

Found Systems As Glitch Culture

Peter Beyls

School of Arts, University College Ghent, Belgium

www.kask.be

peter.beyls@hogent.be

Jerry Galle

School of Arts, University College Ghent, Belgium

www.kask.be

jerry.galle@hogent.be

Abstract

Most generative art develops imaginary worlds; some form of conceptual machinery, formalized and implemented as to manifest itself in a given medium. In contrast, this paper considers the algorithmic potential of found social systems within the audiovisual medium of film. We contextualize found systems in the light of glitch culture – the deliberate design of imperfection or the exploration of the functional edges of media – through a significant number of examples. Two projects recently implemented at Interaction Lab of UC Gent receive detailed analysis in terms of inspiration and performance. Semantically speaking, the paradigm of film is kept intact though subtle audiovisual manipulations suggest raised awareness in the onlooker while continuously balancing between the obvious and the unpredictable.

1. Definition and history

Astronaut John Glenn first used the term *glitch* in 1962 for describing erroneous and unpredictable behaviour in electronic circuits. Errors often happen spontaneously; therefore they refer to the true nature of things. The genuine character of either tangible or virtual machinery (i.e. hardware or software) gets exposed through non-intentional behaviour. Conversely, glitch aesthetics embraces the unpredictable; it not only accepts irregularities but also suggests active exploration of the potential of accidental performance.

Glitch culture challenges the idea of ‘perfect design’ that is generally believed to be the standard in digital media production. Ironically, most drawing software emulates the inherent physical irregularities of traditional media such as pencils, paint and even the physical characteristics of paper. However, true glitch orientation is much more complex to characterize; the main distinction is between (1) the deliberate creation of accident or (2) expressing blind faith in the accidental discovery of the unforeseen. The first attitude implies an *explicit* orientation towards the design process. The artist creates systems engineered to produce (partially) predictable

output confined by (conditioned) randomness. The second attitude acknowledges the *implicit* authority of nature; biological systems develop natural cycles of development and disintegration.

Examples of work incorporating systems aesthetics, a style of procedural thinking related to the practice of conceptual art, are works made using chemical processes (biological or synthetic) such as found in the works of Alan Sonfist or Herman De Vries [5]. Probably the most dramatic example of nature interfering with art is *Spiral Jetty*; a 1500-foot coil of black basalt rocks near Salt Lake City. After 30 years, the landmark sculpture re-emerged from the sea, thus exposing a fresh appearance, because it was completely covered with white salt crystals.

Another materialist precursor of unconventional threshold considerations in the arts is certainly the field of experimental film. As an articulate key figure of underground film, Stan Brakhage describes his technique to Jonas Mekas in 1962: "By deliberately spitting on the lenses or wrecking its focal intention, one can achieve the early stages of impressionism... One may hand hold the camera and inherit worlds of space. One may over- or under-exposure the film. One may use filters of the world, fog, downpours, unbalanced lights, neons with neurotic colour temperatures, glass that was never designed for a camera..." [7]. Early experimental film exemplifies the power of direct physical manipulation and tactile involvement with a creative medium; one may paint the film, scratch and clip holes into it. Brakhage grew mold directly onto film; a significant pioneering instance of (now quite common) Artificial Life oriented thinking in the arts.

Inaccuracies in the human genetic evolutionary process or disease may either trigger uncommon potential or severe inadequacies. Django Reinhardt developed an utterly wonderful personal style of playing the guitar using just three functional fingers. When Joni Mitchell contracted polio, a crippling illness weakening her left hand, she responded by developing highly personal, alternative guitar tuning systems; physical constraints creating a distinct personal system of chordal harmony. Mitchell confirms her quest for novelty while facing constraints; "I called them chords of inquiry, they had a question mark in them." [8]. Blues legend Hound Dog Taylor was born with six fingers on his left hand, he developed an astounding style of brilliant slide guitar.

Sometimes, virtuoso instrumental performers face physical illness and degradation. When guitarist Derek Bailey was diagnosed with the carpal tunnel syndrome in his left hand, he decided to refrain from surgery and accept the inevitable as a welcome source of novelty. Historically considered a key figure in the British music scene of free improvisation, Bailey developed performance modes by avoiding the constraints imposed by conventional musical perspectives. Paradoxically, the consequences of physical limitations were, however, graciously integrated into his performance practice and cautiously documented in series of chronological recordings spanning 12 weeks [1].

When serious health problems prevented Henri Matisse from painting, he reorganized his artistic method by turning to scissors for 'cutting directly into colour'.

2. Cultural contextualisation

Let us now focus on the first attitude; the one associated with culture rather than nature, a methodology devised to help design imperfection [9].

Paradoxically, the addition of advanced technology to the artists' palette equally introduced a raised awareness for the functional limits both in terms of hardware and software. By definition, any technology is characterized by promise and failure – and historically speaking – many artists went to great effort to devise methods for exploring the unstable edges of media. Let us first consider three related artists; Tinguely and SRL. Swiss sculptor Jean Tinguely created kinetic machines designed to function on the brink of what is physically achievable; electric motors activate an intricate mechanical construction of interconnected parts giving the impression of functioning on the threshold of collapse. In 1969, a huge self-destructive machine, entitled *Homage to New York*, was erected and forced to disintegrate at the Museum of Modern Art, NY. The Bay Area collective Survival Research Laboratories (SRL) develops highly advanced machinery often incorporating control systems of military sophistication. Yet typically, many such machines are left to interfere in spectacular inter-machine performances, while pyrotechnics adds another pinch of instability [11]. In conclusion, the ultimate aesthetic in this form of hardware hacking is simply total destruction.

Let us briefly consider the field of interactive composing; a form of human-machine interaction where musical ideas are generated and interchanged by human and synthetic performers. Musical improvisation thrives from a confrontation with musical contexts generated and evaluated by the two improvising parties in real-time. In keeping a conversational attitude, it is mandatory that human and machine somehow connect in the huge space of infinite musical dimensions, yet, a critical amount of surprise is required to guarantee motivated participatory behaviour. Thus, rewarding interaction is believed to be supported only by a critically tuned cognitive platform. Interestingly, randomness has been investigated extensively to generate machine-melodies in response to human input [6]. A deeper form of unpredictable behaviour, while maintaining a coherent connection to a performance context is by way of genetic algorithms. In brief, the idea of a motivated machine is introduced; for instance, is the machine willing to integrate with a human suggested context? If so, genetic algorithms might evolve software modules to both interpret human input and to generate the appropriate machine responses. Genetic fitness is then implicit to the resulting changes in musical distance between human and machine [3]. It is significant to realize that inaccurate reproduction (the combined effects of crossover and mutation) globally provide the intended sustained functionality.

Musical improviser Michel Waisvisz explored quirks in music synthesizer operating systems to spectacular effect. He played synthesizers in ways not intended by their original designers. Waisvisz developed a highly idiosyncratic performance mode still using standard commercial equipment. As a listener, fascination emerges from the integration of two observations: (1) virtuoso instrumental control over musical processes through bodily (physical) effort and (2) the sonorous excellence of the unusual timbres gained from hacking the initial intentions of electronic instrument

manufacturers [16].

One might say that the actual practice of improvisation intimately acknowledges the exquisite potential of the accidental; the creative spark in the unintended yet coherent behaviour. Expressed in the words of Steve Lacy; “For me that’s where the music always has to be – on the edge – in between the known and the unknown and you have to keep pushing it towards the unknown otherwise it and you die” [2].

3. Philosophical contextualisation

In the early 1950s, John Cage developed the idea of “indeterminacy” in an attempt to exclude any distinctive form of personal decision-making. Significantly instructed by Eastern philosophical concerns, Cage fully emancipated the accidental as the subject matter of his art which is perhaps best exemplified in his piano piece 4’33”.

In an influential paper entitled Museum of Accidents, Paul Virilio equally calls for the general acceptance of the unknown as vital in any culture. According to Virilio [15], substance and accident are seen as complementary; any creative process should embrace the unpredictable, there are no negative considerations for mistakes, errors are viewed as constructive agents. Virilio’s imaginary museum formulates an activist viewpoint towards imperfection and dysfunction. Catastrophes are the inexorable consequences of the acceleration of socio-cultural phenomena. The museum’s *raison d’être* is an instinctive reflex to study the unpredictable by “exhibiting the accident”.

Manifestos

It is perhaps striking that many glitch artists turn to manifestos for claiming cultural territory to express radical attitudes and working procedures including controversial methods such as appropriation.

Manifestos include the Manifesto of Futurism of 1909, the Manifesto for the Unstable Media published by the V2 Organization and the Incomplete Manifesto for Growth written in 1998 by Bruce Mau.

Marinetti embraced electric power, movement and speed brought along by the industrial revolution; he acknowledged their potential for changing social structures in radical ways. The seventh statement in the Manifesto of Futurism reads: “Beauty exists only in struggle. There is no masterpiece that has not an aggressive character. Poetry must be a violent assault on the forces of the unknown, to force them to bow before man” [14]. The prospect of instability is fiercely implicit in this statement.

The V2 Organization manifesto, published in 1987, elaborates on the image of instability, as a metaphor of contemporary society, while the most significant feature of the new digital medium, including networking, is the introduction of instability and insecurity in global socio-cultural relationships.

Bruce Mau’s influential manifesto connects strongly with the idea that accidents should be captured as part of any design process: “The wrong answer is the right answer in search of a different question” [10]. Again, the forces of the unknown are considered vital towards the establishment of a creative process driven by changes

rather than outcomes.

Designed unpredictability enjoys a long tradition in software art through the use of random number generators. A concise analysis is beyond the scope of this paper. We shall, however, explain the ideas and implementation of *DataScript*, a recent project in the realm of algorithmic cinema.

4. Project DUSK



Figure 1. Impending fog in Amsterdam harbour.



Figure 2. Electric light about to interfere with daylight.

Project *Dusk* reveals a fascination for 'found systems' in analogy with the idea of

found footage in the field of experimental film. *Dusk* is intended as a movie as well as a real-time audiovisual installation. The movie is constructed from consecutive frames taken from a camera overlooking the Amsterdam harbour over an extent of 24 hours. The film features an impressionistic undertone given a low-resolution camera and occasional interference and glitches in the transmission channel. However, the most fascinating images unfold as electric lights illuminate the darker stage of twilight. As a consequence, the movie suggests a developing atmosphere conditioned by human (cultural) as well as ambient (natural) phenomena. The various image transitions evocating variable colour content and fluctuating degrees of abstraction are inherent qualities of the method employed here; the individual frames were not in any way manipulated after being captured. In essence, the project may be thought of as created by a generative system built out of three critically configured components; (1) the harbour as a 'found' system, (2) the environmental conditions and (3) the Internet. Figure 1 shows part of Amsterdam harbour, modulated by a foggy filter provided by temporary atmospheric conditions. Figure 2 captures the point in time where electric light just takes over from natural environmental light. Both images were taken from a webcam on December 22, 2009. *Dusk* was implemented in processing [13].

5. Project DataScript

This section provides a description and analysis of project *DataScript* realized in 2011. A short movie clip shot in Le Marais district of Paris is considered a found system, a micro-universe in itself organized according to the myriad of concealed social forces shaping city life. However, the movie is equally acknowledged to reflect certain aspects of the social affinities being expressed between the agents captured in the movie. The behavioural complexity of the movie is addressed with a systems-aesthetics in mind; is there a way to sensibly interface the implicit activity in the movie with some activity in an explicitly designed algorithm? How could the rhythm of life in the Paris biotope face critical analysis and successfully spawn audiovisual comment in real-time? These thoughts are informative in order to address the medium of film from a novel perspective, though, as we shall see, the general projection format of the movie is preserved.

The project *DataScript* aims to validate the rich yet surprisingly coherent behavioural scope of the movie in terms of new visual and sonic material. To this purpose, consecutive movie frames are analyzed in terms of brightness – colour information is not considered. Being implemented in Max/MSP/Jitter (Cycling74), the functionality of the *cv.jit.moments* external library developed by JM Pelletier [12] serves our application as it computes a wide range of invariant shape descriptors.

The global mapping approach is organized as follows: information is extracted from single frames and from changes between frames. A complex, completely deterministic network of mapping modules interprets this information. The resulting analysis controls various attributes of sound and image in real-time.

First order analysis documents shape descriptors; basically, the moments of inertia relative to several image features. In total, for every single frame, the following data is retrieved: moments, Hu invariants, centroids and momentary mass i.e. the total

size of all shapes. A threshold variable constrains the amount of image contents

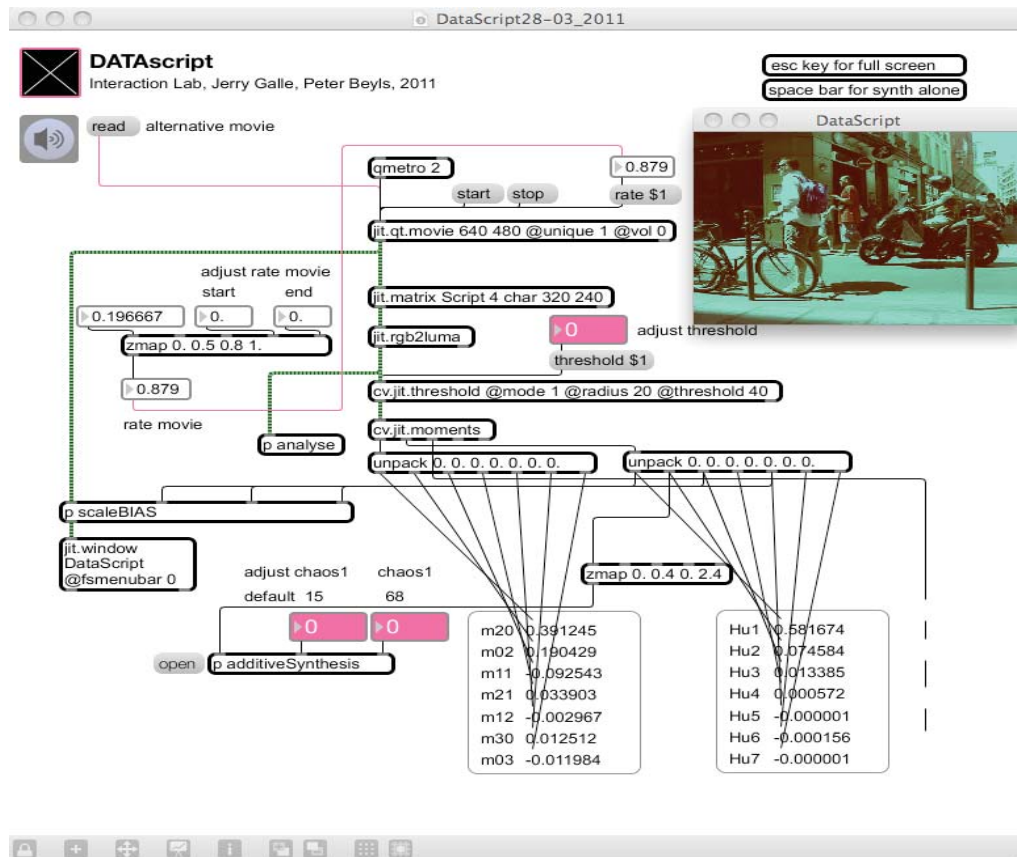


Figure 3. Screenshot of main patch (video) *DataScript*

addressed and is thus to be considered in the mapping process with great care. Second order analysis looks for information *between* consecutive frames: (1) global motion or the amount of difference between frames, (2) the XY-trajectory of the centroid of general motion and (3) the history of the amplitude of general motion. In addition, an adaptive hotspot algorithm is operational; it dynamically follows the centroid of motion with a certain delay. The effect is continuously zooming in on activity as the film develops in time; the mapping algorithm becomes sensitive to visually perceptible regularities expressed between consecutive frames.

Exactly the same type of algorithm is used to map to sound and image. First, analysis data informs the modulation of image colour RGB data and hue – the hue is in fact rotated while luminance data is left unmodified. The outcome is a visual system modifying itself; particular image features will influence the subtle transformation of the same features in the ongoing film.

Both video and audio processing is computed in real-time. We may think of the synthesis section as a blackbox housing a vast network of audio synthesis modules (sine wave oscillators) with variable connectivity. The analysis section creates three data structures for controlling respectively frequency, envelope and amplitude.

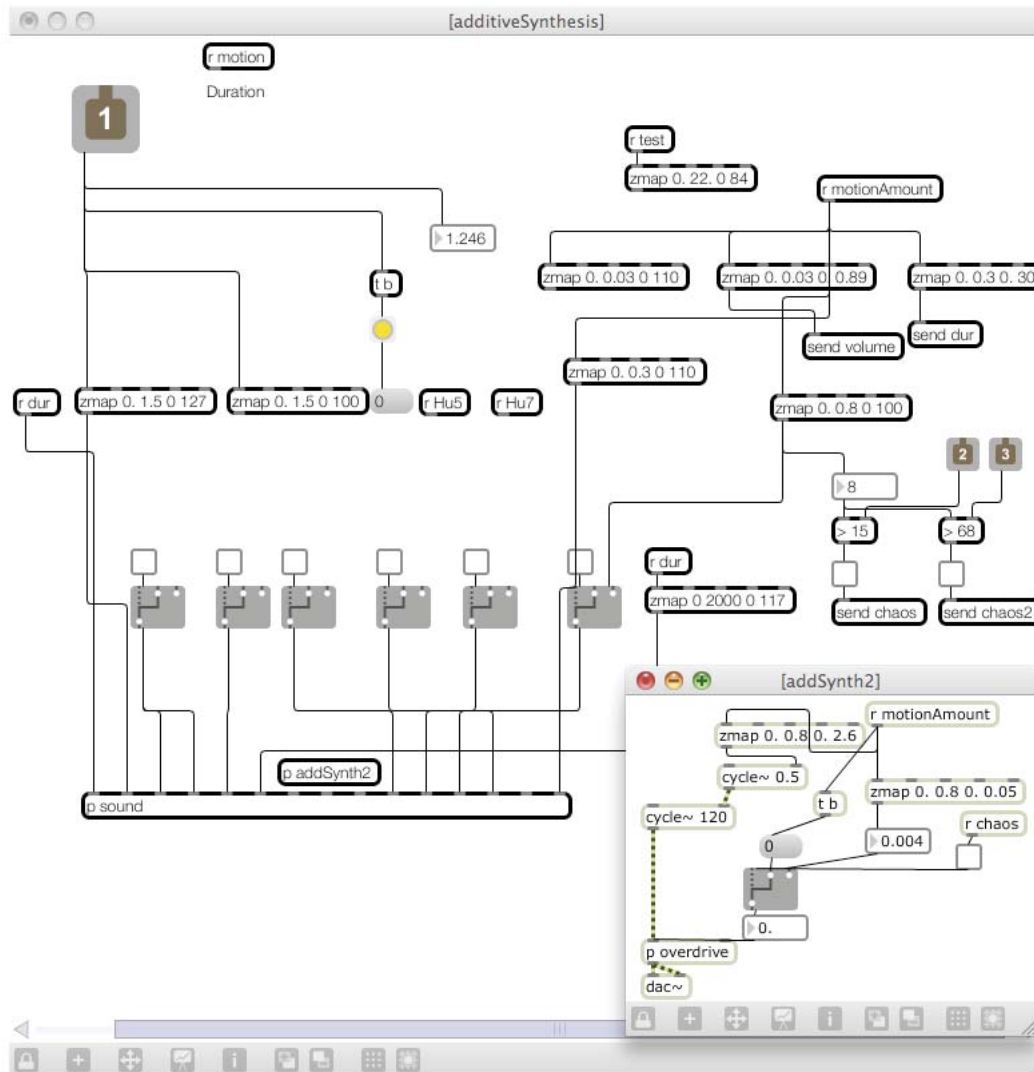


Figure 4. Screenshot of sub-patch (sound) *DataScript*

Although it is beyond the scope of this paper to discuss *DataScript* in detail, let us take a closer look at the two screenshots (depicted in figures 3 and 4) where the main objects are shown that process the outcome. Figure 3 shows a screenshot of the main *DataScript* patch. The 'jit.qt.movie' object sends the source video via the 'jit.rgb2luma' (this object renders the film black and white) to the external cv.jit objects [12]. 'cv.jit.moments' is the main object where the first order analysis is performed on the incoming binary video. Second order analysis, as described above, is performed in the sub-patch 'p analyse'. The sub-patch called 'p scaleBIAS' on the left is where image colour distortion is performed and finally sent to the graphics card. Audio processing takes place in the sub-patch 'p additiveSynthesis' (Figure 4). The sub-patch 'p addSynth' in the right corner is one of many small sub-patches holding sine wave generators (such as 'cycle~120') that compute and synthesize the sound of *DataScript*.

Generally speaking, two practical considerations of critical substance condition the mapping process; (1) the use of a great many variable thresholds spread out throughout the mapping algorithm and (2) the fact that interconnections are explicitly

designed as a fixed network of relationships. All decision-making follows this logic without referring to randomness of any sort. This consideration is in line with our wish for preserving the conventional format of film as a linear projected medium.

Also significant; much time was spent to find the proper parameters for guiding the behavioural scope of the mapping algorithm. All threshold values are tuned by hand, using a method of error-and-trial. Networked connections between analysis objects and image modification components were developed on-line; while the system is running, a development scheme that is not possible with compile-and-run systems. All this conforms to a design strategy expressing faith in the power of *intuition*; applications are created from the intimate and continuous consideration of a dynamic range of creative options in permanent flux.

6. Conclusion

In a recent interview in *Oor Magazine*, star photographer Anton Corbijn insists: “an imperfect picture is more perfect than a perfect picture.” Accordingly, the initial incentive for this project was a fascination with found systems; how does one develop an interpretation of a found system – such as a city – as an imaginary generative system expressing its activity in an infinite number of dimensions? This paper detailed the philosophy and operation of an audiovisual rendering of Paris city life. Mapping is conceived as a deterministic yet complex network following an analysis-synthesis approach. Movie footage is manipulated in real-time while certain visual features trigger audio responses. Image manipulations are subtle; they affect the sensual parameters – to paraphrase Derrick De Kerckhove; “the screen as the skin of culture” [4] – of the image and do not obliterate semantics in any way.

Noteworthy, the quality and depth of the aesthetic experience is definitely related to the perception of unexpected artefacts, or more precisely, the incessant development of a looking/listening strategy aiming to balance expectation and surprise. In addition, audiovisual cues manifest themselves in different levels of comprehension, this raises awareness and calls for an active type of involvement of the onlooker and as such defines a novel approach to the audiovisual medium of film.

References

1. Bailey, D. *Carpal Tunnel CD*, Tzadik Label, 2005
2. Bailey, D. *Improvisation; Its nature and Practice*, Moorland Publishing, 1980
3. Beyls, P. Interactive composing as the expression of autonomous machine motivations, *Proceedings of the International Computer Music Conference*, Montreal, 2009
4. De Kerckhove, D. *The Skin of Culture*, Somerville House Publishing, London, 1995
5. Gooding, M. “herman de vries, chance and change”, Thames and Hudson, London, 2006
6. Lewis, G. Too many notes: computers, complexity and culture in *Voyager*”, in *Leonardo Music Journal*, Vol. 10, 2000

7. Mekas, J. Notes on the New American Cinema, in: *Film Culture*, nr. 24, 1962
8. Mitchell, J. *Woman Of Heart And Mind*. DVD, 2003
9. Moradi, I. Scott, Gilmore and Murphy *Glitch: Designing Imperfection*. Mark Batty Publisher, New York, 2009
10. Mau, B. An incomplete manifesto for growth,
<http://umcf.umn.edu/events/past/04nov-manifesto.pdf> (accessed April 12, 2011)
11. Pauline, M. <http://www.srl.org/mark.html> (accessed April 18, 2011)
12. Pelletier, JM, <http://jimpelletier.com/cvjit/> (accessed April 15, 2011)
13. Reas, C and Fry, B. *Processing*, The MIT Press, Cambridge, MA, 2009
14. Marinetti, FT Manifeste du futurisme, in: *Le Figaro*, February 20, 1909
15. Virilio, P. *Unknown Quantity*, Thames and Hudson, New York, 2003
16. Waisvisz, M. The Hands, a set of remote MIDI controllers, *Proceedings of the International Computer Music Conference*, Burnaby, 1985