Human dragons playing in cyberspace

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Abstract

DRACO.WOLFANDDOTCOM.INFO is an interactive proto-videogame installation that immerses users personified as abstract dragons in a cathartic, stochastic, full body immersive videogame experience in cyberspace. The work attempts to playfully shift user consciousness towards non-human embodiment, by realtime 3d meshing the data from the human body into a mirrored abstract, ill-defined dragonic 3d shape. And by gifting humans with special virtual powers like flying and cusping fireballs, fighting for their progression in the game-space or facing annihilation, through invisible interaction camera-based technologies which will be exposed on this paper. Inside the piece's virtual world, users play as endangered dragons in a XXIst century filled in with companies, dotcom's, humanoids eager to stop the mythological beasts. The dragons progress in the game-space by inflicting damage to the city's landscape. The stochastic-logical-game-space ascends in difficulty as the levels progress, slowly changing the joystick's response into faster speeds and larger city-scapes, inducing the game's ultimate goal of a cathartic ilinxian state of disruption and otherness in human perception.

Let there be dragons

Legendary millennial creatures that have a special fantastic place in human consciousness from tender ages, dragons are usually associated to ancient, inexistent, malevolent or benevolus beasts of thunderous might. As an integral part of magical folk tales and myths, they are gifted with special powers, mixing real animal abilities onto surreal combinations of awe or fright, with uncountable occurrences throughout folk tales, literature, animation, videogames, toys, even art (Figure 1). By inhabiting the mythical plateau throughout millennia, with roots in known ancient european and asian folklore, they provide good example touchstones for subliminal consciousness bridges into mind regions where illusions, imaginary magical constructs, have room for blooming, blossoming and tangible concreteness. Even though their actual ancient animal existence as retold through collective mankind's history remains uncertain and most likely false, dragonic existence in mankind's global mind space is true.

[insert figure 1 here, this text not part of article]
Figure 1: The Great Red Dragon and the Woman Clothed in Sun by William Blake, c. 1805

The spark of their – even if imaginary – existence lights up torches way through bridges in consciousness which lead into mind state regions that operate as empty glades. Here, the psyche is free to wander, construct and touch eery or awe-able animal combinations in the fantasy realm. When reaching these consciousness glades we glare and even touch illusion, i.e., “the ability to interact with a representation” (Manovich, 2001: 177). When the consciousness glades go deep in the psyche engagement towards unexplored regions and modes of being, which profoundly shift our regular patterns of reality apprehension, it is then not only a question of interacting with a representation, but when the transport through these bridges is fully effective and immersive, it is now a question of becoming the representation, of inhabiting and of becoming the illusion.

The shift into this non-human otherness is both corporeal and ethereal. Corporeal with a simultaneous sense of deprivation of normal movement and perception into new senses and ways of motion; of the mind evading the body, disrupting its normal perception, almost becoming another entity, leaving the previous one behind, before the bridge. Ethereal as it is still only a delicate fabrication of the consciousness embodied in the animal that we usually are; ethereal as an alter experience which captivates profoundly our psyche into this otherness, it also dissipates easily in thin air as the target illusion image ceases to appeal, when its fascination and luring properties are somewhat lost, when the bridge collapses and we return to the body. Either way, the transport into this otherness has sporadic concreteness throughout our existence, and it is usually well triggered, among many other means, by the imagination running free on the dragon illusion images that populate consciousness while attempting to inhabit the imaginary animal combinations.

Deleuze and Guattari (1972) were among the first to ascribe human ontology to this perpetual undelineated porous state which provides space for lifelong change (evolution, learning, growth) to take place. They founded identity in that which breaches it: in the now, human beings drive actuality – the identity that takes place in reality –, through the omni-present virtual plane. And every identitary instant contains a mixture with different percentages of these two engulfing forces gladiating for consciousness control, actualized in the identitarian flow of life. The before mentioned bridge now has a keeper that guards access into the non-human otherness which is Deleuze and Guattari's seminal concept of Body without Organs (Corps sans Organes). In unique, different, rare but replicable ritualistic moments, by circulating powerful virtual pre-conscious flows, granular energetic desires, through an intensification of forces, beyond their peaks, in the actuality of a body tendentiously without holes, allowing maximum dervish circulation and preventing energetic leaks, and by letting them run free into and beyond a maximum amplification state, humans construct an alter body, an otherness, and reach a heightened plane of immanence (Deleuze and Guattari, 1972), where organs make no sense, in which a dazzling powerful state of all mighty chaotic otherness takes over, expressing the self at its full power.

Dragons are of many shapes and sizes, usually consisting of a mixture of known animals properties and physiologies, and we don't have to look very far to find artefacts everywhere that remind us of them. From cities' insignias to mythological folklore, bedtime stories and fantasy books, toy and souvenir shops, movies, paintings, sculptures, games, etc. Most importantly, they are also similes of enormous greater than human powers and abilities, friendly or foe, that also resonate with the kantian notion of sublime (Kant, 1992), where one cannot grasp entirely the immensity of their being, the scope and latitude of possibilities of their actions when set in motion, due to being enclosed in an unreferenceable and all mighty mythological human millennial reality. At the same time, we attempt to interact and inhabit the vivid shape presented to our consciousness. The mind is subsumed by this loop of attempting to inhabit this illusion and to grasp dragon's physical traits with known animals that it's accustomed to. And by trying to match the features these combinations give rise to into possible uses – an anticipation which is already somewhat present in a subliminal state due to the contact with the ancient folklore –, the mind is lead through a bridge into a glade where everything can and will be questioned, bread, touched and even perhaps inhabited, beyond the known body until then. There's always room for surprise. And incommensurability, as one attempts to become a dragon. The very simile these creatures stimulate. It's not only a question of matching known feature elements through the fantastic combinations present in dragons, but more importantly, the different movements and ways of displacing through reality which the combinations in the reptilian animals arouse. Lines of otherness intensification, bread by the imagination, that circulate and amplify in the body, like gigantic waves in the identitarian ocean which subsume normal human perception into a deleuzian plane of immanence. Fire breeders, water cuspers, flying snakes, winged warriors capable of apparently impossible feats, they are questionably the lions of a mythological fantastical jungle.

Using immersion and full body computer vision based interactivity, with a disruption of the normal human perceptive senses and movement abilities, gifting human users a new sense of perception and new ways of playing in the game/virtual cyber-world, this interactive electronic installation work endeavors a practical research into creating an audio-visual game space environment which fosters the user's ability to become a representation, to inhabit non-human points of view and to make them feedback on the human. To construct a non-human embodiment system through electronic means as a laboratorial art installation space. Human users are immersed in a cathartic, stochastic, full body immersive videogame experience in cyberspace. They unleash their dragons, when immersed, mediated through this experience.

DRACO.WOLFANDDOTCOM.INFO (Sier 2015) is a single player or local multiplayer interactive installation programmed in C++, composed of one or several networked nodes, where each node holds a computer, a video projection, interactive sound composition, and a camera based interface that operates as a game joystick and also inserts the user and his flying gestures performed mid-air in a proto-videogame stochastic environment, which is shared across a local network. Human users are real time meshified into a solid black – or randomly colored when under enemies line-of-sight –, ill-defined dragonic shape, where the contours of their bodies are somewhat stretched in the x axis, and the captured point cloud of the sampled instant from the depth camera serves vertices to an elongated three dimensional mesh composed of many triangles that undulate near instantly at the same time the user makes a gesture (see figures 2, 3). Using these techniques, every user has their own unique user-dragon, made up from features of their tracked human body in the installation. Instead of attempting a well recognizable pre-modeled dragonic image as the users' avatar, the aesthetic choice of an unique, user bound, ill-defined, abstract, elongated triangular mesh was opted as means to facilitate transportation to the surreal low-fi virtual environment, as well as to leave the focus of the interaction on the mimicking of flying gestures from the user part into a fluid flying movement of the user-dragon avatar in the 3d game space.

[insert figures 2, 3 here, this text not part of article]

Figure 2: recorded frame from user-draco mesh created by DRACO.WOLFANDDOTCOM.INFO

Figure 3: recorded frame from user-draco mesh created by DRACO.WOLFANDDOTCOM.INFO

The objective of this interactive work is thus to build and set afoot a practical responsive programmed electronic construct which facilitates tangible means towards otherness embodiment. It is the first work in the wolfanddotcom series which investigates immersive interactive electronic pathways as bridges to non-human otherness and embodiment. The wolfanddotcom series (Sier, 2011-), named after a creative combination of animality entwined with cyberspace, seeks to create experiences which expand human-body perception and consciousness by inducing a shift onto other species/bodies, by playfully inciting ilinx (Caillois, 1958) via altering and disrupting the perception of self, mediated through technology, algorithms, and custom human-computer interfaces. These cyber-environments thus become laboratories which operate as practical means of immersion of animal embodiment and a locus for study of human behavior. By forging a sense of otherness in the self, deepened into almost inhabiting other species, human users become more aware of their environment, and active listeners of their surroundings and of other lifeforms. Gifted with new senses, the player is now extended, transported inside the experience (Figure 4).

[insert figure 4 here, this text not part of article]
Figure 4: first presentation of DRACO.WOLFANDDOTCOM.INFO at Espaço do Tempo, 28th March 2015

Videogames as consciousness research

In the seminal work Homo Ludens (1939), Johan Huizinga applied game theory to different aspects of human life. An innovative concept since games have been assigned almost exclusively to the ludic sphere, and not as tools to everyday aspects of human life. Though Huizinga tended to theorize about games looking too often at competition. While it is a major game category, there are and were other uses and categories for games. For instance, McGonigal (2011: 5-6), citing Herodotus, remarks an ancient episode where intensive game playing and inventing by the Lydians performed a life-saving role: “The plan adopted against the famine was to engage in games one day so entirely as not to feel any craving for food”. Also, Roger Caillois (1958) built upon and disputed Huizinga's emphasis on competition in play, formulating four separate categories of gameplay: Agon, Alea, Mimecry/ Mimesis, Ilinx. Ilinx focuses on using perception disruption, engendering on the player a vertigo-like sensation. It is this last game category of ilinx, which Caillois exemplifies with daring games of physical feats capable of disrupting normal perception, around which the gameplay in DRACO.WOLFANDDOTCOM.INFO is modeled and may serve as a gateway facilitating otherness intensification into non-human embodiment.

Videogames are among the most elaborated software programs, which house a significantly large number of procedures in every displayed frame. Running in logical machinical substrates, which control-flow electricity as data information at dazzling speeds through labyrinthine electronic circuitry, following highly complex algorithms, which combine almost all computer's abilities at circa 60 frames per second, almost instantly, providing at human scale and their senses a feasible replica of reality, or engaging other realities. They are also a most effective mean by which, through simple interactive experiences (key stroking, mouse moving, sonic, visual, physical or etc input interfaces), it is possible to engage in first-person played experiences, storytelling and even to achieve immersive otherness. They feedback from life and have the potential to modify the self (Sier, 2016).

Videogames holistically merge numerous sciences, arts, engineering and logic to provide a virtual time-space continuum closer to the experience of reality or of experienceable alternative realities: breadboards of reality that feedback from the real, stimulating and modifying the human virtual, which leads the actual and the virtual on the human person; they are playable interactive experiences, safe spaces for experimentation, that convey meanings, knowledge and experiences in ludical ways (Sier, 2016).

The experiences they provide are directly related to the players dexterity in unravelling the full game. They are also a plateau which often combine mini-games within the game, or structure one or many playable experiences through a sequence of goals: objects the player must pick up, keys to open game regions, puzzles that lock game progression, physical dexterity demanding fast reflexes in evading obstacles at high speeds, knowledge incorporation and testbeds, otherness experiences.

Interactive electronic new media arts, through technology, place the viewer as an active observer-participant, while freeing artistic and technologic works from the time and space domain, since it never repeats and its scope can be near infinite, while being interactive to the player's decisions. Unlike time-based works of exact duration, user actions are fundamental in unveiling the full scope proposed in the work. More and more interest is being given to videogames as tools able to foster experiences in the first-person by interacting with the programmed machines. They can act as privileged means to study and even enhance consciousness. Shifting the human from passive viewer to active participant in the work leads to immersion and knowledge incorporation, based on the videogame proposed experience. A good example of this perspective is the work Night Journey (2003-) by Bill Viola, a well-known video artist who manifested interest in making videogames, depicting a metaphysical voyage interactive and dynamically defined by the player's decisions (Fullerton 2009).

Immersive games provide virtual environments where usual rules can be changed and explored into creating distinct modes of experiencing, beyond reality. Humans, animals, plants, lifeforms in general, experience reality through their limited enclosed machinic but permeable bodies (Haraway, 1989), driving and redefining their actuality in reality through their unique breaching desires and goals (virtual plane) (Deleuze & Guattari, 1972). It may be possible to create experiences which expand human body perception and consciousness by inducing a shift onto other species or other bodies, by playfully inciting ilinx (Caillois 1958) via altering and disrupting the perception in the self, mediated through (a) technology, (b) genetic, evolutionary, generative algorithms, and (c) custom human computer interface research. This may also forge a sense of otherness in the self, deepened into almost inhabiting other species, making human users more aware of their environment, enhancing an active listening of surroundings and of other lifeforms, of sharing a common field. Gifted with new senses that computer game technology provides and with the algorithms engineered by the programmer, the player, oblivious of the human body, is now extended, transported inside the experience.

Like interactive windows into an existing imaginary virtual game logical-space, the immersive game, played in the first person, through invisible or haptic interfaces, sonifies and visualizes the experience of inhabiting other species. Consciousness can then shift from human reality to virtual animality. A possible seed onto new laboratorial ontological playgrounds, inserting the human in non-human points of view, facilitated through interactive immersive art. We've already observed how Deleuze and Guattari ascribe identity to that which breaches it. An otherness intensification so profound that reveals the innermost porous identitarian traces. As Ascott (2006: 70) acutely stated:

We should perhaps be open to the idea that “individual consciousness” may be an oxymoron. While individual self–awareness is a prerequisite of living beings, consciousness is more likely to be the attribute of a field than of the individual organism.

The Draco experiment

DRACO.WOLFANDDOTCOM.INFO hides beneath a physical dexterity game with full body interface its real target of achieving non-human otherness through the cathartic engagement on the game mechanics and the innovative full body interface. This main objective is highly facilitated and induced in the tangible installation space through the technology, the cathartic gameplay, the being able to fly and havoc making fireball cusping, simulated and immersive experience.

In this piece's conception lays a simple rudimentary and minimalistic game logic that ascends in difficulty as the levels progress. The human-dragons are spawned in an initially small game arena which encloses stochastic city-like landscapes, populated with colorful either static or moving enemy game agents, which are trying to take down the mythological beast. The player-dragon's purpose is simple: to inflict damage anywhere, in the city buildings, in the enemy game elements, to unleash his anger like an endangered dragon fearing for his life, trailblazing a path of cathartic destruction as he progresses throughout the experience. The dragons inflict damage either by hitting the buildings, or by cusping fireballs at them or at enemies. As the player manages to progress through the levels, the arena expands, the cities structure evolve and grow, more enemies populate the space while becoming more aggressive and harder to take down, as well as a finer and faster joystick response, as the dragons turn quicker and fly faster, demanding from the human user a better precision and acute control.

[insert figure 5 here, this text not part of article]
Figure 5: DRACO.WOLFANDDOTCOM.INFO at MU.SA, Sintra, during Aura Festival 2015

As with almost all my installations and game experiences since the late nineties, all visual design, terrain, city constructions and structure is fully algorithmically generated, without any loaded game pre-made designs or structures other than mathematical formulas which are fine-tuned and parametrized towards reaching the generative algorithmical drawing the computer synthesizes at run time of the experienceable virtual space. All the elements are housed in a custom game engine specifically programmed for this installation, modified and evolved from piece to piece, targeting each unique work its engine infrastructure requirements. Stochastics plays a major role in this kind of design. It is however a structured stochastics synthetic design, as if sculpting the logical-space of the game elements within the gameplay. Its goal is to emotionally envelop the user into the amazing combinations that the stochastics of distinct elements arouse in the virtual space as well as to address a resemblance in difficulty assigned to each distinct level. Distinct algorithms arrange the structure of the city – either circular, grid-like, scattered, with density peaks, random –, the size of the buildings, the terrain configurations, the enemies' meshes. Every time a user enters any level the game presents a new and unique configuration of elements, but the number of elements and their difficulty characteristics as well as the size of the bounding arena space is quite similar among distinct though same level spatial configurations.

Draco resembles a videogame due to the logic it is embedded in, but perhaps it's more accurate to state it is a proto-videogame, as if near a videogame sketch, following a videogame structure to present an objective to the user in the experience, but not caring much about the immersion in the game logic and the overwhelming realism mainstream videogames tend to have nowadays. The game logic is present as a means to provide the players a simple cathartic and fun objective. The focus of the work is given more to the whole illusionary and abstract experience of suddenly our actual body can virtually and actually fly, it can be transported and transfigured into a dragon inside the game space, and it's simply by moving the arms with flying gestures in mid-air, without touching any object or controls that the user gestures' are invisibly interfaced to operate the game, with no feedback other than the game visuals and sounds that respond to the players input through its logic design.

The sound of the environment has a major near-invisible role in heightening the sense of immersion in the abstract game-space. Recorded children voices gnarling and making eerie noises, imitating their own dragonic sounds, drawn from their imagination and from suggestions made during the recording sessions, have been electronically modified and composed into ambient or event sounds. The music is scattered in the game's virtual space, with radii sonic activated composition which sets tone to the environment. To the spacial musical elements are added triggered responsive sounds which go along with the actions players perform and their feedback on the game space.

As one escalates the apparently infinite and unconstrained levels, the relatively small gameplay arena of the first levels gives rise to a greater spatium where the game logic is ever performed. The heightened number of events of the first levels, in the constrained smaller space, which serves as tutorial for physical control of the near embodiment and required destructive and evading logic to advance in the levels without being killed, slowly gives rise to more and more empty moments

as the player seeks the city structure or other game agents to complete yet another level. However, the seeked elements are now engulfed in a reduced random region of the larger game spatium compared to the initially small arena of the first levels. Without other game elements on scene other than the user-dragon and the seemingly infinite generated terrain along with its spatial audio composition, hopefully now the proto-game gives rise to a silent tranquility of non-human embodiment hovering over the flying, after traversing the intensity of the first easy though troublesome and action frenzy levels, as if the user has by this time grown his wings, to leave him space and time to enjoy the immersive otherness as if hovering on it. It also serves as a balance in the psychological attachment to the videogame, leaving more mind space to the contemplation of the aural and visual experiment provided by the game. This virtual space based partitioning composition approach was refined and based in previous and current works such as 0 0 255 (1999), k. (2007), 577Rhea (2012), Hyperborea (2012-5), 747.7 (2014), Atlantis (Sólon Interface) (2016), among others. Composing visual and aural events in spatiality resembles deeply our own approach of the sense data through the experience of others and otherness in our own body. And it's a compositional technique which virtual infinite space provides an easier use, instead of, like in reality, to scatter the events throughout the real world space.

Invisible Human-Computer Interfaces

The core of Draco's interface lays in a camera based joystick that captures player presence in a thresholded distance from the piece's projection and estimates a simple skeleton based shape from the human image camera input. From the camera calculated skeleton it is then possible to estimate the main parameters to drive the dragon: the angle between the arms positions, which calculates and provides the turning amount in the game space; and the distance between the arms, which sets forth the speed parameter for the draco's avatar in the cyber-environment.

Unlike most computer vision works that rely on OpenCV (Intel Research, 2000) – a famous computer vision library developed by Intel and hundreds of computer programmers –, this piece relies on a custom tailored computer vision library that has been developed since 2006 named Flob. Flob (Sier, 2006-) is a flood fill multi-blob tracker and simple skeleton estimator, not as fast as OpenCV, but engineered to calculate parameters that the robust Intel library cannot.

Flob's development began as a Max/Jitter C programmed external for my 747 series (Sier, 2002-), dubbed a-jit.human (Sier, 2006), on which a single image blob – i.e., an individualized thresholded binary island region with the picture frame –, after being found in the incoming camera image, is additionally scanned for extra parameters estimation (Figure 6). Since node based languages tend to be cumbersome while building complex interactive pieces that rely on computer vision, game tree's, collision detection, and more programming topics fundamental to game engines, further development on this research work – like multiple blobs support per frame among other algorithmical refinements– was built initially in Processing/Java and later on the robust and faster C++ library for computational artists openFrameworks.

[insert figure 6 here, this text not part of article]
Figure 6: a-jit.human help patch calculating simple frontal skeleton information for 747.3

This computer vision method assumes the interactive agent is on a frontal tracking setup, facing the camera forward, or slightly tilted from above. After individualizing the blob on the camera image through the flood fill method, in which a binary map of the incoming frame is constructed (where white pixels indicate presence and black pixels absence), we now know bounding box, centroid and overall shape of the instant blob. The algorithm I devised in early 2006 to serve as joystick for the piece 747.3 (Sier, 2006) starts after this initial scan (Figure 7). After knowing where to look in the incoming camera image, the algorithm then travels through the blob's bounding box perimeter in an attempt to find where the head, left arm, right arm, left leg, right leg are located. With this extra information we can thus construct a simple skeleton tracker.

[insert figure 7 here, this text not part of article]
Figure 7: 747.3 first public flight at Lugar Comum, 20061116

The algorithm's working flow is simple: if scanning for the head position, scan the topmost line of the bounding box region where the blob is located, starting from the center position and iterating alternatively left and right until either a white pixel in the blob region is found, or the scanning head reaches the extremes of the bounding box in the actual frame being analyzed. If a white pixel is found, the algorithm assumes this is the head's current position, and continues to track other features. Calculating the arms positions was a bit trickier, since sometimes when humans simulate flying gestures with their arms, seldomly the arm region is not on the left or right perimeter of the blob region, but instead located in the top or bottom ones.

After knowing where to pinpoint the arm's positions within the blob we have now the necessary information to build the invisible joystick mechanics. While on 747.3 the simulated flight is merely in the frontal direction, allowing for some left right tilting of the user-plane's avatar in the audiovisual environment, on DRACO.WOLFANDDOTCOM.INFO the 3D space is entirely open and the user can apparently travel towards any direction on the virtual world. The basis of both these interface mechanics are similar: one constructs a line from the calculated flob's left and right arms positions in blob space. The slope the arms' line provides serves as left or right directions, and the proportional lines' length is directly mapped to the influence the physics speed of the avatars in the game world.

The skeleton tracking abilities of Flob are not robust as to track a finer tuned skeleton shape in any camera orientation. Or to estimate future poses based on the current ones like some skeleton trackers provide. It only works in a frontal camera setup on the actual instantaneous image frame and is incapable of calculating accurately the bodies extreme positions if this assumption is changed. However, this code has served well its purpose within both these interactive works, and since robust skeleton trackers are a swampy patented field that emerged in the following years after flob's conception and implementation (Microsoft's Kinect is from 2010 and robust skeleton tracking requires depth image information, while Flob only needs standard rgb images and can as well work on kinect depth images), which require proprietary or platform specific pieces of code, Flob here bridges this gap as a custom made solution that works well for the purpose it was built for.

Conclusion

Technological immersive cyber-environments provide fertile ground for research in the interactive arts of otherness embodiment. Otherness embodiment is a possible touchstone in consciousness research where humans express their identity deeper upon crossing a bridge into mind states where the intensification of forces builds space for a glade. In the glade, apparently anything can be constructed, imagined, touched and even inhabited. Dragons' existence in humanity's mind scape provide concrete imaginary grounds where the mind can run free fostering illusions, feeding on imaginary mythical material, awe-able known animal creative combinations, unheard of possible movements. Illusions may also be intensified beyond interacting with representations into otherness embodiment, which expand the self and feedback on the human, giving rise to a turmoil of sub-consciousness intensification of granular forces, that better draw and actualize its own identitarian boundaries and becoming.

Custom interactive programs, engineered to facilitate humans mind bridges towards playing in cyber-space as human dragons, networked into a cooperative, competitive or solo catharsis, can serve as tools to laboratorially investigate consciousness research, besides exploring and innovating in interactive electronic arts.

Videogames can be tools to delve deeper in the research of consciousness. Besides new videogame experiments, new categories of videogames must be sought. Upon completing this first work in the wolfanddotcom series and reflecting about its possibilities, extended future research in the fields of game theory and programming, custom interactive interfaces and non-human embodiment, becomes highly luring towards forging magical interactive constructs that operate, unveil and fine tune self-profound amplifications.

References

Ascott, R. (2006). “Ontological Engineering: Connectivity in the Nanofield”. In Engineering Nature: Art & Consciousness in the Post-Biological Era, pp. 69-76. Bristol: Intellect Books.

Caillois, R. (1958). Les jeaux et les hommes. Paris: Gallimard.

Deleuze, G. & Guattari, F. (1972). L'Anti-Oedipe. Capitalisme et Schizophrénie 1. Paris: Les Éditions de Minuit.

Fullerton, T. (2009). “Reflections on The Night Journey: an Experimental Video Game”. In Kritische Berichte: The Ludic Society – The Relevance of Videogames, 2.

Haraway, D. (1989). Primate Visions: Gender, Race and Nature in the World of Modern Science. New York: Routledge.

Huizinga, J. (1939). Homo Ludens. Versuch einer Bestimmung des Spielelements der Kultur. Basel : Burg-Verlag.

Intel Research (2000-). OpenCV – Open computer vision. Available at: http://opencv.org

Kant, I. (1992). Crítica da Faculdade do Juízo. (Originally published in 1790 with the title Critik der Urteilskraft von Immanuel Kant). Lisboa: Imprensa Nacional - Casa da Moeda.

Manovich, M. (2001). The Language of New Media. Cambridge, Massachusetts: The MIT Press.

McGonigal, J. (2011). Reality is Broken: Why Games Make Us Better and How They Can Change The World. New York: The Penguin Press.

Sier, A. (2002-). 747 series. Available from: http://andre-sier.com/747/.

Sier, A. (2006-). Flob, a computer vision library for Processing and openFrameworks. Available from: http://s373.net/code/flob

Sier, A. (2006). 747.3. Available from: http://andre-sier.com/747/747-3/

Sier, A. (2011-). New interactive art series Wolfanddotcom. Available from: http://wolfanddotcom.info.

Sier, A. (2015), Local multiplayer immersive dragon simulator piece: DRACO.WOLFANDDOTCOM.INFO. Available from: http://andre-sier.com/wolfanddotcom/DracoWolfAndDotComInfo/ and http://draco.wolfanddotcom.info

Sier, A. (2016). “Artefactos da porta escondida da ponte. (Lançados para dentro de um Labirinto)”. In Cibertextualidades #8 (in press). Porto: Ed. UFP. ISSN 1646-4435. Will be available from: http://cibertextualidades.ufp.edu.pt/

Viola, B. (2003-). The Night Journey. Available from: https://www.youtube.com/watch?v=zL1_twK2NDc.