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Rechteck Fyrkant: If they were the same thing, they were the same thing, but they are not.

André Rangel
i2Ads – Faculdade de Belas Artes da
Universidade do Porto
Av. de Rodrigues de Freitas 265,
4049–021 Portugal

1. ABSTRACT

Generative audiovisual performance where human and machine interact. An original, customised and computerised hyperinstrument generates highly synchronised audiovisuals that are affected by the human performer. Based on a couple of video white noise generators, unpredictable rhythmic sequences and tessitura are calculated and perceived by the audience as precisely synchronised audible and visible events. Retinal images and positive after-images, resulting from instinctive saccade movements, are naturally assembled by audience individual visual experience. In *Rechteck Fyrkant* the visual doesn't follow the audible and the audible doesn't follow the visual, they don't just concur, they occur as unit.

2. CONCEPTUAL CONTEXT

2.1 Algorithmic Composition

In *Rechteck Fyrkant* the space between creative vision and randomness is explored. Algorithms are transformed into a medium of artistic creation through thought and practice that enhances the capacity of expression through the development of principles and methods that support the creation of systems for data creation, calculation and mapping. An original, executable algorithm that uses data, determined by stochastic processes, is the core of this performative system.

2.2 Generative Art

Galanter (2003) proposed a definition of Generative Art:

> "Generative art refers to any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art."

Boden and Edmunds (2009), reiterate Galanter's proposal when they state that the term Generative Art:

> "[C]onverged on work that has been produced by the activation of a set of rules and where the artist lets a computer system take over at least some of the decision-making (although, of course, the artist determines the rules)."

Taking as consensual Galanter's statement that the key element in generative art is […] the system to which the artist cedes partial or total subsequent control, then, *Rechteck Fyrkant* can be categorised within this subset of art. For *Rechteck Fyrkant* an autonomous system was designed and programmed, based on a white noise vídeo generator that calculates in real time unpredictable rhythmic and micro-melodic sequences that are perceived as precisely located audiovisual events. The system, activated and stopped by a human, runs autonomously and the human – performer – can choose among different system states and influence, on each of them, two probabilistic systems – tessitura/gamut and rhythmic (in)determinism.

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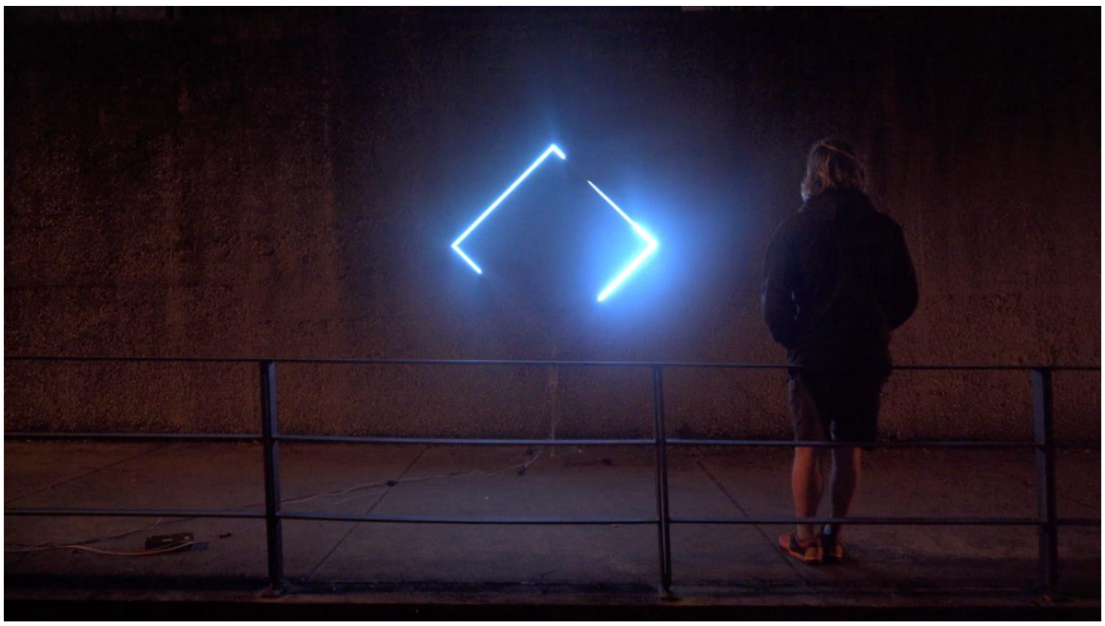


***Figure 1**: Rechteck Fyrkant video documentation (https://vimeo.com/678235622).*

2.3 Perceptual Object

In our daily experience nearly all audible phenomena has a visual event associated to it. Without physical obstacles, when we see heavy rain hitting a surface we also hear it. For Bizlei et al. (2016) visual and auditory objects share properties: both have linked features that change over time and perceptually group together acoustic and visual features. Most objects and events in the external world generate concurrent inputs to several different sensory modalities (Teramoto et al. 2012).

Recent studies on multisensory perception have revealed that different sensory modalities (audition and vision) are closely related and mutually interplaying when processed in the brain.

Hearing and seeing at the same time can be named as auditory-visual integration. Bizlei et al. stated that what we hear and see take strikingly different physical forms, and are necessarily encoded by different sensory receptor organs, but auditory and visual features are effortlessly bound together to create a coherent percept.

O'Callaghan (2017) proposed that both vision and audition involve awareness as of mereologically complex individuals. He considered that perceptual objects bear features, but also have part-hole structures and proper parts that are treated collectively as a single perceptible unity. Grounded on this brief literature review, *Rechteck Fyrkant* as a highly synchronised audiovisual event becomes a single perceptual object that affects simultaneously the senses of hearing and seeing in time and space.

2.4 Positive After-Images and Retinal persistence

Sanford (1891) defined positive after-images "as a disturbance set up in the retina [that] does not at once subside but lasts an instant after the removal of the stimulus". He adds that "if stimuli follow in sufficiently rapid succession the disturbances are added to one another and fused and the result is the same as though the stimuli had reached the retina simultaneously". Sanford grounded is considerations on Helmholtz that defined as "after-images, accidental or consecutive images" "in which the relations of light and shade of the original object are preserved" during a short duration of time. As Helmholtz observed, a positive after-image, "is a phenomenon of retinal inertia, or the prolongation of retinal excitation". Sanford, quantified the rate of succession necessary to give a uniform sensation – 25 to 30 per second.

Directed towards the audience *Rechteck Fyrkant* produces irregular flashes of light, that last for just some milliseconds, that have different lengths (number of LEDs), and flash at different locations of the square frame that hold the LED strips. During the performance audience will experience strong and

vivid multiple, sequential after-images that will be "imprinted" in different regions of the retina resulting in unpredictable, individual visual assemblages/compositions. These unpredictable visual compositions that occur exclusively in the retinas of the eyes of each audience member occur due to several instinctive, consecutive saccades – defined by Purves et al. (2001) as "rapid, ballistic movements of the eyes that abruptly change the point of fixation." Therefore, a *Rechteck Fyrkant* performance should be preceded by the disclaimer "Caution – this show may not be safe for some people with epilepsy. Some lighting is used at this show that may be disruptive to people who are sensitive to light".

2.5 Gestalt – Laws of Closure, Similarity, Proximity and Continuity

The visual display in *Rechteck Fyrkant* is constituted by four high density addressable LED strips that together form a one-meter side square rectangle. One each side of the figure there are 144 LEDs however, the 576 LEDs (4 x 144) that form the square are never flashing at the same time. Verified that are the Gestalt laws of closure, similarity, proximity and continuity, audience members will create, with their own visual perception system, different visual structures and patterns.

3. REFERENCES

Bizley, Jennifer K., Maddox, Ross K., Lee, Adrian K.C. (2006) Defining Auditory-Visual Objects: Behavioral Tests and Physiological Mechanisms. *Trends in Neurosciences*, Volume 39, Issue 2, February 2016, Pages 74-85. Online: https://www.sciencedirect.com/science/article/pii/S0166223615002817

O'Callaghan, C. (2017) *Beyond Vision: Philosophical Essays* (Illustrated ed.). Oxford University Press.

Purves D., Augustine G.J., Fitzpatrick D., et al., editors (2001) *Neuroscience. 2nd edition*. Sunderland (MA): Sinauer Associates; 2001. Types of Eye Movements and Their Functions. Available from: https://www.ncbi.nlm.nih.gov/books/NBK10991

Sanford, E. C. (1891) A Laboratory Course in Physiological Psychology. *The American Journal of Psychology*, 4(1), 141. https://doi.org/10.2307/1411843

Teramoto, Wataru; Hidaka, Souta; Sugita, Yoichi; Sakamoto, Shuichi; Gyoba, Jiro; Iwaya, Yukio; Suzuki, Yôiti (2012) Sounds can alter the perceived direction of a moving visual object. *Journal of Vision* March 2012, Vol.12, 11. doi:10.1167/12.3.11 Online: https://jov.arvojournals.org/article.aspx?articleid=2121046