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The Aesthetics of The Artificial – Critical Design’s Lost Dominion

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Abstract: In its broadest sense, Digital Art spans everything from high-end machine learning applications through to the use of interactive elements, within traditional media. This paper surveys the domain’s full range, with indicative examples, described from the early days of the domain up to today. The examples, embody archetypal commonalities that allow categorisation; Digital Production, Distribution, Engagement and Subject matter, as well as eight sub-themes within the groupings. These are detailed and comprise; automation, presentation, distribution, interaction, simulation, immersion, transformation and hybridisation. The categories and sub-themes, demonstrate the diversity of the field and its maturity, even in areas that overlap with many areas outside of artistic production including Critical Design (Dunne, 1998). In this context, the paper asks the implicit question, of whether emergent strands in contemporary design research and practice (e.g. Design Anthropology), might benefit from a deeper and nuanced exploration of the Digital Art domain.

Keywords: Digital Art, Critical Design, Engagement

1. Introduction

Progress in art and technology have always been inextricably linked. Technology has changed how artists represent the world and the way they work. The primacy of technology in art practice, can be seen as a catalyst for many art movements and aesthetic developments; right back to Renaissance artists’ use of optical tools to draw naturalistically and invent perspective itself. More recently, the invention of photography helped artists break with representational depictions of the world. Freed of the constraint of mirroring reality, they could then explore the material, medium, distribution and purpose of art; a precursor to abstraction.

With the advent of computers and emergence of a ‘network society’, (1996) at the end of the twentieth century, the separation between aesthetics and representation has widened beyond pictorial abstraction and toward conceptualism and critical practice. The advance of computing extends this potential, as well as adding to the technically positivist ‘machine aesthetic’ founded by the Futurists and Constructivists.

Beyond the pictorial evolution of modern art, technology enabled artists to create work outside of the confines of galleries and museums and to connect with the public directly and in greater
numbers, on the streets, on TV or wherever they sought to engage. Lovejoy (2004, pp29) claims that ‘Digital Art’, as a networked medium, requires interaction with an audience and that such artworks are “incomplete without some form of participation by others”. Furthermore, citing Sherrie Rabinowitz (2004) he notes, that the interactive arts challenge the traditional role of the artist:

‘This idea of using the interactive potential of the medium to empower other people instead of one’s self, creates a powerful opening for a new role for the artist and a new kind of public art – one with all the constraints and freedoms to communicate within a wider sphere. It implies a new way of being and communicating in the world.’

Chronologically, the advent of computing is a synchronous development to the dematerialisation of art of the late twentieth century; the separation of object and idea. In computing, material (e.g. software) is intangible, just like the narrative or intent of conceptual artworks. This synchronicity is not accidental, nor is the parallel emergence of a new type of ‘computer artist’. What is perhaps, ‘out of sync’ is the generally positivist stance taken by these artists to technology, compared to their peers, critics and audiences.

Vera Molnar (1975) a ‘pioneer in computer arts,’ considers the computer as having four artistic purposes. Firstly, the technical promise of widening the possibilities of artistic production. Secondly, computers ability to aid artistic production. Thirdly, computers force new ways of thinking about art and lastly, perhaps most interesting of all, Molnar sees the computer as a tool for measuring audience reception. The sophistication and foresight of this vision, is one of many examples; highlighting the underexplored synergies with similar design domains such as Design Anthropology (Kjærsgaard, 2011).

Molnar and a small group of early innovators helped shape a new domain, bridging contemporary art within a profoundly different discipline; computing. The technological character of the medium, changed the way artists worked and even the skills they required. Mohr and several other early computer artists, including Woody Vasulka, became programmers by proxy, developing software to create both two and three-dimensional work. The nature of this work, created a new breed of artist; who either developed the necessary skills or worked with others from computing disciplines to deliver a new kind of aesthetic experience. Rather than being just a tool for creating art, artists began to see the possibility for software to become the product and subject of their work, in many ways echoing the emergence of Critical Design. enriched by the possibilities of the medium.

2. Digital Production

2.1 Automation

Stuart Mealing (2002) collects several examples, of how computers have been used in traditional art practice, resulting in work, analogous to the sculptures and prints made by the old masters. These examples, include computer software and hardware, that enable drawing on paper as well as systems that render and manipulate visual imagery, in fundamentally original ways in newer media such as film and video.

Harold Cohen was an early adopter of the computer as both a tool and medium. One of Cohen’s most well-known works is the AARON computer programme (1983). AARON draws pictures on paper, created through software using heuristics, based on aesthetic principles and outputs the results through digital printing machines. Some versions of AARON allow the artist or ‘user’ to manipulate the outcome, through changing parameters in the authoring programme. While in other
versions, the drawing is completely automated. In either case, Cohen’s work questions whether the creation and execution of the computer programme or the physical drawings produced by it, are the artwork. Or perhaps even the artist himself or herself is the work?

2.2 Presentation

As well as helping artists realise new works, technology has also been crucial to enabling interactive presentations. Naturally, artists have been using multimedia in performance and installations since early ‘happenings’ by John Cage and collaborators from Black Mountain College and even earlier with the Gutai Group (Hopkins, 2000).

Digitalisation radically broadened the possibilities of artistic presentation. Some artists have integrated digital elements with ‘real’ ones. For example, the Wooster Group’s performance entitled ‘To You the Birdie’ (2002) is based on a well-known theatrical play, where the drama is transformed using multimedia elements, that break up and enrich the narrative flow; and change how it is presented to the audience. For example, video is used to show hidden parts of the action on stage, that the audience would otherwise not be able to see.

More recently, Matthew Barney’s ‘Cremaster Cycle’ (2003) uses a sophisticated combination of paintings, drawings and video to create an integrated multimedia ‘experience’. Often cinematic in scope, Barney’s work uses technology to create ‘surreal’ presentations. The complex nature of the work would be difficult (if not impossible) to produce without digital technology. Technology is not just a tool in Barney’s work, it is also partly the subject matter of the work in a similar way to Critical Design, but employing a vastly different aesthetic language.

This is evident in his concern with the human body and the mutability of identity, engendered by scientific and technological progress. While the precise meaning of his work may be obscure to audiences, the presentational aspects draw on a common language of folklore and cinema. Similarly, Laurie Anderson’s ‘The Nerve Bible’ (1995) and Steve Reich and Philip Glass’s ‘Europeras I and II’ (1998) combine various digital tools, as well as traditional props in a more conventionally staged, but equally engaging narrative.

3. Digital Distribution

The advent of digital and network technology opened new ways of accessing the arts. Artinact (1994) is an early example of using CD-ROMs, to curate an interactive exhibition of artists’ works. In this case, the CD-ROM showcased many interactive works by artists including Miroslaw Rogala. Sherrie Rabinowitz and Kit Galloway’s ‘Electronic Café Network’ (2003) extends curation beyond the established artworld and by using network technology to increase public participation in the arts. This project networked six locations in Los Angeles. Each location was equipped with various hardware and software tools, that could be used by visitors. Over time, an archive evolved of the artwork created by the public itself.

The growth of the Internet, has led some artists to make art, that specifically addresses the capabilities and qualities of the medium, for good and bad. Examples of the genre, include alternative browsers, interfaces and websites that subvert traditional media and the instrumental application of technology. Mark Napier’s, ‘Riot’ (1999) browser, collects web pages from various sources to create a random collage, that reflects the networked character of the web and wider society in the information age. Many of these works blur the boundary between art and politics, with obvious overlaps with Critical Design. For example, ‘They Rule’ by Josh On (2001) is a web-based piece that allows users to uncover the hidden power relations between American multinational
companies through manipulating the interface. While these works can be traced to an older tradition of artists’ subversion of traditional media, their impact is amplified through the ease with which they can be distributed to a mass audience.

The advent of cheap and high quality digital tools from the 1970s onward, allowed artists to create alternative media. For example, Paper Tiger TV (1988) created counter cultural broadcasts on cable and public access television channels. A famous example of this kind of intervention is TVTV’s (1972) alternative broadcast of the Democratic convention of 1972. This provided a counterbalance to the broadcasting establishment, by interviewing people who were involved in the convention, but who would not normally have been heard. Interviewees included, ancillary workers as well as politicians. As well as critiquing the media, this work also had an impact on a larger scale than possible in a world of galleries and museums, as it was broadcast on television.

4. Digital Engagement

4.1 Interaction

Artists have used computers to create rich and interactive works that could not be realised otherwise. Miroslaw Rogala’s (1995) ‘Lovers Leap’ allows users to enter an augmented reality ‘bridge’, in which their movements trigger views of Chicago’s Michigan Avenue bridge and randomised shots of Lovers Leap in Jamaica. Rogala used technology to create both ‘representative’ views (of Jamaica) and artificial ‘fisheye’ views (of Chicago). The randomised aspects of the piece, questions the boundaries of interaction and control as the user is uncertain what (or who) causes the changes.

Toshio Iwais’s (1995) ‘Piano as Image Media’ allows users to combine real and virtual objects, to create light and sound in an installation setting. Among other things, his work seeks to fuse the perception of sound and light, so that users can ‘see’ sound and ‘hear’ colour. In combining different media in poetic and interactive ways, these works offer new kinds of experiences and at the same time create a social levelling. These works do not require aesthetic knowledge, nor art theory; just a willingness to experience.

Interactivity can be even more direct. For example, the work of Paul Smetana (1996) often functions at a physiological level. In, ‘The Room of Desires’ the audience is wired up to an interface so that their heartbeat and brain activity trigger sounds and images. This in turn creates the possibility of changing the emotional and physiological state of the ‘user’. In different ways, both works create a limitless scope of interaction whether at a physical or emotional level.

Social interactivity is exemplified in George Legrady’s (2001) ‘Pocket Full of Memories’ installation from the Pompidou Centre. This piece, collected personal objects visitors cherished and had scanned into the installation at the museum. These were then automatically archived and could be accessed through a semantic map of the objects, projected onto an interactive screen. Not only is this work authentically interactive, where users create as much, if not more of the work than the artist, the piece also creates a community of users that would not exist without the work. Lastly, in elevating everyday objects to the domain of high-art, the work changes the boundaries of constitutes art and the role of museums and galleries.

Broadening audience and authorship, is also central to Roy Ascott’s pioneering work in telematics; creating virtual networks among groups engaged in creative work. His ‘Organe et Fonction d’Alice de Merveilles’ (1986) allowed participants around the globe, to create a text based on ‘dispersed
authorship’. By shifting artistic production from making aesthetic experiences to facilitating collaborative creation, Ascott poses a new role for the artist and different kind of art.

More recently, Kolmar and Melamid (1997) take dispersed authorship in another direction; creating traditional artworks based on online surveys that ask what people want paintings to look like and what they dislike. The artists then used the results to create ‘The Most Wanted Paintings’. The artists play with notions of artistic preference; although the kitsch nature of the art produced, seems to reinforce artistic elitism rather than challenge it. Thus, while network technology offers the promise of inclusion there is still the potential for it to reinforce cultural and ideological mores.

Kit Galloway and Sherrie Rabinowitz have used visual computer networking to deliver rich interactive experiences. For example, their ‘Hole in Space’ (1980) was a live two-way satellite connection using video screens to project life-size images between two American cities. Without notice, video screens were installed at two public places in New York City and Los Angeles, so that people at each venue could interact with each other in either location.

More recently, Paul Sermon has used blue screen and network technology together. His ‘Telematic Dreaming’ (1993) allows users to interact with each other in two different places. The work is based on two settees. People sitting on either piece of furniture, can see a projected image of the person sitting on the other settee. Although each person is in a different location, they can interact with each other in ways that would be impossible in the real world.

4.2 Simulation

Many artists play with the border between the virtual and the real; using computation to create unworldly simulations. Nancy Burson and David Kramlich (1982) used digitisation to create a composite face from six men and women, entitled ‘Androgyny’. The result is a portrait that is neither male nor female, but somehow both and neither, recognisably human but artificial too. The work poses many questions on gender as well as the medium itself, specifically how digitisation creates vistas on worlds that are both grounded in actuality without true physicality.

Eija-Liisa Ahtila (2002) meanwhile develops cinematic narratives, that aim to reproduce psychological states by superimposing the real with the ‘impossible’ while Luc Courchesne, creates complex installations that combine real-time action with augmented reality. His ‘Hall of Shadows’ (1995) allows multi-user interaction with a group of virtual actors. The ‘actors’ are scripted with a set of answers and in some cases, are videos of ‘real’ actors. Users can converse with the actors by asking questions. The ‘actor’s’ replies create a one-to-one and group conversation that ranges from greetings to questioning the nature of being itself.

Ken Feingold (1983) uses animatronic dummies, who converse using text to speech software and extends Beckett’s monologues so that the humanistic dummies ‘discuss’ their ‘realness’. Lastly, Naoka Tosa’s ‘Talking to Neuro Baby’ (1994) takes virtuality to an extreme. The piece focuses on a virtual baby that responds to the human voice and exhibits a range of facial expressions and emotions. By creating new worlds and extending the physical world, these works challenge our understanding of reality by showing the artificial nature of virtual reality and the artificiality of reality itself.

4.3 Immersion

Jeffrey Shaw also takes up the theme of combining the ‘real’ and ‘virtual’ but adds a new and uniquely digital characteristic; that of the sense of being immersed in an experience. Shaw has applied increasingly sophisticated technology in his work, culminating in his Extended Virtual
Environment (EVE) (1992). EVE is an enclosed space that allows users to be immersed in panoramic views created by projectors. The scale of this work means that Shaw, is only partly responsible for its outcome, as it requires teams of technical staff to deliver the experience. This has implications for where the work can be staged and its subject matter, that tends to be gargantuan in scale. Many of Shaw’s works (e.g. Place:Ruhr) fuse real and projected places. This means that the viewer can change their viewpoint in ways that they could never do in the real world. Using technology to question the way we see the world is also taken up by Tamas Walicky. His ‘The Way’ (1992). reverses traditional perspective, thereby posing the artificiality of two-dimensional representations of space.

4.4 Transformation

Several artists have also used computers to reconstruct found static objects and sounds too. In many cases reconstruction focuses on the body and how people’s self-image conveys information about them to others. For example, Heiner Blum (1993) well-known installation projects a series of stereoscopic found photographic portraits. The work creates an original narrative from the disparate images and implies a relationship between people, who have no connection between them in real life. Digital reconstruction can be prosaic. For example, Ringler and Bühler’s (1992) ‘Weinbrenners Traum’ does not change media but is rather a recreation of an architect’s unrealised plans for a grand city.

At a more intimate level, Australian artist Stelarc (1992) uses mechanical and computational devices to extend his physical capabilities, for example, by creating a third hand. These artists demonstrate how technology can facilitate new insights into understanding what it is to be human, as well as what is artificial or simulated. In this sense, Digital Arts carry the potential of developing a deeply humanistic art form that goes beyond representation and the self-reflexivity of modernism and postmodernism.

Paul Pfeiffer, uses digital editing tools to cut and strip out elements from video footage. This treatment transforms the content, as well as the experience of viewing the original material. The video footage is often of sports events and the work highlights hidden elements of the action, probably unseen by the casual viewer. ‘The Long Count’ (2001) is a three-part digital reconstruction of three boxing matches. The boxers and the referee have been digitally erased, leaving the viewer to focus on the crowd and the traces left by the boxers as they invisibly stretch the ropes and ingress the canvas. By showing what has been included, as well as what has been excluded from the original mass media footage, Pfeiffer’s work questions the way reality is mediated and how it is highly determined in human perception.

Digital also offers the potential to play with time. Douglas Gordon’s work (2001) subtly alters old films, changing their speed, mode of editing and even viewing angle. He famously reconstructed Hitchcock’s ‘Psycho’ to play at only two frames per second; to uncover ‘micro-narratives’ (Hopkins, 2004 pp240). Like Pfeiffer and more recently, Steve McQueen (1993), Gordon’s deconstruction of ‘found’ images uncover unexpected details that are unnoticeable in the original. The work questions the veracity of the medium, the role of the artist and uniqueness of the artefact, as well as delivering the poetic potential of deconstruction. The ease in which video editing technology makes these transformations possible, shows how increased usability and decreasing costs of high-end technology have aided artistic automation.

As well as pioneering multimedia presentations, John Cage (ibid) often combined procedural elements with chance in his performances. The idea that art can be a set of instructions prefigures the computational aspects of generative art (Gallanter, 2003) although the notion is eerily contemporaneous with the birth on modern computing. In generative art, the work is not limited to
a physical object. Instead it involves the creation and execution of a procedure; just like a traditional computer programme. As well as ‘dematerialising’ art, this approach adds interactivity and mutation to the outcome. Sol LeWitt’s (Gallanter, ibid) work shows characteristics of generative art, but uses traditional art media such as canvas and paint. LeWitt produced several works that were sets of instructions for creating paintings that anyone could carry out.

The procedural nature of generative art, is tightly coupled with the capabilities of computing technology. At its simplest, transformation can be used to generate seemingly random input for interaction. Bill Seaman (1996) uses programming in an installation setting. His ‘Passage Sets/One Pulls Pivots at the Tip of the Tongue’ enables users to create poetic phrases and images in real time on a projected screen from a seemingly infinite list of words. Janet Zweig’s (1993) installation ‘Mind Over Matter’ takes a similar approach by among other things, endlessly combining words from the phrases ‘I think therefore I am’, ‘I think I can’ and ‘I am what I am’ to create new meanings that question people’s sense of self. While many of these works are based on a discrete number of permutations, they appear to be random. With increasing sophistication artists will be able to build on this quality, to offer users very personal and unique interactions. The unpredictable nature of these experiences cannot be anticipated by either the artist or the user; and come from the interaction of both human and computer agency.

More profoundly generative examples of transformation, include Mohr’s ‘P-159/A’ (1973) which creates patterns that are produced by a computer’s software algorithm, in turn based on calculations from a cube’s dimensions. More recently, Larry Cuba (1995) has used mathematical algorithms to generate abstract computer animations and three-dimensional renderings that could not have been created traditionally. Likewise, Boris Kopeinig’s TMP SYS (2004) is a seemly random array of numbers that fill the screen and change through some hidden functionality embedded in the software. These examples question the nature of artistic endeavour and the art object. Does the value of the work reside in the process of creation, the software, the artist or the product? Lastly, these works exhibit a new aesthetic, closer to computer technology than to the traditional arts, and one that is underpinned by changing the relationships between artist, audience and work.

5. Subject Matter

Interactive art can relate to the culture of human-computer interaction, as well as broader issues of technology. An example of the latter is video work by Ulrike Rosenbach (1978) who creates performances that pertain to popular representations of gender seen in new media. Antonio Muntadas’s ‘The File Room’ (1995) taps into the culture of intrusion. The work began as a gallery installation that has subsequently evolved into a web-based archive of examples of censorship that encourages the active participation of users. Matthew Fuller (2005) describes the World-Wide Watch project by Heath Bunting as a distinctly new genre of artistic output. This work links several CCTV cameras around the world and invites visitors to comment on what is going on. These works question the control of the Internet as a cultural space and more importantly, the potential of the technology for both good and bad.

Peter Luining’s (2004). ‘Window’ is literally that, a transparent window that caricatures the ubiquitous graphical user interface version. Such works are an important counterbalance to the instrumental use of technology and the media culture. ‘Window’ demonstrates the artificial nature of technology that we take for granted. It highlights how technology forces us to do things in a certain way and more importantly explicates its limitations. This strand in digital art provides,
perhaps, the closest fit to Critical Design, in its embeddedness within digital culture, implicit political stance, explicit distance from technological positivism and even through an ironic design aesthetic.

This work comes from a group of computer artists centred on the Runme organisation (2004). Unlike many Digital Artists, who have come from a visual arts background, Runme’s community is closer to the hacker and software milieu. Their work is often playful and deals with the poetics of code, as well as the artistic potential of commercially available web tools (e.g. popular browsers) and software culture. The alternative communities engendered by ICT provide counterpoint to mass media and the art establishment. In addition, many of the growing number of activist/artist/programmers defy traditional definitions of the artist and have come together through websites, blogs and discussion groups that are open to anyone. Technology has also created the basis for developing new art forms and communities. Examples of these new forms include ‘Flash Mobs’ and ‘Dogme’ films. Not only are these outside the establishment, they also rely on the active involvement of the community as well as cheap low-fi technology.

6. Conclusion

The taxonomy outlined in this paper includes the use of computer technology for a range of purposes, which fit into four overarching categories; production, distribution, engagement and subject matter. Digital Art fundamentally changes the relationship between artist and viewer. In Digital Arts, the viewer has the potential to become fully instrumental to the aesthetic experience far beyond that possible in traditional work. Furthermore, with networked technology the artist cannot define the exact nature of the experience alone or prior to an audience experiencing it. Future work will expand the taxonomy to cover broader domains within design; providing insights into how these two domains converge and diverge on different strands of the human-digital experience.

7. References

Ahtilla, E.L. (2002). The House, Cited in: Rush, M. New Media in Art., pp 198-199.Thames and Hudson, London, 2005.
Anderson, L. (1995). Stories from the Nerve Bible. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age., pp 270-271. Routledge, 2004.
Artinact. (1994). Cited in: ZKM. Hardware, Software, Artware: Die Konvergences von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997., pp 178. Cantz Verlag, 2000.
Ascott, R. (1986). Organe et Fonction d’Alice de Merveilles, Cited in: Lovejoy, M. (2004). Digital Currents: Art in the Electronic Age., pp 229-231. Routledge, 2004.
Barney, M. (2003). Cremaster Cycle. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age., pp 304-305. Routledge, 2004.
Birnbaum, D. (1994). Damnation of Faust: Evocation. Cited in: Lovejoy, M. (2004). Digital Currents: Art in the Electronic Age., pp 129. Routledge, 2004.
Blum, H. (1993). Augentauschen. Cited in: ZKM, (2000). Hardware, Software, Artware: Die Konvergences von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997., pp 004. Cantz Verlag, 2000.
Burson, N and Kramlich, D. (1982). Androgyny: Six Men and Six Women, Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age., pp 154-155. Routledge, 2004.
Castells, M. (1996). The Rise of The Network Society. Blackwell, Oxford. Cited In: Barney, D. *The Network Society (Key Concepts)*. Polity Press, Cambridge., pp 30-31, 2004.

Cohen, H. (1983). AARON. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge. pp 180, 2004

Courchesne, L. (1995). Hall of Mirrors. Cited in: ZKM. (2000). *Hardware, Software, Artware: Die Konvergenz von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997.*, pp 116-121, Cantz Verlag, 2000.

Cuba, L. (1995). Untitled: Work in Progress. Cited in: ZKM. (2000). *Hardware, Software, Artware: Die Konvergenz von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997.*, pp 134-139, Cantz Verlag, 2000.

Feingold, K. (1983). Talking Heads. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge. pp 162, 2004.

Fuller, M. (2005). *Media Ecologies: Materialist Ecologies in Art and Technoculture*. MIT Press, London., pp 009, 2005.

Gallanter, P. (2003). What is Generative Art? Complexity Theory as a Context for Art Theory. Proceedings of Generative Art, Milan. Cited in Arns, I. (2004) *Read_Me, Execute_Me: Software and Its Discontents*, or: It’s the Performativity of Code, Stupid. Cited in: Goriunova, O and Shulgin, A. [eds]. *Read_Me: Software Art and Cultures*. Digital Aesthetics Research Centre, University of Aarhus, pp 397.

Gordon, D. (2001). 24 Hour Psycho, Cited in: Hansen, M,B,B. *New philosophy for New Media*. MIT Press. Cambridge, Massachusetts, pp 29.

Goriunova, O and Shulgin, A (2004). *Read_Me: Software Art and Cultures*. Digital Aesthetics Research Centre, University of Aarhus, 2004.

Hopkins, D. (2000). After Modern Art: 1945-2000. Oxford History of Art. Oxford University Press. pp 240-267.

Iwai, T. (1995). Piano as Image Media, . Cited in: ZKM. (2000). *Hardware, Software, Artware: Die Konvergenz von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997*. Cantz Verlag, pp 086-091, 2000.

Kjærsgaard, M. G. (2011). Between the Actual and the Potential. The challenges of design anthropology. Ph.D.Dissertation. Faculty of Arts, Aarhus University: Department of Culture and Society.

Kolmar, V and A, Melamid. (1997). The Most Wanted Paintings. Cited in: Rush, M. *New Media in Art*. Thames and Hudson, World of Art. Thames and Hudson, pp 215, 2005.

Kopeinig, B. (2004). TMP SYS. Cited in: Goriunova, O and Shulgin, A. *Read_Me: Software Art and Cultures*. Digital Aesthetics Research Centre, University of Aarhus, pp 370-371, 2004.

Legrady, G. (2001). Pockets Full of Memories, Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 195, 2004.

Lovejoy, M. (2004). *Digital Currents: Art in the Electronic Age*. Routledge, pp 229 - 286.

Luining, P. Window. Cited in: Goriunova, O and Shulgin, A. (2004). *Read_Me: Software Art and Cultures*. Digital Aesthetics Research Centre, University of Aarhus, pp 354-355, 2004.

Napier, M. (1999). Riot. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 252, 2004.

Mohr, M. (1973). P-159/A. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 172, 2004.

Molnar, V. (1975). Toward Aesthetic Guidelines for Paintings with the Aid of a Computer. *Leonardo* Vol. 8, No. 3 (Summer, 1975), pp. 185-189, 1975.

Mealing, S. (2002). *Computers and Art*. Intellect Press, Bristol, England, 2002.
McQueen, S. (1993). Bear. Cited in: Rush, M. *New Media in Art*. Thames and Hudson, World of Art. Thames and Hudson, London., pp 176, 2005.

Muntadas,A. (1995). The File Room. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 248, 2004.

On, J. (2001). They Rule. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 252, 2004.

Paper Tiger TV. (1988). Taping the People with AIDS Coalition Talk Back Show. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge. pp 247, 2004.

Pfeiffer ,P. (2001). The Long Count, Cited in: Hansen, M,B,B. *New philosophy for New Media*. MIT Press. Cambridge, Massachusetts., pp 29-30, 2004.

Popper, F. (1993). *Art of the Electronic Age*. Thames and Hudson, London.

Rabinowitz, S. (2004). Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 117-119, 2004.

Rabinowitz, S and Galloway, K. (2003). Electronic Café Network. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 233, 2004.

Rabinowitz, S and Galloway, K. (1980). Hole in Space. Available at http://www.medienkunstnetz.de/works/hole-in-space/ [accessed 01/09/2014].

Reich, S and Glass, P. (1998). Europeras I and II Cycle. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 214-216, 2004.

Ringler, H and Bühler, R. (1992). Weinbrenners Traum. Cited in: ZKM. *Hardware, Software, Artware: Die Konvergence von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997*. Cantz Verlag., pp 152, 2000.

Rogala, M. (1995). Lovers Leap. Cited in: ZKM. (2000). *Hardware, Software, Artware: Die Konvergence von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997*. Cantz Verlag., pp 152, 2000.

Rosenbach, U. (1978). Meine Macht ist meine Ohnmacht. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 096, 2004.

Scher, J. (1991). I’ll be gentle. Cited in: Lovejoy, M. (2004). *Digital Currents: Art in the Electronic Age*. Routledge., pp 137, 2004.

Seaman, S. (1996). Rosenbach, U. (1978). Passage Sets/One Pulls Pivots at the Tip of the Tongue. Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 189, 2004.

Sermon. P. (1993). Telematic Vision. Cited in: ZKM. *Hardware, Software, Artware: Die Konvergence von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien. 1992-1997*. Cantz Verlag., pp 056-061, 2000.

Shaw, J. (1992). Extended Virtual Environment. Cited in: ZKM. *Hardware, Software, Artware: Die Konvergence von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997*. Cantz Verlag., pp 164-169, 2000.

Smetana, P. (1996). The Room of Desires. Cited in: ZKM. *Hardware, Software, Artware: Die Konvergence von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997*. Cantz Verlag., pp 128-133, 2000.

Stelarc. (1992). Amplified Body, Automated Arm and Third Hand, Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 082, 2004.

Tosa, N. (1994). Talking to Neuro Baby, Cited in: Lovejoy, M. *Digital Currents: Art in the Electronic Age*. Routledge., pp 196-197, 2004.

TVTV. (1972). Four More Years. Cited in Rush, M. *New Media in Art*. Thames and Hudson, World of Art. Thames and Hudson, London., pp 85-86, 2005.
Vitiello, S. (2000). Frogs in Feedback. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age. Routledge., pp 203, 2004.

Waliczky, T. (1992). The Way. Cited in: ZKM. Hardware, Software, Artware: Die Konvergenz von Kunst und Technologie. Kunstpraktiken am ZKM Institut für Bildmedien 1992-1997. Cantz Verlag., pp 030-031, 2000.

Willats, S. (2000). Art and Social Function, Ellipsis Press, London. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age. Routledge., pp 267, 2004.

The Wooster Group. (2002). To You the Birdie. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age. Routledge., pp 120, 2004.

Zweig, J. (1993). Mind over Matter. Cited in: Lovejoy, M. Digital Currents: Art in the Electronic Age. Routledge., pp 158, 2004.

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