- Taylor, R. P.; Sprott J. C. (2008). "Biophilic Fractals and the Visual Journey of Organic Screen-savers." *Nonlinear Dynamics, Psychology, and Life Sciences*, 12, 1, 117–129.
- Wachowski, L.; Wachowski, L. (1999). *The Matrix*.
- Zee, A. (1986). *Fearful Symmetry: The Search for Beauty in Modern Physics*. London: Macmillan Publishing.

Online sources

- Assassin's Creed – Game Script* <available from <http://www.gamershell.com/faqs/assassinscreedgamescript/1.00/>> (3/8/2018).
- Polish Academy of Science (2016). *The World's Greatest Literature Reveals Multifractals and Cascades of Consciousness*. <available from <https://phys.org/news/2016-01-world-greatest-literature-reveals-multifractals.html>> (1/31/2018).
- Marble Marcher* <available from <https://codeparade.itch.io/marblemarcher>> (2/24/2019).
- Noise functions and Fractals*. <available from <https://ohiostate.pressbooks.pub/graphicshistory/chapter/19-4-noise-functions-and-fractals/>> (1/28/2019).

Appendices

Image 1. Sierpinski pyramid (available from https://en.wikipedia.org/wiki/File:Sierpinski_pyramid.jpg (3/10/2019)). (Illustration by Solkoll, Image in Public Domain).

FRAKTALI U VIDEO IGRI ASSASSIN'S CREED

Sažetak

Ovaj rad istražuje fraktalnu narativnu strukturu popularne videoigre *Assassin's Creed* (2008). Također se postavlja teorijska osnova fraktalne analize naracije. Ispituje se mogućnost postojanja političke dimenzije fraktalne estetike, posebice u videoigri *Assassin's Creed*, za koju tvrdimo da je relevantna u istraživanju važnih biopolitičkih uvida u suvremenu digitalnu moć. Polazeći od analize hiperobjekata Timothyja Mortona, tvrdimo da fraktalnost ima ulogu u važnim suvremenim političkim pitanjima. Služeći se analizom pojma modulacije Stevena Shavira, ovaj rad dokazuje da je fraktalna analiza relevantna u istraživanju suvremenih problema digitalne biopolitike. Rad zaključuje da fraktalna narativna struktura videoigre *Assassin's Creed* inovativno upućuje na biopolitiku videoigara.

Ključne riječi: fraktali, naracija, videoigra, hiperobjekti, digitalna moć, modulacija, biopolitika