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Generative Art - Interactive Art: Delineations, Crossovers and Differences

Topic: Interactive Arts – Generative Arts

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In digital art theory, the histories of generative art and interactive art are considered fundamentally interrelated yet distinctively defined - mutually dependent, yet clearly distinguishable by their respective discourse domineering definitions. In the practise of digital art, a multitude of hybrid art forms challenge both definitions and allow for questions on the nature of both artistic currents. Both concepts share a long tradition in the arts, yet both concepts have been refined continuously by scholars and academics over the last decades.

Their discussion has recently gained further momentum as both art forms received heightened attention in artistic institutional discourse, curatorial display and theoretic reception over the last decade. This paper focuses on the two neighbouring fields in the digital arts, their respective traditions, their demarcation lines and theoretic concepts as well as hybrid cross-overs of these art forms that challenge their current definitions.

Analema Group: Eugenia Emets et al. Kinetica 2012 London 2012

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Generative Art - Interactive Art: Delineations, Hybrid Media and Conceptual Differences

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Abstract

In digital art theory, the histories of generative art and interactive art are considered fundamentally interrelated, yet distinctively defined - mutually dependent, yet clearly separated by their respective discourse shaping definitions. Equally, in art practise, a multitude of hybrid art forms challenge these definitions - allowing for questions on the nature of the two currents. Both genres share a longstanding tradition in the practise of digital arts, while their theoretic concepts have been constantly refined by scholars over the last decades. Recently, their discussion has gained further momentum as both art forms received heightened attention in institutional discourse, curatorial display and theoretic reception. This paper focuses on the two neighbouring fields in the digital arts, their respective traditions, their conceptual demarcation lines and theoretic implications. We are singling out examples of hybrid nature, conceptual cross-overs between interactive art and generative art - that challenge their respective domineering definitions.

Interactive Art – between conceptual approach and technical innovation

The Oxford Dictionary defines interactive as allowing a two-way flow of information between a computer and a computer-user, i.e. as responding to a user's input. A computer is defined not only as an electronic device, but secondly as a person who performs calculations, especially with a calculating machine. It is this second definition of computing that we need to engage, if we are looking for an expanded definition of interactive art that includes art production before the 1960s. In the strict sense of the term, interactive art is linked to the history of computers as an electronic

device which is capable of receiving information (data) in a particular form and of performing a sequence of operations in accordance with a set of procedural instructions (program) to produce a result in the form of information or signals (Oxford Dictionary).

Although the word art and technology derive from the same epistemological Greek roots – the word techne- interactive art does not primarily focus on technical explorations alone. In interactive arts, technology exists only as a tool to explore new realities, new forms of engagement and new expressions of meaning. Wong, Jung and Yoon from Seoul's Soongsil University argue that it is not sufficient for the work to react based on the spectator's selection, but interactivity should allow the meaning behind the interaction to be discovered (Wong, Jung, Yoon 2009, p.180). As Maria Teresa Cruz declared - "Interactivity is not a specifically technological issue (Cruz 2009, p.2)."

The artist Nathaniel Stern states that in interactive art "installations are not objects to be *perceived* but relations to be *performed*" (Stern 2011, p. 233) Interactive art is often understood as a subgenre of installation art – yet performative actions, live audience participation and real time engagement are its integral components. Interactive art has its roots in performance arts, happenings and the explorations of Fluxus. In between sculpture and installation, performance and participation, technology and tradition – interactive art is considered platform independent and hybrid per se – bridging many conceptual rifts.

Edmonds and Mueller assert that interactive art privileges experience over static objects (Edmonds, Bilda & Muller 2006, p.142)." As conceptual credo, this observation echoes Nicholas Bourriaud's political account in *Relational Aesthetics* "that art is at once the object and subject of an ethic - art is a state of encounter" (Bourriaud 2001, p.18). While Bourriaud's umbrella term centres around social contexts and the discussion of social engagement, interactive art is a social dialogue in itself – a social encounter per se. According to Veronika Korakidou and Dimitris Charitos, in interactive art, *"the visitor is the one that completes the artwork. Without him/her, the artwork does not exist*[i] *(Korakidou & Charitos 2011, p.281)."*

Geoffrey Keays at the MIT points out that interactive art is as old as the cave paintings of Lascaux, which date back to 13000BC. Ipso facto, the history of interactive art is not merely a history of technical advances (Keays 1999). The history of interactive art encompasses a history of audience participation, physical engagement and participatory authorship. As such interactive art doesn't always entail high tech gadgetry or the use of ground-breaking technology. Marcel Duchamps Bicycle Wheel (1951) - transformed a bike wheel into a kinetic art piece. When audience members' physical interaction created a readymade out of a single wheel, they also altered its visual effect on other audience members.

The way we experience interactivity in the arts changed dramatically throughout art history. Technical advances and innovation influence the way artists tackle

inseminations of interactivity in the artistic practise. In “Interaction, Participation, Networking - Art and Telecommunication”, Peter Weibel explores the terms interactivity/interaction in the context of art history. Definitions of the term appear vague and fuzzy if studied over time - as concept and practises of interactivity underwent multiple transformations across the decades. From Nam June Paik or Robert Rauschenberg’s Fluxus pieces of the 50s, to Gene Youngblood’s immersive Expanded Cinema experiments of the 60s, to Dan Graham, Valie Export or Peter Campus’ video pieces and closed circuit installations of the 70s, to Christa Sommerer and Laurent Mignonneau, Jeffrey Shaw or Lynn Hershmann’s pieces of the 1980s and 1990s to to current interactive art practises –spectators’ roles shifted with technical possibilities and altered conceptions of mediation. Interactive art is art that engages the user in a two way flow of information so that the artwork is significantly altered through his or her actions. The artwork wouldn’t exist without the spectators’ input.

As Christiane Paul (2004) concluded, interactive art is not a recent phenomenon in art production – as all art inherently strives to be interactive. Credited as one of the first major exhibitions worldwide to feature computerised interactive art – Jasia Reichhardt’s seminal “Cybernetic Serendipity” at the Institute of Contemporary Art set the tone for its academic discussion: Out of the 143 contributors, 43 were composers and 87 were non-artists: engineers, doctors, scientists and technologists. Interactive art is deeply rooted, but not restricted to a wider discourse on art and technology.

The ICA – Institute of Contemporary Arts London - also set a second milestone in the contemporary history of interactive arts: In 2008 the late artistic director Ekow Eshun decided to close the institution’s Live and Media Department – a locus operandi hitherto dedicated to performative and interactive art alike. Eshun and the ICA reasoned that it was impossible to artificially segregate these art forms from others any longer – interactive art is everywhere.

Between technology, installation and performance, artist happening and audience participation – the very essence of interactive art is to evade genres and classifications. Generative Art – an art that is closely associated with discourses on artificial intelligence, cellular automata and technical autonomy is a neighbouring discipline of equally blurry conceptual boundaries. Dedicated museum spaces such as the ZKM in Germany, FACT Liverpool in the UK, Gaité Lyrique in France, or the ArsElectronicaCenter in Austria- committed to the field of art and technology, digital art and interactive art – are focusing on both debates – side by side, yet within clearly demarcated theoretical discourses.

Generative Art – art as computational process and autonomous system

In What is "Generative Art" Philip Galanter defines his conception of Generative Art as "*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.*[ii] *(Galanter 2003, p. 4)"*

This broad and open definition reflects an inclusive approach, restricting the field within the digital arts on the use of autonomous systems in the process of its artistic production. Generative art is a rule based art form, closely linked to the fields of complexity theory and artificial intelligence. Outside the context of art theory, various definitions of autonomy exist: The Oxford dictionary, ties the concept to a philosophical or political background - by linking the term to the notion of freedom of choice. Autonomy is either understood politically as ***"the freedom for a country, a region or an organization to govern itself independently*"** **or in a philosophical context as "*the ability to act and make decisions without being controlled by anyone else giving individuals greater autonomy in their own lives."* None of these definitions have had any repercussions in the discussion of generative arts. Prevailing definitions centre around a terminology borrowed from artificial intelligence (see: Galanter 2003, McCormack 2001 and Edmonds 2009).**

In artificial intelligence and robotics, the term "autonomy" has played a crucial role to refine both control and intelligence. From the outset, artificial intelligence served as a conceptual backdrop for generative arts - whether on a theoretical level or in computational practise[iii]. The European Space Agency's definition of autonomy in is strictly constrained to a set of conditions to be met by a robotic system. Both the term autonomy itself and definitions for its subsidiary "degrees of autonomy" are thus technically restrictive and exclusive: Only when all of the six conditions are met *and "performed without human guidance" a robot can be called Autonomous*[iv]*.* This definition clearly earmarks autonomy as a concept defined through the *exclusion of human interaction*. Autonomy is understood as self-reliance of a learning system. Its self-subsistence and self-sustainability for growth, intelligence and corollary progress-based results explicitly excludes human interference.

In "Autonomous Robots: From Biological Inspiration to Implementation and Control" George Bekey refers to autonomy as "a system being capable of operating in the real world environment without any external control for extended period of time"[v]. The very definition of autonomy in AI and Robotics is based on the idea of circumvention of external control i.e. human intervention. On the contrary, definitions of interactive art tend to focus entirely on human intervention, concentrate on active human participation in the creation of a "completed work of art".

Similarities in both art forms include proximity to technological discourses, frequent use of computational practises, and a rule based approach that centres often on questions of chaos and control. Both traditions have a long history, with a recent resurgence in artistic production and institutional prominence. Both traditions are now firmly linked, but not exclusively confined to contemporary digital art production. Furthermore, both terminologies and their conceptions have frequently changed over the last decades.

Similar to the history of interactive arts, the history of generative art is as old as mankind and not intrinsically linked to a discourse on technology. Philip Galanter points towards Christopher Henshilwood's discoveries of cave paintings of triangular shapes – 70,000 of age (Galanter 2003). Iterative symmetry and geometry have been integral part of artistic creation from the Assyrian civilization to contemporary art production today. Yet it isn't the inherent symmetry that makes these ancient art forms a subset of generative art. Generative art is neither considered to represent a style, nor a technique. According to Galanter, "in principle, any computer based generative method could be carried out by hand.(Galanter 2003, p. 16)" Even though the terms -computer art and generative art- were used interchangeably at their introduction into academic discourse in the 1960s, computers do not necessarily constitute for a term defining variable.

Henry's Drawing Machine is considered to be more of a machine than a computer. In 1962, this generative art tool earned Desmond Paul Henry the title of being the first generative artist to exhibit in a solo show. Equally, John Whitney's converted M-5 "Anti-Aircraft" had little resemblance with a personal computer, yet this apparatus and its results are widely recognised as early examples of generative art in their production of slit scan images. As discussed, neither style nor techniques are per se defining factors for generative art. By definition, their main constituents are defined by the prevalence of a rule based system for the creation of autonomous artistic processes.

Early computer art was often perceived as congruent, if not equal to generative art: Georg Nees and Frieder Naacke are widely recognised as pioneers of computer art and generative art alike. Georg Nees and Frieder Nake's seminal exhibition "Generative Computergraphik" in Stuttgart 1965 is widely recognised as being the first of its kind – four years prior to Cybernetic Serendipity. Both artists used the term "generative" to describe artwork that was at least in parts automated and ultimately produced by a computer (Boden & Edmonds 2009, p. 23). Stephen Wilson or Ed Manning used computer plotted lines to create generative art. Other generative artists, such as Nicholas Schoeffer, Joseph Nechvatal or composers such as Cage

used completely different means and techniques to the same end – to produce rule based art that is the result of automated procedures.

With the advent of software art, and the explosions of personal computers in homes of nuclear families worldwide, the terms computer art and generative art experienced both - a certain degree of dissolution and a clearer delineation in its discussion. A series of conferences and a wealth of publications led to a refined distinction between the terms. Philip Galanter's relatively young definition is preceded by decades of artistic production in generative arts that saw revolutions in music (John Cage, Lejaren Hiller), installation art (Brian Eno, Sol LeWitt) and program based art (Jon McCormack, Mark Napier). More recently generative art proponents transgress borders of any subgenre (Marius Watz, Genetic Moo, Michael Takeo Magruder from King's Visualisation Lab).

The theoretic framework of generative art is deeply rooted in artificial intelligence and cybernetics - both in practise (Roy Ascott, Gordon Pask) and theory[vi]. In robotics and artificial intelligence, the term "autonomy" conscribes a set of technical conditions for a given robotic system: Capable of interpretation of directives, such a system needs to be environment aware, self-controlling and able to anticipate outcomes of its own actions (see: European Space Agency ESA[vii]). In generative art, autonomy as a concept takes its terminological references and linguistic clues directly from Artificial Intelligence.

Algorithms and rule sets are a fertile ground for generative art – art that operates in a system of self-subsistence no matter whether this is language (Sol LeWit), physics – (Hans Haacke – Condensation Cube, 1965), biological paintings (Joseph Nechvatal) or architecture (Celestino Soddu). Generative Art is subject to controllable directives, capable of self-control and predictable as it relies on a set of rules for its creation. Artistic creation often starts with a conscious choice of these rules, but isn't limited to any medium, topic, technique or philosophical context. Questions of order and chaos are intrinsically linked to these rules and determine its philosophical proximity to complexity theory (Stephen Wolfram and others).

Generative art is either outcome or process of an artistic production based on autonomous systems - thus excluding human spectator agency. Interactive art, on the contrary, is based on spectatorship agency. Interactive art is per definition either the process or creative result of inter-subjective human art generation. At first, demarcation lines of both art forms seem very clearly defined. At the heart of creation and discussion of both art forms lies the same question on chaos and control: In interactive art and in generative art, controllability is reached through

rules: In generative art rules create art, in interactive art the absence of rules defines human interaction. Yet the very artists whose work leads to a discussion of these terms, continuously raise questions on authorship and visitor participation throughout their work – thereby challenging the concepts of their own genres.

Analema Group – Khaos – performed at Kinetica, London 2012

Generative Art or Interactive Art?

In both generative art and interactive art, a broad academic consensus has accepted dominating definitions for both art forms – defintions that seem related due to their inclusiveness of computer agency, yet appear mutually exclusive in the role they attribute to human intervention. Artistic practise has always challenged academic debates, a critical role further pursued in the digital arts. The practises of both generative art and interactive art deviate from their respective theoretical context – challenging our conception of computer-human interrelations. To the extend that we question where an autonomous computerised process starts and where it ends, where the radius of action for humans follows automated procedures, where we find distinctions between humans and cyborgs (Donna Harraway 1990),

human and posthuman (N. Katherine Hayles 1999), or if the new philosophies for new media (Mark B. Hansen 2004) are so new after all. By challenging existing definitions of digital art, artistic practise engage in theoretic meta-discourses on broader subjects on the relationship between humans and computers.

Exhibitions such as “Talk to Me” (MOMA 2011), Decode (V&A 2010-2011) or “Choreograph Me” (2010-2011) at the Hayward Gallery – focus on the the role of the audience in the exploration of contemporary interactive art production. All three exhibitions milestone in the curatorial discussion of their respective fields, present pieces that can be classified as either “Generative Art” or “Interactive Art”, yet none of these shows draw a distinctive line between the two concepts. Current definitions for both digital art categories point to clear-cut concepts that are mutually exclusive, conceptual antagonisms, ergo ask for distinctive denotations for both art forms. yet these elemental definitions do not seem to resonate in either practise of art production or the realities of their presentation.

In Nicolas Myers piece “Transgenic Bestiaries” – exhibited at “Talk to Me” spectators create autonomous organisms of new species out of an existing DNA stock. Mixing and matching, the spectator becomes the creator of a new life form - an artificial intelligence created out of DNA code – is this generative art or interactive art? Modified DNA code create autonomous systems, life forms that are self-sustainable and non-dependent on human interaction, yet these forms need human interaction to be initiated. Generative Art or Interactive Art – what are we looking at?

In one of the now classic pieces of interactive art, “interactive plant growing” by Laurent Mignonneau and Christa Sommerer(1993), plants act as an audience interface to control the real time growth of artificial, generative, virtual plants. Plants become an interface for real-time controlled generative art, art that is both generative and interactive – autonomous as a biomechanism, yet dependent on human interaction to become visible, to become alive.

Botanicus Interacticus, presented at Siggraph 2012 echoes Sommerer and Mignonneau’s seminal piece: Digital organisms are created through real life forms, human interaction triggers generative computer art as a mirror image of biodiversity, and biomechanics. Developed by Ivan Poupyrev from Disney Research, Pittsburgh and Philipp Schoessler, University of Arts Berlin, their “interactive plant technology” displays plants acting as a transmitter of electrical currents, currents that are then transformed into real-time generated digital organisms – visible only in a mirrored reflection behind their emitter. The visitor triggers digital growth of these generative digital art forms through his interaction with the live plant. Should we classify this as an interactive form of generative art or a generative display of interactive art?

At Kinetica 2012, London’s biggest annual event for art and technology, the artist Eugenia Emets presented Analema Group’s Khaos. Analema Group is a collaboration between Eugenia Emets (artist), Mohammad Taha (3D animation / design), Eurico Moita (programmer), Patricia Afari (sound artist / programmer) and

challenges the very definitions of generative art and interactive art: Using a large scale “Pepper’s Ghost” interface – the Musion screen, Eugenia Emets interacts with a generative algorithm, her live motion performance controls fractal shapes. Generative art in its purest form - 3d fractals – are created through algorithmic code, interactively controlled and modified through movement in space and live sound. The human becomes a cyborg, a live form of digital code in an interactive performance of an intrinsically autonomous; code based art generation: A form of generative art or of interactive art?

In our own research at the CDE – Centre for Digital Entertainment – a joint institutional postgraduate centre by Bath and Bournemouth University, Alain Renaud, Oliver Gingrich and the artist Eugenia Emets, work on artistic strategies to translate principles of cymatics – the transformation of matter through sound waves- into code based digital art work. Code representing interference patterns of liquids generated by sound is visualised using a a large scale Peppers Ghost display – the Musion screen. Users experience their own actions as physically tangible sound, communication as the emergence of interference patterns of two interrelated soundscapes. The result consists in the 3D visualisation of cymatic principles – a generative art form that is constantly modified by interactions between people. Here, a code based, autonomous system is acting as mediator between people, rather than mere representation of a self-contained system. Yet, to paraphrase Marshall McLuhan, the medium is the message: At the base of any generative art, however autonomous the result, lies human input as a decision making process by the artist. Autonomy of any generative computing system is only ever possible through initial human input. In this case, users become artists, as the audio-visual system it is only ever generated if the input equals human interaction.

Current artistic production challenges the very notions of the theoretical context it operates in – evading all classifications, categorisations and definitions. Digital art is prompting us to ask broader questions, not only on the nature of generative and interactive art, but on artificial intelligence and human performance – on chaos and control and on the complex and intertwined relation between computer and human.

This paper presents generative art and interactive art as two distinctive concepts with their own traditions, theoretic backgrounds and academically recognised definitions. Both art forms are presented as diametrically opposite concepts, concepts at once distinctive, concurrent and yet often interrelated. Contemporary digital art practise shows us that the relationship between computer and human, spectator and author, quasi autonomous systems and visitor engagement are more complex than their dominating definitions seem to establish:

A multitude of hybrid art forms exists – transgressing the confinements of both conceptual schools of thought. Over the last decades, the role of the spectator in art production and art consumption has shifted towards a more integral and pro-active one, while the role of technology and computers in artistic art production changed from secondary to omnipresent. In contemporary artistic institutions, human actions

and interactions are computer penetrated or computer aided wherever we look; To the extend that computers are forming part of communication processes, generative art, hitherto a biotope of autonomous computer generated art production is being conquered by human interactivity. We are experiencing a multitude of art forms commenting on hybrid forms of communication, a multitude of art forms that challenge both: the concepts of autonomy of computers, and the autonomy of being human.

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