INTERFACE CRITIQUE

BEYOND UX

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2018
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arthistoricum.net
SPECIALISED INFORMATION SERVICE ART · PHOTOGRAPHY · DESIGN

INTERFACE CRITIQUE JOURNAL
2018, VOL. 1: BEYOND UX

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Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie. Detailed bibliographic data are available on the Internet at http://dnb.ddb.de.

Published at arthistoricum.net, Heidelberg University Library 2018.

The electronic open access version of this work is permanently available on the website of arthistoricum.net
http://www.arthistoricum.net
doi: https://doi.org/10.11588/ic.2018.0

Cover illustration: Florian Hadler

ISSN 2570-0472 (Print) 2570-0480 (Online)
ISBN 978-3-946653-91-2 (Softcover)
ISBN 978-3-946653-92-9 (PDF)

BEYOND UX

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Suggested citation:
Hadler, Florian (2018). "Beyond UX." In *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.45695

CULTURE & HISTORY

An interface – in a merely technological perspective – is a site where incoherent modes of communication are rendered coherent[1] and where signals are translated and combined,[2] a simple gateway between databases, code modules and other forms of machine based communication. An interface is also a site where technological and human preconditions meet in structured moments of sense-making and interaction.[3] Furthermore, an interface is a form of relation and at the same time a form of differentiation and distinction,[4] of transition and mediation[5] and of inclusion and exclusion.[6] An interface therefore is not just a surface or a passive gateway or threshold, not only a mode or a site of interaction or communication, but a deeply historical artifact: a structured set of codes, complex processes and protocols, engineered, developed and designed, a space of power where social, political, economic, aesthetic, philosophical and technological registrations are inscribed.[7]

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1 Florian Hadler, Daniel Irrgang, "Instant Sensemaking, Immersion and Invisibility. Notes on the Genealogy of Interface Paradigms." *Punctum 1*, 2015: 8.

2 Søren Pold, Christian Ulrik Andersen, eds., *Interface Criticism. Aesthetics beyond the Buttons*. (Aarhus Denmark: Aarhus University Press, 2011), 9.

3 Alan C. Kay: „User Interface. A Personal View," in *multiMEDIA. From Wagner to virtual reality*, (New York, NY: W.W. Norton, 2001 [1990]),123.

4 See Peter Weibel: "The Art of Interface Technology." In *Sciences of the Interfaces,* ed. Hans Diebner, Timothy Druckrey and Peter Weibel, (Karlsruhe: ZKM, 2011), 272–281. See also Zielinski in this journal p. 46

5 Alexander Galloway, *The Interface Effect.* (Malden, MA: Polity Press 2012). See also: Johanna Drucker: "Humanities Approaches to Interface Culture," *Culture Machine 12*, 2011.

6 Branden Hookway: *Interface*. Cambridge, MA and London: MIT Press, 2014: 4.

7 For a discussion of a historical predecessor of current interfaces see the chapter on the post-

The interface is a cultural and historical phenomenon.[8]

WORLD-RELATION AND -PERCEPTION

Our techno-ecological surroundings appear dialectical and paradoxical: Surface refers to depth, perceptibility implies imperceptibility, simplicity is built upon complexity, usage includes being used. With the dissolution of computation into networked on-demand resources, with distributed ledger technologies and decentralized infrastructures for storage, information and data retrieval, with far field voice recognition and context-sensitive service design, large parts of our techno-ecological surroundings are accessible only through the interface of connected apparatuses. The interface therefore has a very specific role in these dialectics: it not only conveys between human and machine (and machine and machine for that matter), but it also oscillates between object and subject, between tool and agent. An interface constitutes the boundaries between human and machine, holding them apart by linking them together, drawing thin and preliminary lines between them. The interface is validated by the user[9] – both become an ensemble,[10] constantly renegotiating the intersections between human, machine and environment. The operational iconicity of the (graphical) interface – eg. its ability to instantly manipulate its object by manipulating its visible representation – is a recursive hermeneutic operation that redefines our relation to the world.[11] Through this convergence of human, machine and environment, the interface is not just a process or device, but rather a way to see, understand and act within our ubiquitous techno-ecological surroundings, providing access to a mediated world. To paraphrase the famous quote from Wittgenstein's Tractatus ("The subject does not belong to the world; rather, it is a limit of the world."[12]), one could argue that the interface belongs neither to the machine nor the user, but designates and negotiates their limits through their connection.[13]

The interface impacts our perception of and relation to the world.

office counter in the 1930s from Susanne Jany in this volume on p. 82.

8 Hadler, Irrgang, „Instant Sensemaking, Immersion and Invisibility," 21.

9 See the article from Lasse Scherffig on cybernetic perspectives on the interface in this volume on p. 58.

10 An idea that is obviously employed by actor-network-theory, and also discussed in the text by Max Bense on the automobile, in this volume on p. 112.

11 The operational iconicity and recursive hermeneutics become highly sensitive in the case of ground based drone operations, as discussed by Olia Lialina in her article on Rich User Experience in this volume on p. 176.

12 Ludwig Wittgenstein, *Tractatus Logicus Philosophicus*, (London: Routledge & Kegan Paul, 1961 [1922]), sect. 5.632.

13 Hadler, Irrgang, "Instant Sensemaking, Immersion and Invisibility," 11.

ENGAGEMENT AND IMMERSION

The form and structure of media is shifting from linear and multi- or non-linear information towards instantaneous and simultaneous interaction[14], enhanced through ever more intuitive, immersive and conversational applications and services. If we expand the definition of the narrative from a sequence of events towards connecting, supplying and rendering information,[15] the definition of text towards service and the definition of viewer or reader towards user, we can identify some well-known mechanisms and structures within these (not so) new media paradigms. Known as flow,[16] engagement[17] or continuity of experience[18] in the various human interface guidelines is the *découpage classique* or *continuity editing* from film practice and theory.[19] Its aim is to create a sense of consistency between different elements and to immerse the user.[20] These effects of immersion are incredibly important for the monetization of most web-based user-facing services and applications: Metrics such as returning user and retention rate are crucial KPIs[21] for almost every tech-based B2C[22] business model, as they indicate the time a user spends on a service or application, which correlates directly with the user value, eg. money spent either through conversions or money made through advertising. The more immersive a service is, the higher the value per user. Immersion is achieved with coherent design and intuitive control, but also with gamification mechanisms like quantification and instant gratification via social feedback. These dopamine fueled regimes[23] of visibility – or rather accessibility with

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14 Florian Hadler and Daniel Irrgang: „Nonlinearity, Multilinearity, Simultaneity: Notes on Epistenological Structures," in *Interactive Narratives, New Media & Social Engagement*, ed. Hudson Moura, Ricardo Sternberg, Regina Cunha, Cecilia Queiroz, and Martin Zeilinger (University of Toronto, 2014).

15 Alan N. Shapiro makes a plea to break down the separation of story-telling and technology in this volume on p. 34.

16 See the description of Microsoft Fluent Design: https://fluent.microsoft.com/, accessed on march 7th 2018.

17 See the description of iOS Human Interface Guidelines: https://developer.apple.com/ios/human-interface-guidelines/overview/themes/, accessed on march 7th 2018.

18 See the description of Google Material Design: https://material.io/, accessed on march 7th 2018.

19 Jan Distelmeyer elaborates further on the relations between film theory and interface, eg. on the concept of operative images, drawing from the filmmaker Harun Farocki, in this volume on p. 22, and also the takeover of the term "mise en abîme" by Søren Pold and Christian Ulrik Andersen in their "Manifesto for a Post-Digital Interface Criticism", in *The New Everyday*, 2014, http://mediacommons.futureofthebook.org/tne/pieces/manifesto-post-digital-interface-criticism, accessed on march 7th 2018.

20 For a broader discussion of immersive media, pre-digital illusionary spaces and the role of the body see also the article from Julie Woletz in this volume on p. 96.

21 KPI: Key Performance Indicator

22 B2C: Business to Consumer, B2B: Business to Business

23 There are a number of initiatives that strive to liberate the user from these rules of engagement through a new approach to technology, for example the light phone: https://www.thelightphone.com/about/ ("Our time and attention are the two most important things that we too often take for granted."), or the center for humane technology: http://humanetech.com/, ("Reversing the digital attention crisis and realigning technology with humanity's best interests."), both accessed on march 7th 2018.

regards to conversational, spatial and ambient interfaces such as speech, voice and gesture – are intertwined with corporate brand strategies, demanding attention and engagement and guiding self-narration and identity construction.[24]

The interface governs its users through immersion and engagement.

INVISIBILITY AND DISSOLUTION

It is a well-known proverb among interface designers that the real problem of the interface is that it is an interface. The goal of each interface design therefore is to disappear and to become invisible or imperceptible, to be so intuitive that the user is no longer aware of using it.[25] This is why although interfaces seem to be the omnipresent (and still mostly visual) blockbusters of contemporary culture,[26] they at the same time dissolve before our eyes and sink into the background. As Mark Weiser pointed out, the most profound technologies are the ones that disappear and integrate seamlessly into everyday life, so that they are no longer distinguishable from it.[27] The best user experience[28] is rendered when the user is not aware of him/herself as being a user of a specific program, but experiences him/herself as the one per-forming a task without noticing the mediation. This concept of embodiment reaches back to the tacit and subconscious control of the cockpit and the automobile,[29] where the user is driving but not commanding.[30]

The interface is most efficient when it is invisible.

AGENCY AND DATA GENERATION

This enhanced user experience would not be possible without the constant tracking and measurement of user behavior through all kinds of sources and sensors. The backgrounded technological objects be-

24 For the identity effects of snapchat and the role of the interface designer as meta-storyteller see Karl Wolfgang Flender, "#nofilter? Self-narration, Identity Construction and Meta storytelling in Snapchat," in *Interface Critique*, ed. Florian Hadler, Joachim Haupt, (Berlin: Kulturverlag Kadmos, 2016). For the impact of social media on concepts of the Self see Florian Hadler, Gabriel Yoran, "Default Metaphysics – Social Networks and the Self," in *Public Interest and Private Rights in Social Media*, ed. Cornelis Reiman (Oxford, Cambridge, New Delhi: Chandos Publishing, 2012).

25 See also the text by Siegfried Zielinski in this volume on p. 46.

26 That is how Jan Distelmeyer calls it on p. 22.

27 Mark Weiser, Rich Gold, John S. Brown, "The Origins of Ubiquitous Computing Research at PARC in the late 1980s," *IBM Systems Journal 38*, (1999).

28 See also the text by Olia Lialina on the history and origins of the term user experience in this volume on p. 176.

29 See Branden Hookway: *Interface*, p. 147, and the artwork from Branden Hookway and Maria Park that depicts the flight cockpit as an early prototype of human-machine-interaction in this volume on p. 160. See also the text by Max Bense on the automobile and the self in this volume on p. 112.

30 Terry Winograd and Fernando Flores: *Understanding Computers and Cognition: A New Foundation for Design* (Norwood NJ: Ablex Publishing, 1986).

come unreadable and imperceptible[31] and the networked computation no longer requires human interference and relies more and more on post-hermeneutic APIs, AI and smart contracts. Optimizing algorithms are now working with real time data to deliver a context sensitive and user oriented interpretive interface that anticipates and predicts the user's needs and expectations and guides the user with subtle affordances towards desired interactions. Behavioral patterns and conversion funnels, click-through-rates, page impressions and sales objectives, buzz, sentiment analysis, organic search and direct traffic as well as location tracking, heart rates, body weight, sleep cycles and social graphs form the currency of data – generated through the usage of interfaces. This data is used for constant optimization and A/B testing, integrating even deviation and misapplication, so that every abuse or violation might become a feature or a source of innovation.[32] The shift from linear media to instant interaction no longer provides a text that requires a rather passive reader. Instead, the user is presented with data or information that demands and incentivizes interactions, feedbacks and decisions.

The interface requires interaction to generate value.

OUR PROGRAM

Interface Critique is not interested in the enhancement of usability, in mere ergonomic questions of design and architecture and in the optimization of user orientation or user experience. Interface Critique does not require a generally accepted definition of the interface. On the contrary: The obscurity and fuzziness of the term interface promises theoretical productivity and fruitful frictions among all kinds of disciplines. In order to render these diverse and multifaceted aspects of the interface visible, we need to expand our focus and include aesthetics, economics, engineering, politics, history, philosophy, sociology, coding, architecture, art, design and many more.
Interface Critique strives to expose the implicit agencies, conditions and contingencies of interfaces, applications and apparatuses. Interface Critique encourages comprehensive and transdisciplinary perspectives and promotes an understanding of the interface as a dynamic cultural phenomenon. Interface Critique acknowledges that the discourse on interfaces is neither new nor groundbreaking and therefore intends to resurface old texts and discourses, either through translation, republication or initial publication if they haven't been or are no longer avai-

31 Some artistic / activist projects aim to render these techno-ecological surroundings and especially technologies of surveillance visible again, see for example the work of Julian Oliver (https://julianoliver.com/, accessed on march 7th 2018) like *men in grey* (https://criticalengineering.org/projects/men-in-grey/, accessed on march 7th 2018) or *the unplug device* (https://plugunplug.net/, accessed on march 7th 2018).

32 See also Florian Hadler, "Von der Subversion zur Strategie. Anmerkungen zur diskursiven Karriere des Narrativs der Zweckentfremdung," in *Zweckentfremdung: ‚Unsachgemäßer' Gebrauch als kulturelle Praxis*, ed. Maria Dillschnitter, David Keller (Paderborn: Fink, 2016).

lable.[33] And last but not least, Interface Critique actively seeks to expand these viewpoints beyond the western European framework and to include more female authors and contributors.[34]

This first issue tackles the versatility of the interface in five preliminary and deeply interlinked sections:

PROGRAMMATIC, where approaches for the analysis and production of interfaces are developed.
GENEALOGIES, where the histories, origins and predecessors of current interfaces are investigated.
PHILOSOPHIES, where conceptual and metaphysical assumptions of informatics and the interface are discussed.
PROJECTS, where concrete engineering and artistic practices engaging with interfaces are presented.
POLITICS, where the social relevance and implications of interfaces are highlighted.

THANK YOU

This journal wouldn't be possible without the goodwill of and support by a whole range of people. We are thankful to the following people and institutions:

Mari Matsutoya for proofreading selected articles, Joel Scott for translating the essay by Max Bense, Joachim Haupt for accompanying the first steps of the project back in 2014,[35] Helene von Schwichow for the support during the kickoff of this journal in 2017, Alexander W. Schindler for supporting my never ending struggle with MS Word, the Heidelberg University Library and especially Dr. Maria Effinger and Dr. Katrin Bemmann for their incredible infrastructural support through their network arthistoricum.net (and Petra Zimmermann for introducing us), Frank Krabbes and his colleagues for their advice and support on print-production, the HfG Karlsruhe for financial support for translation and proofreading and especially Prof. Dr. Siegfried Zielinski for the permission to publish one of his older texts, the Vilém Flusser Archive at the Berlin University of the Arts and especially Dr. Anita Jòri for granting us access and facilitating important contacts, Miguel Gustavo Flusser for the permission to publish an until now unpublished letter from

33 As long as we can obtain non-exclusive publishing rights

34 Unfortunately, this initial volume – with a gender ratio of 2,17:1 and all authors from the EU or US – does not live up to these standards. But we will give our best to achieve them in the next volumes.

35 Which included the initial conference in 2014 at the Berlin University of the Arts, and the editing of the first anthology in 2016: Florian Hadler, Joachim Haupt, eds., *Interface Critique* (Berlin: Kulturverlag Kadmos, 2016).

Vilém Flusser and Prof. Dr. Elisabeth Walther-Bense (who sadly passed away this January) for the permission to translate and publish an essay by Max Bense.

We also wish to thank all contributing authors who invested their time and energy and we are incredibly glad that we could convince every single one to believe in this project.

And I am especially grateful for the support of my two co-editors:
Daniel Irrgang – without his publishing and editing experience and efficiency, and his professional network, this journal would not meet even basic scientific standards.
Alice Soiné – without her insistence and perseverance, dedication and commitment, research and never-ending work, this journal would never have happened.

All texts are available online and open access at interfacecritique.net.

Florian Hadler, Berlin, March 2018

REFERENCES

Andersen, Christian Ulrik, and Søren Pold, eds. *Interface Criticism. Aesthetics Beyond Buttons*. Aarhus Denmark: Aarhus University Press, 2011.

Andersen Christian Ulrik, and Søren Pold. “Manifesto for a Post-Digital Interface Criticism.” *The New Everyday* (2014). http://mediacommons.futureofthebook.org/tne/pieces/manifesto-post-digitalinterface-criticism, accessed on march 7th 2018.

Drucker, Johanna. “Humanities Approaches to Interface Culture.” *Culture Machine 12* (2011).

Flender, Karl Wolfgang. “#nofilter? Selfnarration, Identity Construction and Meta storytelling in Snapchat.” In *Interface Critique*, edited by Florian Hadler, Jachim Haupt, 163-179. Berlin: Kulturverlag Kadmos, 2016.

Galloway, Alexander. *The Interface Effect*. Malden, MA: Polity Press, 2012.

Hadler, Florian, and Daniel Irrgang. “Instant Sensemaking, Immersion and Invisibility. Notes on the Genealogy of Interface Paradigms.” *Punctum 1* (2015).

Hadler, Florian, and Daniel Irrgang. „Nonlinearity, Multilinearity, Simultaneity: Notes on Epistenological Structures.“ In *Interactive Narratives, New Media & Social Engagement*, edited by Hudson Moura, Ricardo Sternberg, Regina Cunha, Cecília Queiroz, and Martin Zeilinger. University of Toronto, 2014.

Hadler, Florian, and Gabriel Yoran. “Default Metaphysics – Social Networks and the Self.” In *Public Interest and Private Rights in Social Media*, edited by Cornelis Reiman. Oxford, Cambridge, New Delhi: Chandos Publishing, 2012.

Hadler, Florian. „Von der Subversion zur Strategie. Anmerkungen zur diskursiven Karriere des Narrativs der Zweckentfremdung.“ In *Zweckentfremdung: ‚Unsachgemäßer' Gebrauch als kulturelle Praxis*, edited by Maria Dillschnitter, David Keller. Paderborn: Fink, 2016.

Hadler, Florian, and Joachim Haupt, eds. *Interface Critique*. Berlin: Kulturverlag Kadmos, 2016.

Hookway, Branden: Interface. Cambridge, MA and London: MIT Press, 2014.

Kay, Alan C. “User Interface. A Personal View.” In *multiMEDIA. From Wagner to virtual reality*, edited by Randall Packer, Ken Jordan. New York, NY: W.W. Norton, 2001 [1990].

Weibel, Peter. “The Art of Interface Technology.” In *Sciences of the Interface*, edited by Hans H. Diebner, Timothy Druckrey, and Peter Weibel. Karlsruhe: ZKM, 2011.

Weiser, Mark, Rich Gold, and John S. Brown. “The Origins of Ubiquitous Computing Research at PARC in the late 1980s.” *IBM Systems Journal 38* (1999).

Winograd, Terry, and Fernando Flores. Understanding Computers and Cognition: *A New Foundation for Design*. Norwood NJ: Ablex Publishing, 1986.

Wittgenstein, Ludwig. *Tractatus Logicus Philosophicus*. London: Routledge & Kegan Paul, 1961 [1922].

PROGRAMMATIC

INTERFACE MYTHOLOGIES – XANADU UNRAVELED

By Christian Ulrik Andersen and Søren Pold

"We are seduced by the interface into neglecting the work behind it, and the operationalization and instrumentalization of dreams that takes place. The interface appears mythical, absolute and frozen."

Suggested citation:
Andersen, Christian Ulrik and Pold, Søren (2018). "Interface Mythologies – Xanadu Unraveled." In *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44738

TECHNO MYTHS

Data mining, machine learning and other disciplines involved in finding patterns of data promise a future with new insights that will enable a new mode of intelligence. However, as with much other technological marketing, this is also a myth. In our interface criticism, we propose to engage with ubiquity, openness, participation and other aspects of this intelligence as mythological constructions which are presented to us via interfaces.

Following on from Roland Barthes' seminal studies of visual culture, where he discusses everything from striptease to washing powder, we intend to engage with the illusions of technologies. In many ways it is, for instance, an illusion to believe that a computer system can really forecast everything. As with weather forecasts, predictions of traffic, browsing, and other behaviours are faulty. Machine learning works by approximation and by generating generalized functions of behaviour, which are only generalizations after all; and similarly, the data we produce is captured by technologies that constantly have to deal with the noise of many simultaneous and ambiguous actions. However, from the perspective of a mythology, the important aspect is not whether the generated algorithms work or not, but how they become part of our reality. For instance, they function as speech acts that create correlations between 'data analytics' and 'intelligence', and this performative act may have a real impact when we rely on this alleged intelligence – when we market products, control traffic, fight terrorism or predict climate changes.

The mythologization of technology that takes place in the speech acts does not imply that how the technology 'really works' is hidden, but merely the ability to automatically associate certain images with certain signification in an absolute manner. To follow on from Roland Barthes, the mythologization of our smart technologies removes the history of intelligent systems, smartness, ubiquitousness, openness, and so forth, from the linguistic act. Just as we do not question that Einstein's famous equation, and equations more generally, are keys to knowledge – as Barthes describes – intelligent systems for smart cities, state security, logistics, and so on suddenly appear absolute.[1] Along with openness, participation and other techno myths, 'smartness' appears as an algorithmic reality we cannot question.

However, all techno myths should be seen as expressions of how we want the world to be, rather than what it really is. In order to perform an interface criticism, we do not need to discuss if the technologies are true or false – for the smart techniques of data mining, machine learning, and so forth, obviously work – but we need to realize that their myths are also part of our reality. As Philip Agre

1 Roland Barthes, *Mythologies*, transl. Annette Lavers (New York: Hill and Wang, a division of Farrar, Straus & Giroux, 1972).

has noted, we subject our actions to the system that needs to capture them as data; and this deeply affects the way we produce, socialize, participate, engage, and so on.[2] The monitoring of academic production and the capture of citations is, for instance, used to create indexes which indicate impact. Ideally, this can affect the efficiency of academia and be a relevant parameter for funding opportunities, careers, and the like. Even though this efficiency may be absent, the data capture still has an effect on the perception and performance of academic work; it is constitutive of our habitat and subtly affects our habits.

In many ways, the technological myths always feel real, and are dominant actors that affect a range of areas – from the perception of the weather, to our cities, and our cultural production and consumption. We have every reason to question not only if the technology works, but also the implications of its myths. It is often when we realize the pointlessness of our actions (that texts can be quoted for their mistakes, rather than their insights; or their summaries of knowledge rather than their epochal value) that we structurally begin to question the absolute assertions about the world embedded in the myth, and also to envision alternatives.

In this article, we do not want to dismiss intelligent, open, participatory or other technologies, but to discuss how technologies participate in the construction of myths. To us, this criticism fundamentally involves a mythology – a critical perspective on the interface that explores how the interface performs as a form of algorithmic writing technology that supposedly transcends signs, culture and ideology. To focus on the interface as a a language diverts attention away from technology's immediate assertions about reality – the technical fix – and highlights the materiality of their staging. The aim will be to discuss how technologies perform as dreams of emancipatory or other post-semiotic idealized futures, and argue for the need for an interface mythology that critically addresses the technologies as myths; and unravels them as value systems and tools for writing – of both future functionalities and future cultures.

DREAM MACHINES

There is a general tendency to develop technology in the light of cultural utopias. The development of hypertext is a very good example of this. With the emergence of hypertext in the sixties (and later the WWW, weblogs, social media, and much

2 Philip E. Agre, "Surveillance and Capture: Two Models of Privacy," in *The New Media Reader*, ed. Noah Wardrip-Fruin and Nick Montfort (Cambridge, Massachusetts and London, England: MIT Press, 2003). According to Agre there are two dominant notions of surveillance. Surveillance is often perceived in visual metaphors (i.e., 'Big Brother is watching'); however, computer science mostly builds on a tradition of capturing data in real time, and is often perceived in linguistic metaphors ('association', 'correlation', etc.). Hence these metaphors are also better suited to describe the kinds of surveillance taking place when data capture permeates social life, friendship, creative production, logistics, and other areas of life.

more), the development of various forms of textual networks has been intrinsically linked to strong visions of new ways of producing, experiencing and sharing text. One of the strongest proponents of such visions has been Theodor H. (Ted) Nelson. Nelson's *Xanadu* is a lifelong project, and it has been the outset for numerous reflections on the development of hypertext. Perhaps the most well-known of these texts is *Computer Lib/Dream Machines* from 1974, a self-published book featuring illustrations, cartoons and essays on various topics, all aiming in different ways to explore alternative ways of thinking related to computers.

Furthermore, the book can be read from both ends. The one end offers a technical explanation for common people of how computers work; as Nelson writes: "Any nitwit can understand computers, and many do. Unfortunately, due to ridiculous historical circumstances, computers have been a mystery to most of the world."[3] The other end is meant to make the reader see the development of the computer as a "choice of dreams."[4] According to Nelson, what prevents us from dreaming is the developer's incomprehensible language (or, as he labels it, "cybercrud"), which in his view is just an excuse to make people do things in a particular way; that is, to let the technocratic visions of culture stand unchallenged.

Already in 1965 Nelson invented the term hypertext for a new kind of file structure for cultural and personal use:

> The kinds of file structures required if we are to sue the computer for personal files and as an adjunct to creativity are wholly different in character from those customary in business and scientific data processing. They need to provide the capacity for intricate and idiosyncratic arrangements, total modifiability, undecided alternatives, and thorough internal documentation. [...] My intent was not merely to computerize these tasks but to think out (and eventually program) the dream file: the file system that would have every feature a novelist or absentminded professor could want...[5]

In this way, Nelson was already in 1965 aware that developing alternative uses of the computer was closely linked to developing alternative versions of the technical structure and even the file system. He continued – and still continues – to develop his idea of hypertext, of which he premiered the first publicly accessible version at the *Software* exhibition of technological and conceptual art in New York in 1970. Visions and dreams appear in a recognition that the power of computation – or of computer liberation – is linked to visions of a new medium; that the inner

3 Theodor H. Nelson, "Computer Lib / Dream Machines," in *The New Media Reader*, ed. Nick Montfort and Noah Wardrip-Fruin (Cambridge, MA: MIT Press, 2003 (1974/1987)), 302.

4 Ibid. 305.

5 "A File Structure for the Complex, the Changing, and the Indeterminate," in *The New Media Reader*, ed. Nick Montfort and Noah Wardrip-Fruin (Cambridge, MA: MIT Press, 2003 (1965)), 134.

signals of cathode ray tubes are related to signs and signification, and therefore to cultural visions. In other words, they are linked to the hypothesis that the computer interface, at all levels, and not just the graphical user interface, is an interface between the technical and the cultural. When text, for instance, is treated by protocols there is a double effect, where not only the cultural form of the text changes (e.g. from book to hypertext), but also the technology itself appears as a deposition of cultural values. This is why the discussion of the future of text and images, on the web and in e-books, also appears as a discussion of text protocols and formats.

THE SUBSUMPTION OF DREAMS

Many writers and theorists have adopted Nelson's visions of alternatives, and of new modes of producing, reading and sharing text. For example, in his book *Writing Space*, Jay Bolter explored what writing was before and potentially could be with hypertext.[6] Bolter's main hypothesis was that print text no longer would decide the presentation and organisation of text, and that it no longer would decide the production of knowledge. Readers would become writers, and this would undermine the authority of print text; writing would become liquid, and we would experience a space of creative and collective freedom. However, as we have experienced on today's Internet, not everything seems as rosy. There are plenty of reasons to look more critically at Facebook, Twitter, Wikis and other services.

Nelson's Xanadu system had already included an advanced management instrument, the so-called 'silver stands': stations where users can open accounts, dial up and access the information of the system, process publications and handle micro payments. Nelson himself compares this to a McDonald's franchise and the Silver Stands somehow resemble the Internet Cafés of the late 90s and early 2000s or the commercial, centralized platforms of Web 2.0. Furthermore, copying content in the Xanadu system is restricted to dynamic "transclusions" that include the current version of the original text and assure a small royalty when accessed, a so-called "transcopyright".

When looking at the services of Facebook, Google, Amazon, Apple, and so on today, it is similarly obvious that the common production modes characteristic of a free writing space are accompanied by strict control mechanisms. There are, for instance, strict protocols for the sharing, searching, writing and reading of text, and these protocols often ensure an accumulation of capital and compromise the anonymity and freedom of the participant. In other words, the in-

6 J. David Bolter, *Writing Space the Computer, Hypertext, and the History of Writing* (Hillsdale, N.J: L. Erlbaum Associates, 1991).

strumentalization of the dream includes everything else but the dream. The envisioned shared, distributed, free and anonymous writing space is in fact a capitalised and monitored client-server relation.

This critique of contemporary interface culture is perhaps not news, but what we want to stress here is the effect of the instrumentalization of dreams and visions. What this indicates is that down the 'reactionary path' (that is, the path of instrumentalization), our dreams turn into myths. However, the ethos of the dreams remains, and become automatically associated with the technical systems.

THE THREE PHASES OF MEDIA TECHNOLOGIES

The dream of a shared writing space, a Xanadu, that overcomes the problems of representation facing linear text forms, as well as the hypertext system's instrumentalization of this dream, the mythological status of such systems, and the adherent critique of them, all fit into a three-phase model of media presented by the German media theorist Harmut Winkler.

From a linguistic perspective all new media are, in the first phase, considered post-symbolic, concrete and iconic communication systems that present a solution to the problem of representation, or the arbitrariness of the sign. Winkler even sees the development of media as "deeply rooted in a repulsion against arbitrariness", and a "long line of attempts to find a technical solution to the arbitrariness" dating back to the visual technical media of the 19th century.[7] In addition, hypertext was perceived as establishing a more true relation between form and content, because of its more intuitive, democratic, and less hierarchical, nonlinear structure. It will often be the investment in the dreams that pays for their technical implementation: You not only buy new functionality, you buy a new way of living, working, thinking and dreaming. In this way, the development of hypertext, the WWW, social media – and also computer games and virtual reality, and their alleged liberation of the user – is driven by an urge to fulfil a dream, a vision of a new future.

In the second phase, the utopias become natural, stable and hegemonic. Through subsumption by market forces they become commodified, and sold as myths of being part of a media revolution. However, the subscription to this reality also contains an explicit lack of visions of alternative futures, and is therefore also without the critical, activist and heroic dimensions of the first phase.

It is, however, also a phase where people begin to study the media and learn how to read and write with them. In other words, the new media begins to enter a phase where you see it as a language, and hence where the arbitrariness of the sign is

7 Hartmut Winkler, *Docuverse* (Regensburg: Boer, 1997), 214.

reinstalled. In the third phase, this arbitrariness has turned into disillusion over the media's lack of abilities; which, however, also constitutes the ground for new visions, new media technologies, new interfaces, and new media revolutions.

The question is how far are we, today, from Ted Nelson's critique of centralised data processing and IBM-like visions of efficiency and intelligence? In several ways, it seems as if we are in a phase where we might soon begin to regard big data, smart systems, social intelligence, and so forth, as a language; where we begin to see through the technological systems' mythological statuses, or at least their dark sides in the form of control and surveillance. This is by no means an easy phase. As Ted Nelson also noted, "Most people don't dream of what's going to hit the fan. And computer and electronics people are like generals preparing for the last war."[8] The developers of technology and their supporters will often insist that their system is the future, and that the users' actions need to follow the system's intrinsic logic.

INTERFACE MYTHOLOGIES

From a design perspective, the assumption will typically be that the clearer the representation of the computer signal-processes appears (or the mapping of mental and symbolic labour – the formalization of labour to computer language performed by the programmer), the more user-friendly and understandable the user interface appears. To computer semiotics, the aim was ultimately to create better interface design. However, in relation to an interface criticism, it is noteworthy how computer semiotics also explains how a design process in itself contributes to the mythological status of the interface – its absolute assertions about the world.[9] In other words, the myths of interfaces are not only established through how they are represented elsewhere (how they are talked about, written about, advertised, etc.), but also through the interfaces themselves, and how they are designed. It is in its design as a medium, and in its claims of an iconic status as a communication system, that we find the interface's operationalized mythology. And, in a general perspective, this is not unlike how media such as photography, film, the panorama, and so on, according to Harmut Winkler, have tried to operate in earlier times.

To read this myth demands that one begins to read the media – or, in our case, the interface. It is a tool for reading and writing, and not an absolute representation of the world. We must, therefore, begin to pay attention to the establishment of sign-signal relations that take place in the interface design, as a particular production mode, a particular kind of labour; a production of signs that at

8 Nelson, "Computer Lib / Dream Machines," 305.

9 On computer semiotics and the work of Frieder Nake and Peter Bøgh Andersen, see Søren Pold and Christian Ulrik Andersen, *The Metainterface: The Art of Platforms, Cities and Clouds* (Cambridge, MA and London, England: MIT Press, 2018).

once reflects cultural and historical processes, and leaves an imprint on the world and how we organise and deal with it.

For instance, the software of the print industry, as Nelson also demonstrates, both reflects the historical and cultural origins of print and negotiates the reality of text, as searchable, sequential, iterative, sortable, and so forth. Our file formats and standards for storing and showing data also reflect such processes. Jonathan Sterne, for instance, has recently analysed how the diameter of the Compact Disc directly reflects relations to the cassette tape, and how the mp3 format also holds an audio culture of listening that is embedded in the sound compression, and how this directly challenges the cnception of technological progress as equal to increased high fidelity.[10] Even the electrical circuits and the signal processes deep inside the computer can be viewed as the result of language acts, as Wendy Chun has pointed out.[11]

Computer software and its formats and platforms promise us dreams of the future, of technological progression, better opportunities to make our music portable and shareable, better ways of organising our work, and so forth. It is often these dreams that carry the technological development. However, the dreams have a tendency to freeze, and gain an air of absoluteness, and of hegemony. This happens through their commodification and appropriation to a reality of power and control. Technology is marketed as a utopia of being in the midst of a media revolution. But in this phase the cultural and historical residues are hidden. We are seduced by the interface into neglecting the work behind it, and the operationalization and instrumentalization of dreams that takes place. The interface appears mythical, absolute and frozen. We do not see the mp3 format's compression of sound as a result of an audio culture, but as the only possible scenario, a technological fact; and we do not see the IT systems of workers as the result of a negotiation of labour processes, and we do not see the operational system's metaphorization of actions as other than a result of natural selection in the evolution of technologies. To get out of the deception of the technological facts we need interface mythologies – critical readings of the interface myths.

10 Jonathan Sterne, *Mp3: The Meaning of a Format, Sign, Storage, Transmission* (Durham: Duke University Press, 2012).

11 Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory* (Cambridge, MA and London, England: MIT Press, 2011).

REFERENCES

Agre, Philip E. "Surveillance and Capture: Two Models of Privacy." In: *The New Media Reader*, edited by Noah Wardrip-Fruin & Nick Montfort, 737-60. Cambridge, MA: MIT Press, 2003.

Barthes, Roland. *Mythologies*. Transl. Annette Lavers. New York: Hill and Wang, a division of Farrar, Straus & Giroux, 1972.

Bolter, J. David. *Writing Space the Computer, Hypertext, and the History of Writing*. Hillsdale, N.J: L. Erlbaum Associates, 1991.

Chun, Wendy Hui Kyong. *Programmed Visions: Software and Memory*. Software Studies. Cambridge, MA: MIT Press, 2011.

Nelson, Theodor H. "Computer Lib / Dream Machines." In: *The New Media Reader*, edited by Nick Montfort, and Noah Wardrip-Fruin, 301-38. Cambridge, MA: MIT Press, 2003 (1974/1987).

Nelson, Theodor H. "A File Structure for the Complex, the Changing, and the Indeterminate." In: *The New Media Reader*, edited by Nick Montfort and Noah Wardrip-Fruin, 133-45. Cambridge, MA: MIT Press, 2003 (1965).

Pold, Søren, and Christian Ulrik Andersen. *The Metainterface: The Art of Platforms, Cities and Clouds*. Cambridge, MA: MIT Press, 2018.

Sterne, Jonathan. *Mp3: The Meaning of a Format (Sign, Storage, Transmission)*. Durham: Duke University Press, 2012.

Winkler, Hartmut. *Docuverse*. Regensburg: Boer, 1997.

DRAWING CONNECTIONS – HOW INTERFACES MATTER

By Jan Distelmeyer

“[…] interfaces carry – in every sense of the word – the global computerization of living conditions.”

Suggested citation: Distelmeyer, Jan (2018). “Drawing Connections – How Interfaces Matter” In: *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44733

A telling incident concerning computerization in 2017 took place on Friday, May 12: On the very day the Upper House of the German Parliament approved a law permitting self-driving cars, the *WannaCry* ransomware began its international outbreak. This coincidence makes it easy to imagine a future in which hackers can target computerized and networked cars without the need for suicidal drivers.

What does this, though, have to do with the question of interfaces? Interfaces are key to – or the carrier of, to be exact – these programmatic proceedings.

Since interfaces form the complex of connections and processes that both enables a computer to fulfill its promise of being a *general purpose machine* and establishes the connections we call networks, the question of interfaces becomes inescapable if we want to deal with the actual presence of various computers, no matter how seamless or "ready-to-hand"[1] they may appear. Human computer interfaces are important here but only as an aspect of a larger complex. That said, human computer interfaces and especially graphical user interfaces could indeed help address the aspect of programmability as as crucial for the computerization of societies discussed as „algorithmic governance".[2] To elaborate on this I would like to first reconsider the term interface.

CONNECTIONS AND PROCESSES

Graphical user interfaces are but one of the multilayered aspects characterizing interfaces in terms of digital computing. These "symbolic handles", as Florian Cramer and Matthew Fuller call them, "which […] make software accessible to users"[3] depend on and are connected to other interface aspects and processes, such as hardware connecting humans /bodies to hardware, hardware connecting hardware to hardware, software connecting software to hardware, and software providing software-to-software connections. Embedded computers like in networked household appliances or combat drones could be said, then, depend primarily on hardware interfaces connecting computing hardware to non-computing hardware, whereby the computing and networked hardware is, of course, intertwined with and based on other networked software and hardware interfaces. Because the adjective "networked" has become a dulcet catch-all for various interface processes between processing and protocol-driven systems.

This scope of the interface complex suggests the necessity of thinking about interfaces, if the current presence of diverse computers and their connections are to be grasped and reconsidered. Moreover, it is important

1 Florian Sprenger, *Politik der Mikroentscheidungen. Edward Snowden, Netzneutralität und die Architekturen des Internets* (Lüneburg: meson press, 2015), 115.

2 Benjamin Bratton, *The Stack: On Software and Sovereignty* (Cambridge, MA: MIT Press, 2016).

3 Florian Cramer, and Matthew Fuller, "Interface," in *Software Studies: A Lexicon*, ed. Matthew Fuller (Cambridge, MA: MIT Press, 2008), 149.

to remember that the term interface introduced in late 19th century by the physicists James and William Thomson originally described the transmission of energy.[4] Thomson's usage "would define and separate areas of unequal energy distribution within a fluid in motion, whether this difference is given in terms of velocity, viscosity, direc-tionality of flow, kinetic form, pressure, density, temperature, or any combination of these"[5]. This enables a description of a computer's "interior telegraphy"[6] (its inner processuality and flow of signals) and its connections, its relations to us, and its incorporations.

Bearing this in mind, the question of the sought-after ubiquity and networked embeddedness of computing that relies on electrical transmissions of signals is even more obviously a question of interfaces. Hence, the ongoing development of dissemination, interconnection, and the implementing of computers can be investigated only through interface processes. Interfaces induce the diverse procedures of connectivity and transferences, marking the current presence of computers often as ubiquitous.

INTERFACE POLITICS

Today's interface culture is undoubtedly very much shaped by various forms of interfacing. N. Katherine Hayle's remark that, "[m]obile phones, GPS technology, and RFID (radio frequency identification) tags, along with embedded sensors and actuators, have created environments in which physical and virtual realms merge in fluid and seamless ways"[7], sums up some forms of interfaces that construct and organize "seamless" processes of connectivity. But this development – mirrored recently by the term "Post-Interface"[8] and Mark B.N. Hansen's perspective on "twenty-first-century media" ("no longer a delimited temporal object that we engage with focally through an interface such as a screen, media became an environment that we experience simply by being and acting in space and time"[9]) – should not be mistaken for a vanishing of interfaces.

Firstly, the complex outlined above emphasizes that the promoted ubiquity of computers – including the promise of seamless processes in the

4 See Peter Schaefer, "Interface: History of a Concept, 1868-1888," in *The Long History of New Media: Technology, Historiography, and Contextualizing Newness,* ed. David W. Park, Nicholas W. Jankowski, and Steve Jones (New York: Lang [Digital Formations 76], 2011), 163-175; Branden Hookway, *Interfaces* (Cambridge, MA: MIT Press, 2014), 59.

5 Hookway, *Interfaces*, 59.

6 Hartmut Winkler, *Prozessieren. Die dritte, vernachlässigte Medienfunktion* (Munich: Wilhelm Fink, 2015), 294.

7 N. Katherine Hayles, "Cybernetics," in *Critical Terms for Media Studies*, ed. W.J.T. Mitchell, Mark B.N. Hansen (Chicago: University of Chicago Press, 2010), 148.

8 Michael Andreas, Dawid Kasprowicz, and Stefan Rieger, "Technik | Intimität. Einleitung in den Schwerpunkt," *Zeitschrift für Medienwissenschaft* 15, no. 2 (2016): 12.

9 Mark B.N. Hansen, "Ubiquitous Sensation: Towards an Atmospheric, Impersonal and Microtemporal Media," in *Throughout. Art and Culture Emerging With Ubiquitous Computing*, ed. Ulrik Ekman (Cambridge, MA: MIT Press, 2013), 73.

"internet of things" (and the related measuring of everything and everybody) – is, in fact, a dissemination of interfaces. Secondly, (and on this basis), our encounter with computers, computerized media, and computerized things through various forms of programmed and designed user interfaces is not superseded but rather accompanied by "pervasive" and "seamless computing".[10] Mark B.N. Hansen's des-cription of the "experiential shift" by "twenty-first-century media" depicts the diversity of interconnected interface politics:

> Thus, well before we even begin to use our smart phones in active and passive ways, the physical devices we carry with us interface in complex ways with cell towers and satellite networks; and preparatory to our using our digital devices or our laptops to communicate or to acquire information, the latter engage in complex connections with wireless routers and network hosts.[11]

While these devices are constantly (and "calmly"[12]) interfacing with networks and servers, we do also use ›our smart phones in active ways‹, which is why we pay for and update them. Even today, graphical user interfaces are so obviously omni-present that this manifestation of software is still "often mistaken in media studies for ›interface‹ as a whole"[13]. Despite this, media studies analyses of common user interfaces are still not common.[14] This must change if we want to better un-derstand our interrelationship with (pre-vious, current, and upcoming) forms of computing.

In the second half of the twentieth century, film studies and film analysis became institutionalized at European universities. Given the increasing relevance of (per-sonal) computing and graphical user interfaces over the last thirty-five years, it is high time to establish the discipline of interface studies and analyses in the humanities. This is necessary, because interfaces define today's reality in mani-fold ways. Understood as the complex of various processes of connectivity and con- duction, interfaces

10 See Thomas Steinmaurer, *Permanent vernetzt: Zur Theorie und Geschichte der Mediatisierung* (Wiesbaden: Springer VS, 2016), 305.

11 Mark B.N. Hansen, *Feed Forward. On the Future of Twenty-First-Century-Media* (Chicago: University of Chicago Press, 2015), 62.

12 See Florian Sprenger, "Die Vergangenheit der Zukunft," in *Internet der Dinge. Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, ed. Florian Sprenger, and Christoph Engemann (Bielefeld: Transcript, 2015): 143-168.

13 Cramer, Fuller, "Interface," 149.

14 For exceptions see Fuller, Matthew: "It looks like you're writing a letter: Microsoft Word", in: Matthew Fuller , ed., *Behind the Blip. Essays on the Culture of Software* (New York: Autonomedia, 2003), 11-37; Christian Ulrik Andersen, and Søren Pold, eds., *Interface Criticism. Aesthetics Beyond Buttons* (Aarhus: Aarhus University Press, 2011); Margarete Pratschke, "Interacting with Images. Toward a History of the Digital Image: The Case of Graphical User Interfaces," in *The Technical Image. A History of Styles in Scientific Imagery*, eds. Horst Bredekamp, Vera Dünkel, and Birgit Schneider (Chicago: University of Chicago Press, 2015), 48-57; Teresa Martínez Figuerola and Jorge Luis Marzo, eds., *Interface Politics* (Barcelona: Gredits, 2016); Florian Hadler and Joachim Haupt, eds., *Interface Critique* (Berlin: Kadmos, 2016); Jan Distelmeyer, "Machtfragen. Home Entertainment und die Ästhetik der Verfügung," *in Film im Zeitalter Neuer Medien, Teil II: Digitalität und Kino*, ed. Harro Segeberg (Munich: Fink Verlag 2012), 225-251.

carry – in every sense of the word – the global computerization of living conditions. Interface processes transmit, channel, bear, support, sustain, head, conduct, promote, and lead. A vital role in this context is still played by graphical user interfaces which amount to something like the blockbusters of today's visual politics.

Graphical user interfaces inform us (to some extent) of the real and the imaginary, the well-prepared and consequential relations between humans and computers as applied in computers. Studying their complicated interface politics and ordinary manifestations like graphical user interfaces in particular, allows for the computer to be realized as a particular "power machine"[15], which enables us to examine a key component of computers and computerized things /beings/environments: programmability.

OPERATIVE IMAGES AND DEPRESENTATION

The interdependence of aesthetics and dispositifs demands that attention be paid to the special status of these images and signs that – to quote a *Windows 10*-commercial from 2015 – "help you do your thing"[16]. Of course, these so-called "computer icons" could likewise be symbolic, depending on the specific interface design. Regardless of the potentially iconic or symbolic character of these images and signs, all clickable or touchable appearances correspond to Peirce's idea of indices.[17] These images and signs must somehow have a physical relation to the presented processes of computing, to the interior telegraphy of the computer; they "show something about things, on account of their being physically connected with them"[18]. They otherwise simply would not work. To specify this indexicality, it is helpful to consider the difference between what Peirce called a genuine index and a degenerated index, because graphical user interfaces combine both forms of Peirce's indexicality.

Graphical user interfaces visualize what the computer offers to do in a particular way without, of course, showing what is actually happening ›inside‹ the machine. "Software, or perhaps more precisely OS," as Wendy Chun has stated, "offer us an imaginary relationship to our hardware: they do not represent the motherboard or other electronic devices but rather desktops, files, and recycling bins."[19] This is obviously true, but at the same time this relationship – depresented by symbolic or iconic

15 See Jan Distelmeyer, *Machtzeichen. Anordnungen des Computers* (Berlin: Bertz + Fischer, 2017), 82-92.

16 https://www.youtube.com/watch?v=j3ZLphVaxkg, accessed August 30, 2017.

17 See Marianne van den Boomen, *Transcoding the Digital. How Metaphors Matter in New Media* (Amsterdam: Institute of Network Cultures, 2014), 37-41.

18 Charles S. Peirce, "What is a sign," in *The Essential Peirce: Selected Philosophical Writings, Volume 2* (1893-1913), ed. The Peirce Edition Project (Bloomington: Indiana University Press, 1998), 5.

19 Wendy Hui Kyong Chun, *Control and Freedom. Power and Paranoia in the Age of Fiber Optics* (Cambridge, MA: MIT Press, 2006), 20.

signs – offers more than just an *imaginary relationship* to the working hardware of the computer, for instance, in the form of the motherboard. These clickable or touchable signs are simultaneously linked electronically to the inner processes of the machine, to its interior telegraphy, whose flow of electronic signals connects, among others, the motherboard to the indexical signs of the graphical user interface. This enables us to click/touch them, to start the promised and hidden algorithmic processes, which is why Frieder Nake calls them "algorithmic images"[20].
The contradictory character of these images and signs has led Marianne van den Boomen to coin the very fruitful term depresentation. They show what we can do without showing the "procedural complexity" and the multitude of requirements and consequences attached:

> [T]he icons on our desktops do their work by representing an ontologized entity, while depresenting the processual and material complexity involved. This is the way icons manage computer complexity, this is the task we as users (in tacit conjunction with designers) have delegated to them.[21]

To address the special quality of these "symbolic handles"[22], I have discussed them as "operative images", [23] adopting a term coined by Harun Farocki to describe the production of imagery by machines for machines.[24] These images are, as Volker Pantenburg has put it, "completely absorbed into the process of the respective operation. They aren't intended to be released separately, and strictly speaking don't need to appear as images at all but emerge as the intermediate product of a wider technical process."[25]
The adjective "operative" indicates that these images are included as efficient components of electronic technical operations.[26] With this in mind, Farocki underlines that these images are made for operative purposes and neither for "edification nor instruction" ["Erbauung oder Belehrung"[27]]:

> In my first work on this subject, Eye/Machine (2001), I called such pictures, made neither to entertain nor to inform, ›operative images.‹ These are images that do not represent an

20 Frieder Nake, "The Semiotics Engine. Notes on the History of Algorithmic Images in Europe," *Art Journal* 68, no. 1 (2009): 76-89.
21 van den Boomen, *Transcoding the Digital*, 36.
22 Cramer and Fuller, "Interface," 149.
23 Translating of the term "operative Bilder" Farocki uses "operative images" as well as "operational pictures" and "operational images" – I will use here "operative" to stress the efficacy of these images and signs (see: Harun Farocki, "Phantom Images," *Public. Art, Culture, Ideas* 29 (2004): 12-22 and http://www.harunfarocki.de/installations/2000s/2003/eye-machine-iii.html, accessed August 30, 2017.
24 See Distelmeyer, *Machtzeichen*, 92-98.
25 Volker Pantenburg, *Farocki/Godard. Film as Theory* (Amsterdam: Amsterdam University Press, 2015), 210.
26 This distinguishes Farocki's operative image from Sybille Krämer's concept of operational imagery and operational scripts (see Sybille Krämer, "Operative Bildlichkeit. Von der Grammatologie zu einer ›Diagrammatologie‹? Reflexionen über erkennendes Sehen," in *Logik des Bildlichen. Zur Kritik der ikonischen Vernunft*, ed. Martina Heßler, and Dieter Mersch [Bielefeld: Transcript, 2009], 94-123.)
27 Harun Farocki, "Quereinfluss / Weiche Montage," in *Zeitsprünge. Wie Filme Geschichte(n) erzählen*, ed. Christine Rüffert, Irmbert Schenk, Karl-Heinz Schmidt, and Alfreys Tews (Berlin: Bertz, 2004): 61.

object, but rather are part of an operation.[28]

This last point is crucial, and marks a productive difference between Farocki's concept and my application of it.[29] Whereas the operative images of the interface *mise-en-scène* may not be made for "edification nor instruction" in the classical sense, they do (and must), of course, instruct us as "users"[30] what is capable of being done. What they instruct, and are part of through depresentation, is a kind of knowledge about computers, about their usage, and about us – an "implicit memory"[31].

Operative images as depresentations of computer performance are parts and thresholds of (at least) four types of mutually connected operations forming today's widespread computerization – that is, interface operations within the meaning of the multilayered interface facets:

1. Interface operations between various types of hardware and software inside computers forming their interior telegraphy.

2. Interface operations between computers, leading to further coaction of hardware and software by protocol-driven networks.

3. Interface operations between computers and non-computer forms of interconnected materiality – such as bodies or technical artifacts in smart cities and their idea of programmatic control.

4. Interface operations that allow humans to use computers more or less consciously – hence, operations understood as technical, physical, artistic, and epistemological processes, including questions of the relationship between software and ideology raised by Wendy Chun[32], Alexander Galloway[33], and Cynthia and Richard Selfe.[34]

28 Farocki, "Phantom Images," 17.

29 For other uses of the term, see: Werner Kogge, "Lev Manovich – Society of the Screen," in *Medientheorien. Eine philosophische Einführung*, ed. Alice Lagaay and David Lauer (Frankfurt a.M.: Campus Verlag, 2004), 297-315; Ingrid Hoelzl, "The Operative Image – an Approximation," http://mediacommons.futureofthebook.org/tne/pieces/operative-image-approximation, accessed August 30, 2017.

30 Using the term "users" I would like to stress the point that the common distinction between "users" and "programers" is highly problematic – especially when it comes to interfaces. As Wendy Chun has pointed out, "programmers are users" since "they create programs using editors, which are themselves software programs": "The distinction between programmers and users is gradually eroding, not only because users are becoming programmers (in a real sense programmers no longer program a computer; they code), but also because, with high-level languages, programmers are becoming more like simple users. The difference between users and programmers is an effect of software." (Wendy Hui Kyong Chun, "On Software, or the Persistence of Visual Knowledge," *Grey Room* 18 (2004): 38.

31 See Jan Distelmeyer, "An/Leiten. Implikationen und Zwecke der Computerisierung," *Medien, Interfaces und implizites Wissen, Navigationen – Zeitschrift für Medien und Kulturwissenschaften* 17, no. 2 (2017).

32 See Wendy Hui Kyong Chun, *Programmed Visions. Software and Memory* (Cambridge, MA: MIT Press, 2011).

33 See Alexander Galloway, *The Interface Effect* (Cambridge, MA: MIT Press, 2012).

34 See Cynthia L. Selfe, and Richard J. Selfe, "The Politics of the Interface: Power and Its Exercise in Electronic Contact Zones," *National Council of Teachers of English* 45, no. 4 (1994): 480-504.

(AESTHETICS AND LOGIC OF) REGULATION

As a final point, I would like to highlight just one aspect of the fourth type related to the special indexicality of these operative images, which brings me back to the question of how analyzing graphical user interfaces could help address the dicey character of computerization. Addressing this indexicality inevitably confronts us with the consequences of programmability, which I understand as perhaps the most thought-provoking characteristic of computers and computerized media /things/beings. Graphical user interfaces always propose ideas and depresentations of more than just the computer; instead, "[i]nterfaces and operating systems produce ›users‹ – one and all."[35] And since all of our computer use has to be envisaged and enabled by programming, computer interfaces always empower users to regulate while at the same time forcing them to be regulated. Hence, the depresenting interface *mise-en-scène* shapes the aesthetic appearance of the computer as an *aesthetics of regulation* [*Ästhetik der Verfügung*].[36]

This aesthetics of regulation is marked by a particular power structure – a logic of regulation: Actively regulating users are being regulated in a system, in which they have to play under the default rules with the provided tools and prerequisites. But this is no one-way street: Precisely because every computer operation relies on programs, all programmed functions, regulations, barriers, and presets are principally alterable and expandable by users or hackers. This processuality identifies dealing with computers as a power struggle with which its political issues may begin.

Dealing with an interface *mise-en-scène* built on changeable and depresenting operative images confronts us with programmability by involving us in it. That is why an interface analysis of the various processes of connectivity and conduction leads to an investigation of programmability, as the basis for both defining processes and allowing for protest und redefinition. Hence, if we live in a world headed for "complete computerization", what does it mean for every purpose of these general purpose machines we increasingly rely on, to necessarily depend on programming?

If, for instance, an "ambient intelligence" and "smart environment" require "the programming of autonomous agents of various kinds"[37], what kind of autonomy is this with which "the question of the in- or ahuman, the question of our inexistence"[38] is associated? What kind of programs are at work, and who or what has set it up for what purposes?

35 Chun, *Programmed Visions*, 67-68.

36 See: Distelmeyer, *Machtzeichen*, 65-126.

37 Ulrik Ekman, "Complexity and Reduction – Interview with Davis Rokeby," in *Ubiquitous Computing, Complexity*, and Culture, eds. Ulrik Ekman, Jay David Bolter, Lily Diaz, Maria Engberg, and Morten Søndergaard (New York: Taylor & Francis Ltd., 2015), 199.

38 Ulrik Ekman, "Introduction," in *Throughout. Art and Culture Emerging With Ubiquitous Computing*, edited by Ulrik Ekman (Cambridge, MA: MIT Press, 2013), 21.

And if programming these “autonomous” software agents makes it “impossible for the programmer and operator to capture all situations in advance and to connect them with specific instructions”[39], what responsibility rests with the abstract rules provided by the programs? Simply put, whose purpose will reign?

39 Kai Hofmann, and Gerrit Hornung, “Rechtliche Herausforderungen des Internets der Dinge,” in *Internet der Dinge. Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, ed. Florian Sprenger, Christoph Engemann (Bielefeld: Transcript, 2015), 355.

REFERENCES

Andersen, Christian Ulrik and Søren Pold, eds. *Interface Criticism. Aesthetics Beyond Buttons.* Aarhus: Aarhus University Press, 2011.

Andreas, Michael, Dawid Kasprowicz, and Stefan Rieger: "Technik | Intimität. Einleitung in den Schwerpunkt." In: *Zeitschrift für Medienwissenschaft* 15, no. 2 (2016): 10-17.

Bratton, Benjamin: *The Stack: On Software and Sovereignty*. Cambridge, MA: MIT Press, 2016.

Chun, Wendy Hui Kyong. *Control and Freedom. Power and Paranoia in the Age of Fiber Optics.* Cambridge, MA: MIT Press, 2006.

Chun, Wendy Hui Kyong. "On Software, or the Persistence of Visual Knowledge." In: *Grey Room* 18, (Winter 2005): 26-51.

Chun, Wendy Hui Kyong. *Programmed Visions. Software and Memory*. Cambridge, MA: MIT Press, 2011.

Cramer, Florian, and Matthew Fuller. "Interface." In: *Software Studies: A Lexicon*, edited by Matthew Fuller, 149-152. Cambridge, MA: MIT Press, 2008.

Distelmeyer, Jan. "An/Leiten. Implikationen und Zwecke der Computerisierung." In: *Medien, Interfaces und implizites Wissen. Navigationen – Zeitschrift für Medien und Kulturwissenschaften* 17, no. 2: 37-53.

Distelmeyer, Jan. "Machtfragen. Home Entertainment und die Ästhetik der Verfügung." In: *Film im Zeitalter Neuer Medien, Teil II: Digitalität und Kino*, edited by Harro Segeberg, 225-252. Munich: Fink Verlag, 2012.

Distelmeyer, Jan. *Machtzeichen. Anordnungen des Computers*. Berlin: Bertz + Fischer, 2017.

Ekman, Ulrik. "Complexity and Reduction – Interview with Davis Rokeby." In: *Ubiquitous Computing, Complexity, and Culture*, edited by Ulrik Ekman, Jay David Bolter, Lily Diaz, Maria Engberg, and Morten Søndergaard. New York: Taylor & Francis Ltd, 2015.

Ekman, Ulrik. "Introduction." In: *Throughout. Art and Culture Emerging With Ubiquitous Computing*, edited by Ulrik Ekman. Cambridge, MA: MIT Press, 2013.

Farocki, Harun:"Phantom Images." In: *Public. Art, Culture, Ideas* 29 (2004). Also: Farocki, Harun. "Auge/Maschine III."Accessed August 30, 2017. http://www.harunfarocki.de/installations/2000s/2003/eye-machine-iii.html.

Farocki, Harun. "Quereinfluss / Weiche Montage." In: *Zeitsprünge. Wie Filme Geschichte(n) erzählen*, edited by Christine Rüffert, Irmbert Schenk, Karl-Heinz Schmidt, and Alfreys Tews, 57-61. Berlin: Bertz, 2004.

Fuller, Matthew: "It looks like you're writing a letter: Microsoft Word", in: Matthew Fuller (ed.): *Behind the Blip. Essays on the Culture of Software*, New York: Autonomedia, 2003.

Galloway, Alexander. *The Interface Effect*. Cambridge, MA: MIT Press, 2012.

Hadler, Florian and Joachim Haupt (eds.): *Interface Critique*, Berlin, 2016.

Hansen, Mark B.N. "Ubiquitous Sensation: Towards an Atmospheric, Impersonal and Microtemporal Media." In: *Throughout. Art and Culture Emerging With Ubiquitous Computing*, edited by Ulrik Ekman, 63-88. Cambridge, MA: MIT Press, 2013.

Hansen, Mark B.N. *Feed Forward. On the Future of Twenty-First-Century-Media*. Chicago: University of Chicago Press, 2015.

Hayles, N. Katherine. "Cybernetics" In: *Critical Terms for Media Studies*, edited by W.J.T. Mitchell and Mark B.N. Hansen, 145-155. Chicago: University of Chicago Press, 2010.

Hoelzl, Ingrid."The Operative Image – an Approximation." Accessed August 30, 2017. http://mediacommons.futureofthebook.org/tne/pieces/operative-image-approximation.

Hookway, Branden. *Interfaces*. Cambridge, MA: MIT Press, 2014.

Kogge, Werner. "Lev Manovich – Society of the Screen." In: *Medientheorien. Eine* *philosophische Einführung*, edited by Alice Lagaay and David Lauer, 297-315. Frankfurt a.M.: Campus Verlag, 2004.

Krämer, Sybille. "Operative Bildlichkeit. Von der Grammatologie zu einer ›Diagrammatologie‹? Reflexionen über erkennendes Sehen." In: *Logik des Bildlichen. Zur Kritik der ikonischen Vernunft*, edited by Martina Heßler and Dieter Mersch, 94-122. Bielefeld: Transcript, 2009.

Martínez Figuerola, Teresa and Jorge Luis Marzo (eds.). *Interface Politics*. Barcelona: Gredits, 2016.

Nake, Frieder. "The Semiotics Engine. Notes on the History of Algorithmic Images in Europe." In: *Art Journal* 68, no. 1 (2009): 67-89.

Pantenburg, Volker. *Farocki/Godard. Film as Theory*. Amsterdam: Amsterdam University Press, 2015.

Peirce, Charles S. "What is a sign." *The Essential Peirce: Selected Philosophical Writings*, Volume 2 (1893-1913), edited by The Peirce Edition Project, 4-10. Bloomington: Indiana University Press, 1998.

Pratschke, Margarete. "Interacting with Images. Toward a History of the Digital Image: The Case of Graphical User Interfaces." In: *The Technical Image. A History of Styles in Scientific Imagery*, edited by Horst Bredekamp, Vera Dünkel and Birgit Schneider, 48-57. Chicago: University of Chicago Press, 2015.

Schaefer, Peter. "Interface: History of a Concept, 1868-1888." In: *The Long History of New Media: Technology, Historiography, and Contextualizing Newness*, edited by David W. Park, Nicholas W. Jankowski, and Steve Jones, 163-175. New York: Lang (Digital Formations 76), 2011.

Selfe, Cynthia L. and Richard J.Selfe. "The Politics of the Interface: Power and its Exercise in Electronic Contact Zones." In: *National Council of Teachers of English* 45, vol. 4 (1994): 64-85.

Sprenger, Florian. *Politik der Mikroentscheidungen. Edward Snowden, Netzneutralität und die Architekturen des Internets*. Lüneburg: meson press, 2015.

Sprenger, Florian. "Die Vergangenheit der Zukunft." In: *Internet der Dinge. Über smarte Objekte, intelligente Umgebungen und die technische Durchdringung der Welt*, edited by Florian Sprenger, and Christoph Engemann, 73-88. Bielefeld: Transcript, 2015.

Steinmaurer, Thomas. *Permanent vernetzt: Zur Theorie und Geschichte der Mediatisierung.* Wiesbaden: Springer VS, 2016.

van den Boomen, Marianne. *Transcoding the Digital. How Metaphors Matter in New Media.* Amsterdam: Institute of Network Cultures, 2014.

Winkler, Hartmut. *Prozessieren. Die dritte, vernachlässigte Medienfunktion*. Munich: Wilhelm Fink, 2015.

GESTALT-IDEAS AT THE INTERFACE BETWEEN THEORY AND PRACTICE

By Alan N. Shapiro

"Stories and technologies: two objects of knowledge-inquiry heretofore strictly separated from each other in our knowledge-culture, now brought together as a single object of inquiry, rethought from scratch as a paradoxical hybrid union […]"

Text of the keynote speech given at the "Zurich Design Biennale", 08th September 2017.

Suggested citation: Shapiro, Alan N. (2018). "Gestalt-Ideas at the Interface between Theory and Practice." In: *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44741

What is design as a "thinking discipline"? What is the relationship between "academic" ideas and the wider capitalist-practical-business-society?

The information society, the hi-tech society, the society of digital culture, the society of universal networked connectedness – where the answer to every question is seemingly available at our fingertips, by little scrolls of, and little finger inputs into, our smart devices – has brought many benefits. We can now all communicate with each other. We have access to online existence from anywhere and at any time. New communities and new contacts are formed.

But online life has also brought many disadvantages. There is hiding behind anonymity, disembodiment, texting with strangers through your smart phone instead of talking with your family at dinner, the formation of radical right political groups who talk only among themselves and invent fake news, information overload, and the reduction of knowledge to mere information.

One of the negatives which online life has brought about is that it seems to be more and more difficult to get inspiration, to develop original ideas, to introduce ideas into our democratic discussion as a society, ideas about individual and social life, about human existence, about our place in the city or in the universe. A democratic society very much needs ideas.

In the 20th century – regardless of whether one's ideas opposed or embraced the business-consumer world – ideas were a wholesale attitude of either critique or acceptance, principles that one believed in, and capitalism (or its alternatives) was /were judged *en bloc* in relation to self-contained integral principles.

Traditionally, one major source of ideas has been from the humanities. And from the sciences. And from the social sciences. And from the arts. We have whole fields study at large universities which are dedicated to ideas. There is philosophy, sociology, theology, literature studies, art history. These fields are devoted to ideas or theory or knowledge. I do not make any judgments about these fields. I am neutral about them. (This is a rhetorical technique that I have learned from Donald Trump. You say that "you would never say something," but at that very moment you are saying that very thing, and you "cleverly" distance yourself from any moral responsibility for having made that statement.) If I would say something about these mono-disciplines like philosophy or critical theory, I would draw attention to their "purism," to their "abstraction," to their self-referential discourses. I would point out that they are part of a system of a certain extreme separation between theory and applications or practice. A dualism, a binary opposition. We are tending to train students, and to disseminate forms of theoretical knowledge, on the one side, and practical skills, on the other side, into the world, which are either pure theory or pure practice.

I learned about the dualisms or binary oppositions which underlie much of Western culture and Western thinking by reading the works of the philosopher of "deconstruction" Jacques Derrida. And from reading some Buddhist texts.

At the elite humanities university in Trumpland where I myself studied, known as Cornell University in Ithaca, New York, the history of ideas (*Geistesgeschichte*) was considered to be the queen academic science of knowledge in the humanities.

The eminent professor of intellectual history, Dominick LaCapra, was my mentor. However, now I think that the history of ideas takes as an unreflected- upon assumption an inherited notion of what an "idea" is, a 20th-century idea of an idea. An idea as an illumination, a metaphorical light bulb lighting up over my head, as often depicted in comic books, cartoons, and caricatures. This needs a revision and a rethinking.

The potential of the field of design in the 21st century is to contribute to society a different kind of idea, something which is actual and fresh. Somewhat of a hybrid between theory and practice. On the border between theory and practice. *Leben an der Grenze – Living at the Boundary* (the title of a book by the co-founder of Gestalt Therapy Laura Perls). Design as a thinking, feeling and action-oriented discipline. Design Universities can and will offer this.

In the 20th century, when the "idea-paradigm" was ideas which were whole and self-contained, the capitalist-business world, the consumer-media culture, advertising and the cyber culture, what left intellectuals like to call "neoliberalism" and the globalization from above of big corporations, were judged as whole entities, measured ethically against or according to the standard of these integral ideas.

The 21st century "idea-paradigm" for dealing with the capitalist economy is different: to bring together (fragments of) powerful ideas with very pragmatic design projects, a sort of hybrid of meaning and technological artefact, an amalgam of stories and technologies as a unified object, beyond their habitual dualistic separation, humanism and post-humanism brought together. Stories and technologies: two objects of knowledge-inquiry heretofore strictly separated from each other in our knowledge-culture, now brought together as a single object of inquiry, rethought from scratch as a paradoxical hybrid union, addressed with fresh philosophical-practical concepts.

The humanities (*die Geisteswissenschaften*) are essentially about meaning, about stories, about narrative. Humanism or the human sciences studies how human cultures and individuals tell stories to themselves to make sense of life. Anthropology studies collective meaning-making in cultures. Comparative literature studies meaning-making by authors in the written and performative works of novels, plays and poetry. Psychology studies meaning-making in the person's psyche, consciousness, and unconscious mind.

But now we are in a posthuman era of new media, new technologies and Artificial Intelligence, and we need to consider the nonhuman perspective. Information has displaced meaning. (In his bestselling book of futurism *Homo Deus: A Brief History of Tomorrow*, Yuval Noah Harari is willing to entertain every sort of monumental change in social-technological existence, except for that of the diminishing validity of the academic-historian humanist conviction to which he adheres that all societies can be understood through their self-telling narratives). We must consider the consequences – especially for our own methodologies and worldview – of the paradigm shift of information having replaced meaning. One consequence is that we must become seriously involved with design, rather than caricature it as the manipulation of sense and feelings.

Stories and narratives are still important, but rather as fragments to be brought together with the active hands-on media imagination, with "phantasmal media"[1], expressive computational media, and with interaction design and experience design.

When we think ecologically about "nature," when we consider the viewpoints of animals and plants, when we wear eye-glasses or get body or medical implants (we are already cyborgs), when we interact at all with media and technology, when we watch a science fiction film about "aliens," when we read the novel *Solaris* by Stanislaw Lem about an entire ocean-planet which is "alive" and has "consciousness," then we are appreciating the "non-human perspective."

Now I will consider the example of the blockchain (a potential project of "techno-logical anarchism," as I call it): blockchain networking database technology, originnally a spinoff of the bitcoin virtual currency project, and now a major technology design project in its own right. Ethereum-based blockchain commerce payment solutions are examples of the new 21st century "idea-paradigm" in action. Banks and financial middlemen are to be eliminated from customer-retailer transactions not because "capitalism is evil" (a 20th century idea in both content and in the form of what an "idea" was considered to be), but because these exorbitant fee-charging financial institutions have taken advantage of the circumstances that no globally trusted system has existed for all these years.

Ethereum is a Swiss-based company and non-profit foundation. Its open-source technology is a distributed computing platform built on a blockchain architecture and offering "smart contract" capabilities. A "smart contract" encapsulates into a single entity the terms of an agreement among two or more parties, and the execution of that agreement. The "smart contract" deals with business, law, and software code. Macro languages are currently being developed that will be used by software-literate attorneys, and which are halfway between law and code. Smart contracts enable decentralized payment processing platforms with built-in and full-fledged trust and reputation systems.

A decentralized – indeed, a sort of anarchist – system will be implemented, not thanks to a political ideology (as would have been the case

1 See the recent book by D. Fox Harrell, *Phantasmal Media: An Approach to Imagination, Computation, and Expression* (Cambridge, MA: MIT Press, 2013).

in the 20th century), but because a media technology to make economic conditions more fair has been designed. Good moral values to benefit both society and individuals have been algorithmically programmed in a sort of "technological anarchism."

This "technological anarchism" has a certain connection to earlier historical pragmatic-utopian ideas in social theory about humans becoming liberated from the drudge work of survival required of them in an industrial economy of scarcity. It was thought by thinkers of the 1960s such as Herbert Marcuse in his book *Eros and Civilization* and Murray Bookchin in his book *Post-Scarcity Anarchism* that technology carries the potential for human emancipation as we move towards a post-industrial and post-scarcity situation. A society of true abundance.

The updated version in 2017 of this 1960s vision is that ethics can be algorithmically programmed as an alternative, or as an addition, to trying to get human beings to act or behave ethically. What is emerging today is an instance of what I call the non-human perspective, in this case, a trusting in intelligent algorithms of software technology to make a better society.

The flaw of socialism or communism was that they were still humanist perspectives. The idea of a benevolent state that intervenes in the economy to offset the inequalities and injustices of a pure free-market private enterprise economy was basically a good idea. Bravo for that. But the idea had the major defect of relying on humans to be the agents running this benevolent state. Humans are notoriously selfish, greedy, corrupt, and power-hungry.

There are many startup companies operating in the blockchain galaxy. Blockchain (and other "distributed ledger") technology will be worked up into new software applications, many of which will benefit artists, designers and creators. These applications will help the growth of what I call the "Internet of Creators." Creators will be better positioned to capitalize on or monetarily convert their symbolic wealth. As creators make money, they will transform what money is.

The artist or creator does not produce a "substitutable" commodity, as the rules of the capitalist economy generally dictate. He or she creates a singular object which circulates more along the lines of "gift-exchange," as in so-called primitive societies studied by anthropology. The artist gives his or her creations to the society, and then they belong to the society, and a spirit of gift-giving circulates further. In the "Internet of Creators," will we still be in the realm of economic exchange in the capitalist sense? Or will something else arise, something post-capitalist, some sort of symbolic exchange? What kind of social relationship is established with blockchain- and distributed ledger-enabled decentralized interactions?

A second example of a contemporary "Ideen-Gestalt" or idea-design composite is that of self-driving cars. Autonomous vehicles connected in an AI traffic network have the potential to overcome the century-old cultural contradiction between the drive for individual transport-logistical advantage and the social necessities of safety and ecological sustainability. The most significant economic (and ultimately philosophical-existential) change occasioned by the self-driving car is that its advent leads almost immediately to the self-owning car. Once the car can drive on its own, without a human at the steering wheel, it becomes a potential profit-center-on-wheels which can be on call and on the road twenty-four hours a day. Given the widespread availability of self-driving cars in a coordinated transport system, people will not want to own a car anymore, and they will want the cost of a ride to be as low as possible. It will not be a new set of large corporations either who will own the cars, but rather the cars who will own themselves. Each car will manage its own finances, customer service responsibilities, and maintenance.

Decades ago, Artificial Intelligence was understood as being the achievement-believed-to-be-on-the-horizon of robots or software attaining to sentience or consciousness. Today this is no longer the goal. Already Alan Turing had allowed that a simulation of an intelligent conversation would qualify the software entity for AI status. Today, if an AI being attains to the operational level of being an economic equal to humans in the democratic-capitalist society, then this is a landmark meaningful change. The self-driving and self-owning car will be the best and most trustworthy vendor-and-customer transaction partner possible, because it will be intelligently programmed.

As with blockchain transactions, these advances in decentralized trust technologies in the mobility domain of autonomous vehicles similarly enable a new era where Transdisciplinary Design breakthroughs become possible which are realistic and utopian at the same time, beyond the binary opposition between realism and utopianism which was always the case in the past. Design and technology work together to become a force for good in society. The positives of both capitalism and socialism get finally unified – and by a technology. Cars become what we might previously have called a "public good," but ironically becoming that through an act which we might previously have called "private ownership." This previously believed-to-be-impossible synthesis of the advantages of "private" and "public" is made possible through a paradigm shift to a non-human perspective.

Are the money sphere and the public sphere to be understood as being separated from each other or intertwined? The notion of their separation inherits from the historical background of a simplistic social democratic model of the "mixed economy." According to this old-fashioned left-liberal idea (a "pure idea"), commerce and monetization are a "necessary evil" for society, an involvement to be avoided when high up in the rarefied air of "public goods" like culture, art, education, and creativity. In reality (in our situation of "virtuality"), the two spheres are already intertwined on all the most intimate detailed levels.

There is no private anymore. There is no public anymore. I sit at my computer in my apartment, and skype and facebook tell me when everyone I know comes online or goes offline. These other people are sitting at my computer with me. When I am forced in the train to listen to someone else's personal or business conversation that they are conducting on their cell phone, I am effectively sitting in their bedroom or living room or office. Or something like that – you can no longer explain it with "private" and "public." We need entirely new "political philosophy" terms and concepts to grasp this new situation.

There is no "public space" anymore – although architects, urban designers, and street artists continue to speak of it. It is part of the titles of many of their books. Instead, I will speak in my work about "the simulacra of public space."

A third example of the paradigm shift to what I call "technological anarchism" and "post-scarcity economics" (beyond capitalism and socialism) and the "non-human perspective" is what I call "learning from androids." There are two ways of thinking about robots or androids, distinguished by the different associations evoked by the two terms robot and android. I want to synthesize the two perspectives. The robot perspective is about engineering and economic benefits. The android perspective is about us humans growing to become more embodied, more ethical and more in touch with our feelings and emotions, as we learn from androids.

We see this difference between the robot perspective and the android perspective in science fiction films. In the film *I, Robot*, the robots are treated in the story as servants or slaves, and, as a consequence, they rebel violently against their condition and against us (their masters). In this narrative, we treat the robots as things, as machines. We offload some of our drudge work to them, and miss the golden opportunity that the historical-SF project of building androids affords us to finally place into question the civilization of production and work – the opportunity to change ourselves.

In films about androids like *Blade Runner* and *Ex Machina*, and in the *Star Trek: The Next Generation* TV episodes about the android Data (played by the actor Brent Spiner), on the other hand, androids teach lessons to humans and they are our "partners." Their existence raises questions of emotions, ethics, embodiment, and creativity. Androids have rights and subjectivity.

Androids will have greater flexibility than humans have had until now, in both mind and body. Androids will teach humanity this new flexibility. Androids are enchanting, seductive, theatrical, and magical. We should be concerned about the freedom and happiness and identity of androids, because we are going to learn from them how to become freer and happier ourselves.

I conceive of three successive (historical or science fictional) phases of the role of the university in transmitting (or failing to transmit) ideas to society.

In the first phase, which I call the era of the "pure idea," the university maintains its traditional role as an "ivory tower" or separate idealistic sphere within the modernist democratic society, carrying on abstract self-referential discourses like philosophy and history, generating and discussing ideas which have very little or no direct application in the "real world."

This was the 20th century way of "opposing capitalism."

In the second phase, which I call the era of the "specialized idea," universities arrive at the viewpoint that they should become more relevant to business. Large humanities, social science, and natural science universities become more like vocational schools (*Fachhochschulen*). There is no longer knowledge for the sake of knowledge. Universities make the decision that students should study subjects which directly prepare them for jobs. The diploma is achieved by passing a series of exams demanding a lot of memorization (as in the so-called Bologna reforms). The day after the exam, the student forgets what he or she has binge-memorized ("crammed into the brain").
This was the 20th century way of "accepting capitalism."

In the third phase, an alternative to both of these idea-paradigms appears which I call the era of the "Idea-Gestalt." Fragments of ideas from the humanities are bound together with practical design projects, in the educational venture which I call Transdisciplinary Design. Then these "Ideen-Gestalten" are brought into the commercial economy as entrepreneurial design patterns. But not only in order to function within the business world – but rather, to *transform the business world* (like blockchain payment transaction applications and self-driving-self-owning cars and "learning from androids").

The third idea-paradigm will originate from art-and-design universities and from the designers whom they educate.

This will be the 21st century science fictional way of neither opposing nor accepting capitalism, but rather steering capitalism in a new direction. Capital enjoys an absolute initiative as an historical event, and it is only by anticipating the future in a science fictional mode that significant change is possible. Science fiction is the privileged mode of radically dealing with capitalism.

The transdisciplinary intention is deeply embedded in the German historical-cultural tradition, going back to the 18th century. The classical German idea of *Bildung* (meaning education or formation) is also related to transdisciplinarity. The notion of the literary genre of the *Bildungsroman* as coming-of-age novel originated in Germany in the 19th century and was exemplified by Goethe's *Wilhelm Meisters Lehrjahre*. *Bildung* as a concept is associated with the theory of education as all-around human development elaborated by Wilhelm von Humboldt (Alexander Humboldt's brother), the philosopher, linguist, diplomat, educational reformer and founder of the Humboldt University of Berlin. The Humboldtian model of higher education integrates appreciation of art and science, nature and culture, subjective humanist values, and the objective external reality of the world.

Transdisciplinarity is important today because the existing classification system of knowledge, the division of knowledge that we have in the existing disciplines, is holding back the advancement of knowledge. Each existing knowledge discipline has its own private self-referential discourse or terminology that almost nobody outside of that field understands. Mono-disciplines tend to be conservative in defending their own territories. When fields of knowledge come together in a transdisciplinary way, then breakthroughs in knowledge can occur. Transdisciplinarity is good for humanity.

Transdisciplinarity is science-fiction-oriented and futurist-design-oriented. Science fiction is not about the future or predictions of the future. It is more about the reality of the present that the ways of thinking of the dominant culture prevent us from seeing.

In Transdisciplinary Design, there are elements of personal, existential, biographical, and performance-oriented creativity. The way that knowledge is presented should be consistent with the content or message of that knowledge.

The goal of Transdisciplinary Design is to have a hybrid of theory and practice, to be continuously on the boundary between the two. Many art and design universities in Germany teach theory or ideas in a serious and rigorous way (and this is good), but, for the most part, they institute a strict separation between theory and practice. Philosophy, sociology, media theory and art history tend to get taught in conventional academic ways that are directly taken over from the large contemporary German humanities universities, without ever having engaged in an explicit, conscious project of reflection on the development of a new pedagogy of the hybridity of ideas and practice which could truly be beneficial for art and design students.

Should not the practice of making films, for example, be taught in ways that are integrated with the study of film theory and film history? How else can students develop a feeling for rich creativity in storytelling and narrative to go along with learning top-quality practical filmmaking skills? With a hybrid approach, students could develop into really good filmmakers.

Should not the practice of making websites be taught in ways that are integrated with the study of Creative Coding and software engineering object-oriented concepts? With a hybrid approach, students could develop into real software innovators.

I take the idea of the Idea-Gestalt from the psychological practice of Gestalt Therapy as developed primarily by Friedrich “Fritz” Perls, Laura Perls, and Paul Goodman. Compared to classical Freudian psychoanalysis, or Jungian analytical psychology, or the Lacanian school of psychoanalysis, Gestalt Therapy has received relatively little attention among left intellectuals in the Western countries, and in the academic fields of critical sociology and cultural studies.

It is very difficult, and even undesirable, to systematize or codify the ideas of Gestalt Therapy into academic writing. In his autobiographical book called *In and Out The Garbage Pail,* Fritz Perls talks about his seminal ideas in psychology in a performative and personal way, using lengthy poems and jokes as modes of writing. To exist completely and freely in the world, according to Perls, one must live situations where one can freely express one's feelings and emotions.

Perls felt that classical Freudian theories downplay the emotions. "Nature is not so wasteful as to create emotions as a nuisance," writes Fritz Perls. "Without emotions we are dead, bored, uninvolved machines."[2] Breathing, both literal and metaphorical, is essential for the life of the organism. The experience of Gestalt Therapy is about contact, about engagement with life and with other people. Contact stimulates a greater appreciation of differences.

Laura Perls recommends to live on the boundaries, and not within a fixed border. On the border is excitement plus interest, which becomes growth. The content of what I am saying or recounting in this moment is less important than sensing how I feel in this moment when I say what I am saying, and the practice of becoming ever more attuned to the reality and validity of my feelings.

What is essential in Gestalt Therapy is contact, and direct conscious experience with and of other persons and objects, and passionate involvement with the world. One accepts the risks and dangers of becoming a human being.

There is a relation between the German terms *Gestalt* and *Gestaltung*, even though they appear to have two different meanings. The German word *Gestaltung* and the English word *design* are, surprisingly, not exact equivalents, and they are not interchangeable. This is made clear by the fact that *design* is, in certain contexts, translated as *Entwurf*, as in *Entwurfsmuster* (*design patterns* in English).

What does *Gestalt* mean in English? Laura Perls explains:

> The term *Gestalt* cannot be represented in English by any single concept. It covers a whole range of related terms such as appearance, form, figure, configuration, structural unity, and a whole that is something more, or other than, the sum of its parts.[3] [translation by the author]

In Gestalt Therapy – or, by transference, in Transdisciplinary Design – there is no fixed technique.

Design will be a thinking discipline. That is our goal. But it will not be the same kind of thinking-work as is done in academic universities. It will rather be connected to practice. And it will be connected to feelings, the body, dance movements, emotional and social intelligence, the physical-virtual and analog-digital interfaces, and to performance.

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2 Frederick (Fritz) Perls, *In and Out the Garbage Pail* (Gouldsboro, ME: The Gestalt Journal Press, 1992), 50.

3 Laura Perls, *Leben an der Grenze: Essays und Anmerkungen zur Gestalt-Therapie* (Cologne: Edition Humanistische Psychologie, 1999), 97.

REFERENCES

Harrell, D. Fox. *Phantasmal Media: An Approach to Imagination, Computation, and Expression.* Cambridge, MA: MIT Press, 2013.

Perls, Frederick (Fritz). *In and Out the Garbage Pail.* Gouldsboro, ME: The Gestalt Journal Press, 1992.

Perls, Laura. *Leben an der Grenze: Essays und Anmerkungen zur Gestalt-Therapie.* Cologne: Edition Humanistische Psychologie, 1999.

1997: ART AND APPARATUS (A FLUSSERIAN THEME). PLEA FOR THE DRAMATIZATION OF THE INTERFACE

By Siegfried Zielinski

Exposé for a lecture given at the 6th international Vilém Flusser symposium in Budapest on “Intersubjectivity: Media Metaphors, Play and Provocation”, (March 15-19, 1997) that was first published in the booklet of the DVD *“We shall survive in the memory of others” – Vilém Flusser*, ed. by Miklós Peternak for C³, Budapest and Siegfried Zielinski for the Vilém Flusser Archive, Berlin (Cologne: Walther König, 2010)

Suggested citation: Zielinski, Siegfried (2018 [2010]). “Art and Apparatus (a Flusserian Theme). Plea for the Dramatization of the Interface” In: *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44746

"[...] in the age of Baroque the crystal chandeliers with their myriads of light refractions that hung from the ceilings of palaces functioned as an interface through which the cosmos became imaginable from out of the straits of the private and personal sphere."

In 1997, Siegfried Zielinski held a lecture on "Arts and Apparatus," based on the manuscript published here, during the 6th international Vilém Flusser symposium in Budapest. In remembrance of the Czech philosopher Flusser, who had passed away six earlier, the symposium on "Intersubjectivity: Media Metaphors, Play and Provocation" aimed at developing further Flusser's thoughts on the role of the human subjectivity in a "codified" society. In his lecture, the media-archaeologist Zielinski, or "media-thinker," as he today would describe his occupation in a more open gesture, made a "plea for the dramatization of the interface": Indeed following a "Flusserian theme", he plead for resisting the deterministic programme of the technical apparatuses, which Flusser described as "black boxes" with tempting surfaces providing playful interaction. Due to critical techno-artistic theory and practice, the deterministic "techno-cultural character of the artefacts" shall be uncovered under the tempting, smooth surface of the interface. The interface paradigm of affordance is here replaced by an attitude of resistance. Zielinski's plea shows various parallels to critical thinking and practice in media art, media theory and media activism, which became even more relevant in recent years while our "codified" societies are increasingly governed by opaque data networks.
We thank the author for his kind permission to republish the text.

Daniel Irrgang

The common boundary of (media) people and (media) apparatus is one example of what we call an *interface*. At one and the same time it divides and connects two very different worlds: the world of creatively acting subjects – whether they be primarily perceiving or directly aesthetically productive – and the world of machines and programmes.

Both present technological advance as well as dominant media concepts are moving in the direction of rendering this interface imperceptible. Or at least the differences between humans and machines should become insignificant.

You are to use a computer without being aware that you are dealing with an algorithmically constructed computation and simulation machine. You are to immerse yourself in so-called *virtual reality* without being aware, indeed without even knowing, that you are dealing with a precise, pre-structured, computed construction of time and space.

Computers are being engineered for their users to resemble a *camera obscura*, as a black box.

This is the point which the arts face enormous challenges that affect, at the very least, their future identity vis à vis design. The outstanding task of the arts in aesthetic and ethical respects is to enable sensitization for the Other, the strange, the inexplicable (in the case of advanced media, also with regard to machines). It follows that this includes the obligation to render this Other, insofar as we are able to formulate it, accessible to sensorial experience, as a fiction, as constructed reality.

The conflicts that emerge here are not new. They run through the entire history of the technical media. They were last brought to the fore for discussion in a major way with regard to cinema, that great machinery of illusions and fantasies of the last hundred years. The *apparatus debate* attempted to simulate the ciné-avant-garde into making films that dared to walk a tightrope: to put the audience in a state of suspenseful, passionate involvement, and excitement while not allowing it to forget that the reality on the screen is a synthetic reality.

Along with Vilém Flusser, I assume that a combination of magical and rational thought is not only possible but necessary. Here I attempt to fathom this fundamental problem of the avant-garde and to sketch one direction a possible solution might take.

23 Items:

1. The interface is something that separates [one thing from another]. Otherwise the term would make no sense.

2. The interface is something that connects [one thing to another]. Otherwise the term would make no sense.

3. The interface denotes a difference and connection.

4. The phenomenon of the interface appeared when the concept of a unified world gradually developed into the concept of a world that was at least a duality. [The English noun "interface" dates from 1882; the verb "to interface" from 1962; the adjective "interfacial" (crystallography) from 1837].

5. That which an interface both separates and connects is, in the most general sense, the One from the Other.

6. How we handle the interface and its shaping is therefore pre-eminently both an aesthetic concern and an ethical one. Ethics binds the arts and the sciences (and is binding for both).

7. Over the interface, the Ones define their relationship to the Others, those different to themselves, that is, essentially unknown, and vice versa: over the interface the One manifests itself to the Other, but in those aspects that are understandable.

8. For example, in the age of Baroque the crystal chandeliers with their myriads of light refractions that hung from the ceilings of palaces functioned as an interface

through which the cosmos became imaginable from out of the straits of the private and personal sphere.

9. In telematics, the interface separates and connects the world of active people on the one hand, and the worlds of working machines and programmes on the other. The interface separates and connects media-people and media-machines. It is the boundary at which the medium formulates itself, at which the aesthetic praxis takes place.

10. The pragmatic task of the telematic interface is to provide media-people with a particular access to the Other by means of machines and programmes. At the end of the twentieth century, telematic machines and programmes are themselves a prominent part of this Other.

11. Current efforts in telematics aim at making the differences between media-people, media-machines, and media-programmes imperceptible. This represents a special case in the trend toward eradication of the boundaries between production and reproduction, between work and remainder-time, in a common system of communication-based consumer and service relations. We are now just at the beginning of this process. With regard to the interface, this process will really take off when the still existing symbolic hindrances to perception and usage (particularly the alphanumeric keyboard) are no longer prerequisites for using a computer, and the interface between media-people, media-machines, and media-programmes assumes the character of an environment, in which media-people will act as they would in non-machine-based relationships.

12. The most important, all-embracing means in this hegemonic strategy is illusionisation, not in the sense that anything specific is at stake but rather in the sense of a no-risk identification with the world of icons, symbols, and relations just as it appears on the monitor. At present, the praxis of this illusionisation takes two directions: either with concepts of a primary spatial orientation in the tradition of the *ars memoriae* or with concepts of a primary temporal orientation as in classical Aristotelian dramaturgy. In adventure games we find both concepts combined, in the best examples, as multilinear concepts of a dramaturgy of memory and empathy.

13. The Ones (the media-people) are to be under the illusion that they can be totally in the Other (media-machines, for example) – this is called virtual reality or telepresence. Via illusionisation, the Other turns into the One, takes on its identity. This is above all the world of metaphors.

14. In this world of metaphors, the allusion to life is central; the discipline of biology maintains its leading function.

15. There is a long tradition of taxing this interrelationship of life and machine. Viewed from the perspective of the body, it has passed through various phases of excorporation and incorporation. Many of the first automatons were copies of living things. Ernst Kapp called this “organ projection” in his philosophy of technology, which was published in 1877. He criticised vehemently that the “idea of the organic as a model, involuntarily and unremarked, tinges the mechanical copy and vice versa when the mechanical is used to explain organic processes; in the excitement of experimentation the mechanical swings over into the organism unremarked, so that apart from these metaphoric explanations of the how, why, and wherefore, also obvious confusions that are inadmissible under usual circumstances, are inevitable.” (Ernst Kapp, *Grundlinien einer Philosophie der Technik*, Braunschweig: Georg Westermann, 1877, p. 99)

16. In these founding years of the computer-centred telemedia, life is being externalised in the machines and the programmes. These are constructed and computed after the naive model of the organic and its evolutionary dimensions. The underlying idea of this allusion is that life is something which is continuous, flowing, growing, in constant motion (also harmonious). With regard to the concept of evolution, we are dealing here with Darwinian, or Neo-Darwinian models, that is, with an extension of the Darwinian principle of the (information-wise) fittest that takes into account recent research in genetics, according to which selection operates at the cellular level and not first at the level of individual organisms and their relationships with one another.

17. From the perspective of being concerned about the aesthetics and ethics of the interface deriving from the autonomy of the Other, both metaphors must be confronted critically – to instruct and inform – and with alternative models: this applies both to life as a leading metaphor and to a concept of biology and evolution which is reduced and of shallow dimensions.

Excursus: attempt at a conceptual definition (with the aid of Hegel's *Introductory Lectures on Aesthetics*, vol. I): Metaphors are comparisons. However, not all comparisons are metaphors. To the phylum of comparisons also belong the symbol, the enigma, the allegory, the image (das Bild). In their function for expression and its possible meaning, metaphors hover between image, symbol, and enigma. Metaphors originate from the needs and the power of thought and feeling "not to be satisfied with the simple, familiar, and unsophisticated but rather to place oneself above it in order to depart for the Other, to linger awhile with the Various, and to put the Twofold together into one." (Hegel, *Vorlesung über Ästhetik. Berlin 1820/21. Eine Nachschrift*, ed. H. Schneider, Frankfurt a.M.: Peter Lang, 1995, p. 520f.) Metaphors are constructed with the intention of augmenting, deepening, increasing something; or they simply wallow in the fantasy of their constructor. This "something" is either mental or physical. Metaphors are constructed in order to ennoble the physical with the help of the mind or through the comparison with the physical to convert the mental into experience, to make it profane, to reify it.

18. The telematics networks are link-ups of technical artefacts and complex material systems with political, cultural, and aesthetic structures; that is, they are already connections of the "Twofold." The Net itself is a comparison, a trivial image. Not only in the ongoing Net discourse is this connection of complex physical and immaterial units and structures once again being compared to living organisms or aspects thereof. This comprises not only the intention of raising the profane (the technical, the political…) but also the objectivity of that which is non-transparent, or opaque, and structural (that is, essentially of the mind).

19. On the other hand, the world of machines and programmes is a systematically constructed world. Everything in it has been generated by numbers and the logical and systematic relations between numbers. In this sense, it is a coherent and

consistent world, in spite of all the complexity that playing with numbers enables. The world of living organisms does not possess a system of such reliability. The decisive factor: this world is irreversible. Due to external disturbances and inherent variations, the many different physiological rhythms that are linked in a living organism never lead back to the same starting point. Organic systems fluctuate around stasis. Digital machines and programmes cannot have a state (Otto Rössler). It is precisely their inherent variations that are to be got rid of through digitization and precision in computation.

20. Technological, social, and cultural systems alike are discontinuous to an extreme degree, both in their genesis and in their present extent. All metaphors that promise the free flow of information, that invoke the ocean as a navigation field, that want to make us experience communication structures like trees or roots, are doomed to failure because of this. The archetypal basic structure of technoid and civilization development is the rigid gradation of the staircase. The archetypal basic structure of life is the spiral. The visual proof, that the genetic code (of DNA) is formed like a double helix, like a twofold spiral staircase, was presented by biology at the same time as cybernetics arrived as a new discipline. The image of the double helix succeeds in uniting both discontinuity and continuity, bending out and turning in, *repetition and difference*…

21. If we admit life science/Lebenswissenschaft as the leading discipline of the outgoing twentieth century (although it was invented already around 1800 by Johann W. Ritter), the very least we should demand with regard to the interface is that the many and varied constructions of evolution(ary theory) which that century witnessed should be taken into account. (Evolution is a theory of the history of life and not life itself). Darwinism and Neo-Darwinism have been supplemented and modified by theories of mutation, synthetic theories, saltation, and punctuated equilibrium, amongst others. For example, the two latter, although with different emphases, propose that the pace of evolutionary change in species is episodic rather than smoothly gradual.

22. *Conclusion*: I would like to make a plea for an experimental interface

- which is based on contingencies rather than virtual reality, on feasible individual events rather than on a homogenous, calculated, continuous, illusory world,
- which is nevertheless recognisable as a constructed world …
- which at least enables a relationship of experimenting toward itself,
- which is less of a cleansing by catharsis and more of a provocation by epic means,
- which nonetheless remembers that the world of communications is a world of sensations and that without these, nobody would bother to enter into relationships with the Other.

What we need is a language (of text, images, sounds), which does not cover up the techno-cultural character of the artefacts and structures of expanded telecommunications but instead displays this character, in its usage refers to it, and reminds one of it(s existence). Discontinuity, dynamics, circuits, contacts, controls,/impulses, interruptions, cut-offs, power, distribution – the possibility of allusions is as rich as the technical and political/cultural spheres themselves. The recent history of the media alone suffices as an example of a rich tradition and Brecht's *Short Organum for the Theatre* (1948) would do well as an exercise for today's interface specialists; or, for example, the *materialist film* – the staging of the material as something that possesses an autonomous power of expression.

23. This plea openly insists on the dualism of media-people and media-machines, media-programmes. Dualism is necessary in order to reach any kind of clarification. It represents a transitional stage, but I am convinced that the dramatization of the interface as a boundary between the One and the Other is the only possibility to achieve qualities of the connection that will differ from a simple decision for the One or for the Other.

No to monopolisation of technology by narcissistic subjects – and yes to a dramatics of the difference!

GENEALOGIES

THERE IS NO INTERFACE (WITHOUT A USER). A CYBERNETIC PERSPECTIVE ON INTERACTION

By Lasse Scherffig

"Interaction is seen as a one-way street, conveying a design model to a user, who is acting by that model either because they adapted to it, or because the model replicates their given structure. This is the cognitivist heritage of the HCI discourse responsible for the idea that interfaces can actually be designed."

Suggested citation: Scherffig, Lasse (2018). "There is no Interface (without a User). A cybernetic Perspective on Interaction." In: *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44739

The interface in itself does not exist. This is not to say that any phenomenon must be perceived in order to exist, but rather that interfaces quite literally only come into being if they are used. They are effects of interaction and thus they are ultimately created by their users.

Of course, academic and professional disciplines like human-computer interaction and interaction design assume the opposite: namely that interfaces are designed (and exist) before they are used, possibly even creating their users. This article[1] traces the development of this view, as well as offering an alternative to it that fundamentally understands any interface as "cybernetic interface."[2]

GENEALOGIES OF INTERACTION

When during the late 1990s, the new millennium prompted countless retrospectives and outlooks, Terry Winograd contributed a chapter to a book about the next fifty years of computer science titled, "From Computing Machinery to Interaction Design."[3] Following an idea of evolutionary progress, this title described a goal directed development from the computing machinery of the past towards a future of interaction.

This trajectory constitutes the standard account of the history of interaction. Often the field is seen as following a teleological development of progress, during which computers became more and more interactive, and interaction became more intuitive, rich, and natural. This development is often explicated as a genealogy. Depending on the focus and goals of their narrators, there are genealogies of interaction focusing on a succession of hardware generations, interaction paradigms, theoretic frameworks, or visionaries pushing the field to the next level.

An early and paradigmatic account that focuses on hardware is John Walker's genealogy of five "User Interaction Generations"[4] published in the early 1990s. This account starts with the "plug boards" and "dedicated setups" of early computing.[5] These were followed by the (in)famous era of batch processing – a time when programming meant punching holes into cards, handing batches of these cards to a mainframe operator and waiting for hours to be handed back a printed result.

It is only the third of these generations that was interactive. As

1 A German language discussion of similar questions, that is much broader in scope, can be found in Lasse Scherffig, "Feedbackmaschinen. Kybernetik und Interaktion" (Dissertation, Kunsthochschule für Medien Köln, 2017).

2 Søren Bro Pold, "Interface Perception: The Cybernetic Mentality and Its Critics: Ubermorgen.com," in *Interface Criticism: Aesthetics Beyond Buttons*, ed. Christian Ulrik Andersen and Søren Bro Pold (Aarhus: Aarhus University Press, 2011), 91.

3 Terry Winograd, "From Computing Machinery to Interaction Design," *in Beyond Calculation: The Next Fifty Years of Computing*, ed. Peter Denning and Robert Metcalfe (Berlin and New York: Springer, 1997).

4 John Walker, "Through the looking glass," in *The Art of Human-Computer Interface Design*, ed. Brenda Laurel (Redding, MA: Addison-Wesley, 1990), 439.

5 Ibid. 439-440.

to be expected from a proper generation, it was a child of the previous one and generated by it: When, this account goes, the algorithms allocating a mainframe's computing time to several batch jobs got more and more advanced, it became clear that it would be possible to divide the computing time of a mainframe even further. Divided into small enough pieces, that follow each other in rapid succession, it would seem to several people that they would have exclusive control over the whole machine. This idea, named "time sharing," did not divide a computer's resources between several batch jobs but between several humans (re-defining these, as we will see below, as "users") who could now engage in "conversational interactivity" with the machine.[6]

While the conversations of the time sharing generation happened as exchanges of written text, the fourth of Walker's generation of interaction introduced graphical displays that concentrated textual commands into visual menus. The fifth and final generation then spawned the graphical user interfaces of personal computing that, in various iterations, keep accompanying us on our desktops, laptops, and phones until today.[7]

Paul Dourish's "History of Interaction,"[8] which is much more contemporary in style, follows a very similar path "from soldering to mouse." Focusing on the mode of interaction instead of hardware generations, the first generation here was defined by "electrical interaction" (using cables, plugs, and the soldering iron) with Walker's dedicated set-ups. This was followed by the era of "symbolic interaction" that was marked by the use of punch cards and batch processing – which were often programmed using the symbols of assembler languages instead of the raw zeros and ones of machine code. This generation, in turn, led to the "textual interaction" with the terminals of time sharing systems. "Graphical interaction" here again marks the final step in an evolution starting with machinery and ending with today's interactive surfaces.

Apart from their implicit assumption that interactivity progressively increases, these, and most other histories of human-computer interaction (HCI) have one thing in common: They all assume an origin of interaction. While operating a computer during Walker's second generation meant batch processing, the third generation introduced time sharing and with it, interaction. In Dourish's terminology, this transition corresponds to the shift from "symbolic" (based on assembler language and punchcards) to "textual interaction" (based on conversational interactivity via command line). Only when computers, after time-sharing was introduced, started to react (seemingly) exclusively and directly to human input, did they become interactive: "Arguably, this is the origin of »interactive« computing."[9]

6 Ibid. 441.
7 Ibid. 441-442.
8 Paul Dourish, *Where the action is. The foundations of embodied interaction* (Cambridge, MA: MIT Press, 2001), 1-17.
9 Ibid. 10.

Of course, history is not that simple. A closer look behind the narratives postulating a teleological development of interaction instead reveals contradictory and asynchronous developments, as well as chronological overlaps.[10] Especially the origin of interactive computing itself can be described differently, for instance, by looking at the first interactive computer ever built – which happens to be one of the first computers at all. It is, as this look reveals, the very first generation of computing machinery that defined interactivity up to this day, including its problems.

INTERACTIVE COMPUTERS AS FEEDBACK MACHINES

During the 1940s, the MIT Servomechanisms Lab started to build a flight simulator. As the leading paradigm for automatic computation at that time was analog computing, the flight simulator was planned to be based on that: "a cockpit or control cabin connected, somehow, to an analog computer."[11] "Analog computing" in this context did not only imply calculating with analog (i.e. continuous) values, it rather implied an entirely different approach toward calculation: It relied on building electrical and mechanic systems, that, as analogues or analogies, could stand in for the systems they were built to simulate. Because building such analog computers entailed accurately following and amplifying changing physical signals, it largely depended on another development: the rise of the use of negative feedback as the *de facto* standard method for handling electro-mechanical systems. In fact, during the early twentieth century, negative feedback became so important in both control and communication engineering that both disciplines merged into one feedback based control theory – in a paradigm shift that yielded the era of "classical"[12] control. This development, in turn, constituted the nucleus of what Norbert Wiener would later call cybernetics – a science of "control and communication in the animal and the machine"[13] that would become thinkable mainly because the application of negative feedback and the associated mathematical formalisms seemed to be powerful enough to tackle any form of "behavior" – of living and non-living systems.[14] Because feedback implies using the output of a system as its own input, the systems of cybernetics exhibited

10 Hans Dieter Hellige, "Krisen- und Innovationsphasen in der Mensch-Computer-Interaktion," in *Mensch-Computer-Interface. Zur Geschichte und Zukunft der Computerbedienung*, ed. Hans Dieter Hellige (Bielefeld: Transcript, 2008), 15-20.

11 Kent C. Redmond and Thomas M. Smith, *Project Whirlwind: the history of a pioneer computer* (Bedford, MA: Digital Press, 1980), 32.

12 Stuart Bennett, *A History of Control Engineering 1930–1955* (Hitchin: Peter Peregrinus Ltd., 1993), 17.

13 Norbert Wiener, *Cybernetics or: Control and Communication in the Animal and the Machine* (Cambridge, MA: MIT Press, 1961).

14 Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow, "Behavior, Purpose and Teleology," *Philosophy of Science* 10 (1943): 18–24.

"circular causality"[15] – a circular interdependence of input and output, entailing that agency within the system is distributed and cannot be pinned down to specific agents.

In building the simulator, moving axes and disks, and changing voltages and currents were used as analogies to the complex dynamics of a plane in flight. As these analogies constituted electro-mechanical motion, coupling them to the moving controls of a cockpit and the motion of their human operators was self-evident. However, during the development of this "Aircraft Stability and Control Analyzer" (ASCA)[16] the first digital computers were under construction as well. The engineers at MIT observed this development and Jay Forrester, one of the project leads, became more and more interested in digital computation – so interested, in fact, he sacrificed the core of the project (building a flight simulator) to his new interest (building a digital computer): The development of the analog computer was halted, and a "general purpose, high speed"[17] digital computer was built. As it was one of the first of its kind, the engineers building it were constantly "pushing the state of the art,"[18] developing new building blocks for digital computation, such as memory mechanisms. Caught up in this task, however, they increasingly lost sight of the fact they were trying to build a flight simulator. This was especially problematic, as the ASCA's cockpit still was the analog machine the project started with. Whereas coupling the motion and continuously changing electrical signals of an analog computer to the analog instruments of a cockpit did not pose a categorical problem, this had changed with digital computing. The digital and discrete state changes of the new computer had to be translated into continuous motion of the instruments, while the reactions of the operators on these instruments, in turn, had to be translated into digital states.[19] "These problems were not impossible, but neither did established solutions exist. *The digital computer was too new,*"[20] one of the engineers in the project later wrote. In consequence, the project management acknowledged that it was not about building a flight simulator anymore and the cockpit of the ASCA was scrapped.[21] The computer was renamed "Whirlwind"[22] and became a general-purpose digital computer not usable for flight simulation anymore. As it thus became a computer without application, it later would be turned from flight simulation to air defense and become the foundation for SAGE, the "Semi-Automatic Ground Environment" air defense system – the largest computer built to date that was in use until 1983.[23]

15 For a detailed discussion, see Heinz von Foerster, "Cybernetics of Epistemology," in von Foerster, *Understanding Understanding: Essays on Cybernetics and Cognition* (New York: Springer, 2003): 229–246.

16 Redmond and Smith, *Project Whirlwind*, 51.

17 MIT, *Whirlwind I: A high-speed Electronic Digital Computer*, promotional brochure (Cambridge, MA: MIT, 1951), 6.

18 Robert Everett, "Whirlwind," in *A History of Computing in the Twentieth Century*, ed. J. Howlett, Gian Carlo Rota, and Nicholas Metropolis (Orlando: Academic Press, 1980), 365.

19 Redmond and Smith, *Project Whirlwind*, 49.

20 Ibid. 49. Emphasis by author.

21 Ibid. 60.

22 Ibid. 43-44.

23 Ibid. 206.

What set Whirlwind apart from the other first-generation digital computers of its time was its heritage in analog computing and flight simulation: It was conceived as a machine that reacts to changes in an environment (the cockpit) by incorporating any change happening here into its calculating. In addition, it would have the results of these calculations directly, and in real-time affect the environment. In other words; it was a digital computer that was to function like the control systems of analog computing and cybernetics – as a digital computer that can react to its environment in real-time.

This is remarkable, given that theoretical computer science operates with a conception of "machine," explicated as with the Turing machine, that does not know time or any reciprocal interaction between calculation and its environment. Only relatively recently did theoretical computer science start to acknowledge, that the actual computing machines we have been using from the very beginning had done something that goes beyond Turing's definition of computation – by incorporating interaction with an environment.[24]

Whirlwind thus was a strange hybrid: A digital computer that also tried to be a cybernetic feedback system, in constant dialog with the environment it controlled. If we follow Winograd's juxtaposition of computing *machinery* and *interaction*, it was both: a machine and interactive – a feedback machine.

INTERRUPTION AND COUPLING: A BLACK ART

Even after having scrapped the cockpit, Whirlwind was still a machine to be used by human operators in real-time and as such posed two problems: How to integrate real-time input from the environment into an ongoing digital computation, and how to couple the process of digital computation to the action and perception of human operators. The engineers of Whirlwind approached these novel (or even "too new") problems pragmatically.

The fundamental problem of having the machine react to its environment was tackled introducing a basic technique into computer engineering whose heritage is alive until today: Whirlwind could interrupt what it was working on, turn to any new data that may have arrived in the meantime, integrate that data (by copying it into memory), and continue where it had left off.[25] Coupling the machine to the environment thus became a function of interruption – which, as hardware interrupt, later became a core feature of any interactive computer.

The problem of coupling computation to human operation was instead approached by introducing

24 Peter Wegner, "Why interaction is more powerful than algorithms," *Communications of the ACM* 40, no. 5 (1997): 83.

25 Everett, "Whirlwind," 377.

what later would be defined as one of the teleological ends of the development of interactivity: Whirlwind produced graphical representations that could be touched. This was made possible when the engineers in the project coupled memory registers of the computer to the x/y-control of the magnetic fields of a cathode ray tube (CRT). Whirlwind could thus paint symbolic representations of data onto screen: "One of the things that I think we did first was to connect a visual display to a computer."[26] This great leap into our screen-based present happened with the pragmatic naturalness of something "I think we did first," simply because all prerequisites for it were already in place: The second world war had established various modes of coupling (analog) radar data to CRTs. Project Whirlwind could build on this foundation and even use the leftover CRTs of the war.[27] In addition, CRTs had already been coupled to digital computers: In the "Williams Tube," the afterglow of the light painted onto a screen was used as a short-term memory device that was not meant to be looked at by humans, but nevertheless constituted computer control of light on a screen.[28]

In order to close the loop between representation and action, the images painted by Whirlwind onto its CRTs were accompanied by a device to touch them: a "light-gun" (figure 1). The device realized this by feeding back the computer's visual output to its own interrupt: The "gun" was designed not to shoot but to pick up light. Pointed at a visual representation on screen, it would pick up the light emitted when the computer drew this very representation. If an operator now pressed a button, the computer was interrupted while drawing it. It thus "knew" which item was selected and could take this selection into account for further computation.[29] Even the light gun, although pioneered here as an interaction device, had technically already been built before it became part of the configuration of interactive computing – as it was originally used to test the Williams Tube memory devices for errors.[30]

Coupling Whirlwind to people was thus both: the pragmatic problem-solving of engineers using parts and components at hand, and a revolutionary prototype for most interactivity to come. But while it offered the basic capability of having human action become part of an ongoing computation, it did not solve any problems of how exactly this setup should be used. Instead, computer science had unexpectedly introduced a new class of problems, as the representations and couplings it made possible now had to be designed. It became a field of design, a "black art"

26 Ibid. 375.
27 Ibid. 379.
28 Claus Pias, "Computer Spiel Welten" (Dissertation, Bauhaus-Universität Weimar, 2000), 55-56.
29 C. R. Wieser, *Cape Cod System and Demonstration, Technical Report* (Cambridge, MA: Lincoln Laboratory – Division 6, 1953), 2.
30 Michael Friedewald, *Der Computer als Werkzeug und Medium: Die geistigen und technischen Wurzeln des Personal Computers* (Berlin and Diepholz: Verlag für Geschichte der Naturwissenschaften und der Technik, 1999), 103.

in which “engineering design,” “creative design,” and scientific methods came (and still come) together.[31]

(IN)HUMAN FACTORS: THE USER AS NEW HUMAN

In spite of Whirlwind, the narratives of the progressive incline of interactivity are not plainly wrong. Although interactive computing existed before time-sharing,[32] MIT’s Whirlwind was a singular development and most of computer science for a long time stuck to building machines running algorithms that produce answers without being interrupted.

Important early developments, such as Ivan Sutherland’s Sketchpad[33] and especially Douglas Engelbart’s NLS, were running against this mainstream that was so dominant it took the field until the 1980s to acknowledge “interaction” as an independent area of inquiry. One of the first books carrying human-computer interaction (HCI) in its title was “The Psychology of Human-Computer Interaction”[34] by Stuart Card, Thomas Moran, and Allen Newell. The role of the latter in establishing HCI is remarkable, as he serves as a link back to the first interactive computer as well as pointing towards the future of the field.

Early in his career, Newell worked at RAND’s Systems Research Laboratory. Here, he was in charge of training the operators of the SAGE system – and thus the first professional operators of interactive computers.[35] This work was conducted together with Herbert Simon, with whom Newell would continue working on a number of subsequent projects. While building a training environment for the SAGE operators, Newell used computer modeling to simulate the input into the training system, consisting of human operators and simulated computer consoles. His simulation created sequences of “radar blips,” as they would have shown up on the real screens of the SAGE air defense system.

The realization that computers could do something like this, and thus “more than arithmetic”[36] would prove highly influential for Newell and Simon. The fact that in training these computer operators, computer modeled input data shown on computer

31 Hellige, “Krisen- und Innovationsphasen,” 16.

32 In fact, “time-sharing” is an after-the-fact conceptualization of what was done in the project, as the term was first used by an engineer working on the already interactive SAGE system. See Friedewald, *Der Computer als Werkzeug und Medium*, 128.

33 Which was programmed on a TX-2 – a direct descendant of Whirlwind. See Friedewald, *Der Computer als Werkzeug und Medium*, 110-118.

34 Stuart K. Card, Thomas P. Moran, and Allen Newell, *The Psychology of Human-Computer Interaction* (Hillsdale, NJ and London: Lawrence Erlbaum Associates, 1983).

35 Douglas D. Noble, “Mental Materiel. The militarization of learning and intelligence in US education,” in *Cyborg Worlds. The Military Information Society*, ed. Les Levidow and Kevin Robins (London: Free Association Books, 1989), 19.

36 Herbert A. Simon, “Allen Newell. 1927-1992,” *National Academy of Sciences Biographical Memoirs* (1997): 146.

CRT and light-gun in action
Copyright: The MITRE Corporation

screens[37] would be perceived and interpreted by human observers, led Newell and Simon to the far-reaching conclusion that all participants of the system were essentially involved in the same task: processing information. Just as Newell's digital simulation processed information in order to produce the fake radar blips, the human operators looked at these blips and perceived them as information to be processed and acted upon. In other words: "Within the simulated training environment, Newell came to view the human operators too as »information processing systems« (IPS), who processed symbols just like his program »processed« the symbols of simulated radar blips."[38]

This is the crucial outcome of the training for the first interactive computers. Subsequently, Newell and Simon authored a number of papers that took this idea further, developing an understanding of human thinking that was driven by the verdict that it is a form of the symbolic information processing exhibited by computers. This culminated with the "Physical Symbol System Hypothesis," declaring intelligence to be a feature of all forms of physical systems that are able to manipulate symbols – be it human or machine.[39] This argument, at the time, was part of the development of a new scientific field of studying the human mind that, at least for a long time, understood thinking as rule-based information processing: cognitive science.[40] The field from the very beginning "subsumes various computational theories of mental phenomena. Their computational nature is what unifies the multiple disciplines in the field and may count for much of its success in recent years."[41] In this sense, the human trained to perform in front of the computer became the model for the thinking human in general – a human acting as a computer.

This is what Newell brought back to working with interaction: He proposed to XEROX PARC an "Applied Information-processing Psychology Project (AIP)"[42] that promised to apply cognitive science to the black art of designing interaction. The project started in 1974, led by Card and Moran, who were consulted by Newell. One of its results was the publication of "The Psychology of Human-Computer Interaction" by the three.

37 Which, ironically, in the training system were simulated by complex analog display machinery showing sequences of pre-rendered screens. See Robert L. Chapman, John L. Kennedy, Allen Newell, and William C. Biel, "The Systems Research Laboratory's Air Defense Experiments," *Management Science* 5, no. 3 (1959): 256-262.

38 Noble, "Mental Materiel," 19.

39 Allen Newell and Herbert A. Simon, "Computer science as empirical inquiry: symbols and search," *Communications of the ACM* 19, no. 3 (1976): 116.

40 Newell and Simon presented a Logic Theory Machine at the famous Symposium on Information Theory at MIT in 1956, which often is understood as the founding event of cognitive science. For this standard account of the history of the field see Howard Gardner, *The Mind's New Science. A History of the Cognitive Revolution* (New York: Basic Books, 1985), 28, and George A. Miller, "The cognitive revolution: a historical perspective," *Trends in Cognitive Sciences* 7, no. 3 (2003): 141-144.

41 Frank Schumann, "Embodied Cognitive Science: Is it Part of Cognitive Science? Analysis within a Philosophy of Science Background," *PICS. Publications of the Institute of Cognitive Science* 3 (2004): 12.

42 Stuart K. Card and Thomas P. Moran, "User Technology: From Pointing to Pondering," in *Proceedings of the ACM Conference on The History of Personal Workstations* (ACM: 1986), 183.

The center of this project was not longer the computer operator. Instead, it was the "user" of the computer interface. Card, Moran, and Newell stated: "But the user is not an operator. He does not operate the computer, he communicates with it to accomplish a task."[43] This attribution of agency to the computer (as an equal partner in communication) probably followed from the nature of the interactive computer as feedback machine that exhibits circular causality between machine and (human) environment. For the authors, however, the relationship of user and computer was defined solely by the postulated equivalence of all information processing systems.

In proposing the project to XEROX, Newell suggested to marry the empirical methods of human factors with the formal (and computational) models of cognitive science, creating "a technical understanding of the user himself and of the nature of human-computer interaction."[44] This would be a "science of the user rooted in cognitive theory."[45]

In doing so, he seemed to be aware that this user was not a given, but something that was created by the systems being used – after all, it was a training environment for early computer users that gave rise to the idea of the human as information processing system. In the memo proposing the AIP to XEROX he thus wrote: "There is emerging a psychology of cognitive behavior that will permit calculation of behavior in new situations and with new humans…"[46] Since this user was to be subject to the technical understanding provided by computational theories of mental phenomena, what emerged here was a view of the human being using the computer, as a computer.

The human factors of human-computer interaction, and human- or user-centered design thus become readable as the "inhuman factors"[47] of thinking humans as machines – and making them act accordingly. The training required to become the new human that an interface demands, in this sense, can be seen as a "subtle enslavement", and a "total, unavowed disqualification of the human in favor of the definitive instrumental conditioning of the individual."[48]

COGNITIVE ENGINEERING VERSUS CONCRETE THINKING

It is this convergence of computer and cognitive science that served as the "origin myth" of human-computer interaction.[49] The field did, for a long

43 Ibid. 7.
44 Ibid. 183.
45 Ibid.
46 As quoted in Card und Moran, "User Technology," 183.
47 Anthony Dunne, *Hertzian tales. Electronic products, aesthetic experience, and critical design* (Cambridge, MA: MIT Press), 2008, 21.
48 Paul Virilio as cited in Dunne, *Hertzian tales*, 21.
49 Dourish, Where the action is, 61.

time, embrace cognitive science and its methods, effectively becoming a form of "cognitive engineering" as Donald Norman defined it in a seminal paper: "neither Cognitive Psychology, nor Cognitive Science, nor Human Factors. It is a type of applied Cognitive Science, trying to apply what is known from science to the design and construction of machines."[50]

Being based on the cognitive science idea of what a human is, cognitive engineering was seen as a form of "user-centered" design. At the center of this idea stands a juxtaposition of the mental and the physical. Interaction, the argument goes, is an act of mediating between a user's mental goals and the physical states of a system. This mediation happens in a loop of "execution" and "evaluation," while execution is based on action sequences a user formulates according to their goals.[51] Formulating these action sequences is possible because users possess a "mental model" of how they assume a system functions.[52]

The task of the interface designer as cognitive engineer now is to make sure that this mental model is correct – so that an action sequence will lead to the expected and intended results. They must bridge the gulf between execution and evaluation.[53] Creating an interface thus becomes an act of communication where a designer's "design model"[54] must be communicated in a way yielding the appropriate mental model. In terms of information processing, this means that by its design a system must provide the information that, once perceived and processed, leads to the appropriate actions that fulfill a given goal.

According to Norman, there are two ways of achieving this: "(M)ove the system closer to the user; move the user closer to the system."[55] Of course, user-centered design wants to move the system closer to the user, by creating systems whose physical states behave in an "intuitive" or "natural" way, close to the mental intentions of their users. This, of course, implies that the latter can be formulated in terms of the former. A user's non-physical goals and intentions must be translatable into physical actions and system states, thus reproducing the assumption that computer users ultimately can be understood on the same ground as the computers they use.

The relationship between the psychological states of a user and the physical states of a system has been described as "directness."[56] This term entered HCI discourse when Ben Shneiderman in 1983 was puzzled by "[c]ertain interactive systems" which "generate glowing enthusiasm

50 Donald A. Norman, "Cognitive Engineering," in *User-Centered System Design: New Perspectives on Human-Computer Interaction*, ed. Donald A. Norman and Stephen Draper (Hillsdale, NJ: Lawrence Erlbaum Associates, 1986), 31.
51 Norman, "Cognitive Engineering," 41.
52 Ibid. 46.
53 Ibid. 38.
54 Ibid. 46.
55 Ibid. 43.
56 Ibid. 52.

among users."[57] What set these systems apart was the interactivity already introduced by Whirlwind: "(D)irect manipulation" of graphical representations without the need to type text – the origin (as constructed here) of interaction thus once more got reinterpreted as a milestone of the progressive incline of the field. But as opposed to the pragmatic engineering behind Whirlwind's early interfaces, Shneiderman's discussion of direct manipulation followed a cognitivist pattern, having a clear idea of the human user as rational problem solver in mind: Shneiderman reproduced Norman's idea of interaction as psychophysical mediation by identifying a "problem domain" of "semantic" intentions and a "program domain" of "syntactic" manipulations at the interface. Direct manipulation, he argued, enables users to interact directly with the objects of the problem domain – by, for instance, enabling a writer to directly interact with paragraphs of text, instead of having to deal with the commands meant to manipulate these paragraphs. Direct manipulation would hence be a (or maybe *the*) realization of Norman's "move the system closer to the user" by minimizing the distance of the problem and program domain.

Not surprisingly, Norman himself later joined the discussion, expanding Shneiderman's work in cooperation with James Hollan and Edwin Hutchins.[58] This argument started with the assertion that, "[w]e see promise in the notion of direct manipulation, but as of yet we see no explanation of it."[59]

Trying to formulate this explanation as a full-fledged "cognitive account"[60] of direct manipulation, they reformulate Shneiderman's distance of syntax and semantics as an "information processing distance" between human intentions and machine states[61] – a distance that direct manipulation is minimizing. These interfaces, in this view, are easier to use because what we want do with them corresponds to the way it is done.

This, however, may not be enough to explain the "glowing enthusiasm" described by Shneiderman. Instead, the authors acknowledged that direct manipulation seems to entail an experiential component that can not be explained by information processing alone. It features a feeling of "engagement,"[62] that is hard to come by: "Although we believe this feeling of direct engagement to be of critical importance, in fact, we know little about the actual requirements for producing it."[63] Referring to Brenda Laurel's work that applied Aristotelian poetics to HCI, they concluded that a feeling of "first-personness"[64] must be responsible for

57 Ben Shneiderman, "Direct Manipulation: A Step Beyond Programming Languages," in *The New Media Reader*, ed. Noah Wardrip-Fruin and Nick Montfort (New York, NY and London: W. W. Norton & Company, 2001), 486.
58 Edwin L. Hutchins, James D. Hollan, and Donald A. Norman, "Direct Manipulation Interfaces," *Human-Computer Interaction* 1 (1985): 311–338.
59 Ibid. 316.
60 Ibid.
61 Ibid. 311.
62 Ibid. 332.
63 Ibid. 332-333.
64 Ibid. 318. See also Brenda K. Laurel, "Interface as mimesis," in *User-Centered System Design: New Perspectives on Human-Computer Interaction*, ed. Donald A. Norman and Stephen

the feeling of engagement. For Laurel, this feeling was based on the interplay of user and interface, as "[a]n interface [...] is literally co-created by its human user every time it is used."[65]

Direct manipulation hence seems to contain a playful component and a residue of the non-rational. It is not about a cognitive distance between mental intention and physical representation and action alone, it also is about a subjective experience that is created through the cyclic dependence of user action and machine response. This non-rational (or non-cognitivist) residue, however, seemed to deeply bother Hutchins, Hollan and Norman, who stated:

> On the surface, the fundamental idea of a direct manipulation interface to a task flies in the face of two thousand years of development of abstract formalisms as a means of understanding and controlling the world. Until very recently, the use of computers has been an activity squarely in that tradition. So the exterior of direct manipulation, providing as it does for the direct control of a specific task world, seems somehow atavistic, a return to concrete thinking.[66]

This return to concrete thinking subsequently became even more prominent when "tangible user interfaces" and other forms of non-screen-based interactivity emerged. When, for instance, physical objects in research projects at MIT and elsewhere became phicons[67] – physical icons that represent data and computational processes – researchers at XEROX PARC coined the term, "interfaces for *really* direct manipulation."[68] If tangible user interfaces use real-world objects as representations of computation, the hope was, they would feel ultimately natural and the information processing distance would be reduced to zero.

This, however, makes two things apparent: First, if the mouse and screen felt natural during the 1980s and tangible user interfaces felt more (or really) natural during the early 2000s, naturalness itself must be understood as a fluid category depending on what feels natural for the "new human" of each era. Interfaces like the touch screen in this light must be understood as being products of a naturalization creating the very human for which they feel natural. Second, the whole discussion of tangible interaction neglects the fact that all interfaces in one form or another have been tangible: We have never "directly" manipulated a paragraph of text but always had to deal with pens and marks on paper, keyboard and screen, fingers on a touchscreen. The atavistic syntax of executing manual

Draper (Hillsdale, NJ: Lawrence Erlbaum Associates, 1986), 67–85.

65 Laurel, "Interface as mimesis," 73.

66 Hutchins, Hollan and Norman, "Direct Manipulation Interfaces," 337.

67 Brygg Ullmer, Hiroshi Ishii, and Dylan Glas, "mediaBlocks: Physical Containers, Transports, and Controls for Online Media," in *Proceedings of SIGGRAPH* (ACM: 1998), 379.

68 Kenneth P. Fishkin, Anuj Gujar, Beverly L. Harrison, Thomas P. Moran, and Roy Want, "Embodied user interfaces for really direct manipulation," *Communications of the ACM* 43, no. 9 (2000): 74–80.

actions always existed and was always different from any semantic goal or intention.

What, instead, differentiates tangible user interfaces from graphical user interfaces and these from the command line is something much more profane: It is the simple spatio-temporal distance of human action and computer reaction as well as their perceived similarity. The incremental progress of interaction, postulated by the genealogies of interactivity, is another clue suggesting that what is really interesting about interactivity is the closure of the gap in space and time between human and computer action. In particular, the theoretical reflection on non-screen based interfaces had understood this at an early stage. Already in 2000, Michel Beaudouin-Lafon has concluded that what is really important about the experience of computer interfaces is the "spatial and temporal offset," the "ratio between the number of degrees of freedom" and the "similarity between the physical actions of the users on the instrument and the response of the object."[69]

PERCEIVING ACTION

No matter if we hail the natural or intuitive interface as bridging the gap between user and system, or if we condemn the interface as a form of conditioning that ultimately naturalizes a non-human mode of action and perception, we presuppose the interface as the agent of this process. If interfaces are seen as forming the new human after their own image (by moving them closer to the system) or if they supposedly assist a given human by modeling their non-physical goals or semantics, they are assumed to be sources of information that are perceived, processed and acted upon. Interaction is seen as a one-way street, conveying a design model to a user, who is acting by that model either because they adapted to it, or because the model replicates their given structure. This is the cognitivist heritage of the HCI discourse responsible for the idea that interfaces can actually be designed.

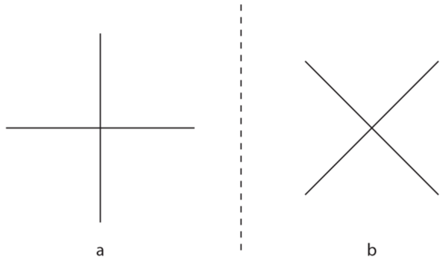
When, however, the engineers in project Whirlwind coupled digital computation to symbolic representation and human action back to computation, they not only wrapped its human operators in the feedback loop of the circular systems of cybernetics: They also created a setting in which the representations would be wrapped in a loop of human action and perception.

The motion on a computer screen is not real motion but a cinema-like sequence of still images, which psychology denotes as "apparent motion." Apparent motion has been a subject of experimental psychology since the cinematograph and cinema rendered it ubiquitous, providing the experimental systems for studying it and for using it as a tool to

69 Michel Beaudouin-Lafon, "Instrumental Interaction: An Interaction Model for Designing Post-WIMP User Interfaces," in *Proceedings of CHI* (ACM: 2000), 446–453.

study perception in general.[70] One seminal early work was Max Wertheimer's experimental studies of the perception of movement,[71] which today is seen as one of the founding texts of Gestalt psychology.[72] While Werheimer pioneered the experimental investigation of apparent motion, Gestalt psychologists like Paul Linke and later Paul von Schiller studied the phenomenon with a focus on a fringe case of it: The perception of "ambiguous motion," which is present whenever the direction of an apparent motion stimulus can not be decided objectively (figure 2). Such stimuli are interesting because they afford more than one possible perceptual interpretation, while subjectively only one direction of motion is perceived at a time. They thus reveal how the sensory system is treating stimuli in deciding how they are to be perceived, making them "invaluable tools for the study of the neural basis of visual awareness, because they allow us to distinguish neural responses that correlate with basic sensory features from those that correlate with perception."[73]

Trying to establish the "laws" of how visual perception deals with ambiguous motion, von Schiller preempted a number of results of contemporary experimental psychology about how form, color and initial position of ambiguous motion stimuli influence the way we perceive them.[74] During his experiments, however, he did make one especially remarkable observation: His subjects were able to actively control the perceived direction of motion if they moved their heads or hands. This was a case, he remarked in a footnote only, where motor activity shapes the Gestalt of optical perception.[75]



Ambiguous motion as described by Linke: Rotating a cross by steps of 45° can be perceived as clockwise or counterclockwise motion.

About sixty years later, this little noted observation was confirmed by modern psychology: In a brief article in the journal "Investigative Ophthalmology & Visual Science," Ishimura and Shimojo report

70 Christoph Hoffmann, "φ-Phänomen Film. Der Kinematograph als Ereignis experimenteller Psychologie um 1900," in *Die Adresse des Mediums*, ed. Stefan Andriopoulos, Gabriele Schabacher, and Eckhard Schumacher (Cologne: DuMont, 2001), 236.

71 Max Wertheimer, "Experimentelle Studien über das Sehen von Bewegung," *Zeitschrift für Psychologie und Physiologie der Sinnesorgane* 61 (1912).

72 Robert M. Steinman, Zygmunt Pizlo, and Filip J. Pizlo, "Phi is not beta, and why Wertheimer's discovery launched the Gestalt revolution," *Vision Research* 40 (2000): 2257–2264.

73 David M. Eagleman, "Visual illusions and neurobiology," *Nature Reviews Neuroscience* 2 (2001): 922.

74 Paul von Schiller, "Stroboskopische Alternativversuche," *Psychologische Forschung* 17 (1933): 180.

75 von Schiller, "Stroboskopische Alternativversuche," 196,

that "Voluntary Action Captures Visual Motion."[76] In a series of studies,[77] they had shown that hand movements capture (as in: influence) the way we perceive visual motion. Their experiments, of course, were conducted with a computer, coupling motion on a physical interface to visual representation on screen. A few years later, Andreas Wohlschläger continued this research, analyzing more features of the effect.[78] Later, it has also been shown that this does not only hold for the relation of hand and eye, but that auditory and tactile perception can be influenced by motion of the hands, eyes, head or feet as well.[79]

What these studies showed is not only that our motor actions directly influence what we perceive. They also showed that this influence is stronger, the closer action and perception happen in space and time and the more their features (like their spatial orientation) align. The strongest influence was measured when manual motion and computer reaction happened simultaneously and overlapped each other. More importantly even, they also showed that the effect is even present if a motor action merely is planned, but not executed. It could also be changed through training: After using a mouse whose control of the cursor on screen was inverted such that a motion to the right yielded an on-screen motion to the left, subjects exhibited a corresponding change in action capture, so that a motion to the left influenced ambiguous motion to the right. Apparently, the effect takes into account the expected results an action has. Action capture thus demonstrates that the more an action is related to the reaction it provokes (in terms of spatio-temporal distance, orientation, and its expected results), the more it influences perception of that action.

From the point of view of physiology, it has long been known that the neural activity causing motion, which originates in the motor cortex of the brain, is not only communicated to the muscles executing motion, but also to sensory areas. Motor signals are accompanied by an "efference copy"[80] or "corollary discharge"[81] that relays them to parts of the brain responsible for perception. This is thought to be part of a process in which the expected results of an action are compared to what actually

76 The note only covers one sixth of a page in the issue. G. Ishimura and S. Shimojo, "Voluntary action captures visual motion," *Investigative Ophthalmology and Visual Science* (Supplement) 35 (1994): 1275.

77 Continued with G. Ishimura, "Visuomotor factors for action capture," *Investigative Ophthalmology and Visual Science* (Supplement) 36 (1995): 357.

78 Andreas Wohlschläger, "Visual motion priming by invisible actions," *Vision Research* 40 (2000): 925–930.

79 Bruno H. Repp and Günther Knoblich, "Action Can Affect Auditory Perception," *Psychological Science* 18, no. 1 (2007): 6–7; Olivia Carter, Talia Konkle, Qi Wang, Vincent Hayward, and Christopher Moore, "Tactile Rivalry Demonstrated with an Ambiguous Apparent-Motion Quartet," *Current Biology* 18 (2008): 1050–1054; Yoshiko Yabe and Gentaro Taga, "Treadmill locomotion captures visual perception of apparent motion," *Experimental Brain Research* 191, no. 4 (2008): 487–494.

80 Erich von Holst and Horst Mittelstaedt, "The Principle of Reafference: Interactions Between the Central Nervous System and the Peripheral Organs," in *Perceptual Processing: Stimulus Equivalence and Pattern Recognition*, ed. Peter C. Dodwell (New York: Appleton-Century-Crofts, 1971), 41.

81 Roger W. Sperry, "Neural Basis of the Spontaneous Optokinetic Response Produced by Visual Inversion," *Journal of Comparative and Physiological Psychology* 43, no. 6 (1950): 482–489.

is perceived, in a feedback loop resembling the one of cybernetic control systems.[82]
Motor activity thus is directly inscribed into the perception of its results. The reactions we expect an activity to have is driving its perception, based on their spatio-temporal relation and perceived similarity.

FACTORING THE HUMAN BACK IN: CYBERNETIC INTERACTIONS

Years after Hutchins worked with Norman on a cognitive account of direct manipulation, he diverged from classical cognitive science. As if he could not longer ignore the "concrete thinking" conducted by the hands on the physical interface, he turned to "embodied" and "enactive" cognitive science, trying to understand thinking as a process involving bodies engaged in the culturally structured world surrounding them.[83] Analyzing the reasoning and actions of humans performing nautical navigation, he observed that "[t]he traditional »action-neutral« descriptions of mental representations seem almost comically impoverished alongside the richness of the moment-by-moment engagement of an experienced body with a culturally constituted world."[84] He thus shifted his focus on how the "actions of the hands"[85] drive insight and even constitute the physical symbols or representations we are working with: "To apprehend a material pattern as a representation of something is to engage in specific culturally shaped perceptual processes."[86]

This view corresponded to the way enactive cognitive science understands how our actions are ultimately responsible for the perceived features of objects, such as their shape. As Kevin O'Regan and Alva Noë wrote in a seminal text on how an action-centric view of cognitive science could look like: "The idea we wish to suggest here is that the visual quality of shape is *precisely* the set of all potential distortions that the shape undergoes when it is moved relative to us, or when we move relative to it."[87]

This also holds for the interface. Although very few research has been devoted to studying how an interface is perceived while it is used, there is a remarkable PhD thesis by Dag Svanæs titled "Understanding Interactivity."[88] In explicit tradition of

82 For a thorough discussion see Lasse Scherffig, "Moving into View: Enacting Virtual Reality," *Mediatropes* 6, no. 1 (2016).
83 For his own introduction to "embodiment" and "enaction" see Edwin Hutchins, "Enaction, Imagination, and Insight," in *Enaction: Towards a New Paradigm for Cognitive Science*, ed. John Robert Stewart, Olivier Gapenne, and Ezequiel A. Di Paolo (Cambridge, MA: MIT Press, 2010), 428.
84 Hutchins, "Enaction, Imagination, and Insight", 445.
85 Ibid. 443.
86 Ibid. 429-430.
87 Kevin O'Regan and Alva Noë, "A Sensorimotor Account of Vision and Visual Consciousness," *Behavioral and Brain Sciences* 24 (2001): 940.
88 Dag Svanæs, "Understanding Interactivity: Steps to a Phenomenology of Human-Computer

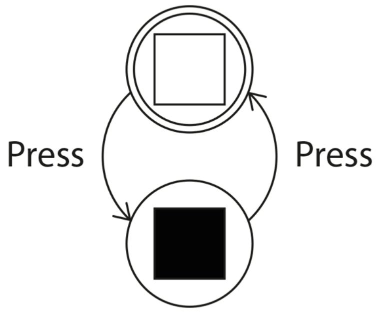
Gestalt psychology and its qualitative methods, Svanæs, as part of this thesis, conducted experiments in which subjects (or users) interacted with abstract minimalist systems of black and white squares called "Square World."[89]

Users interacted with these worlds using a mouse, clicking on the squares and observing the subsequent changes in the world on screen. Governed by more or less complex state-transition-diagrams, the squares in the world changed their color (from black to white or back, see figure 3). Svanæs recorded the user actions while correlating these with their verbal descriptions of what, according to them, was happening.

Among his observations was an interesting shift in his users' perceived "locus of agency," which moved from describing actions in the Square World ("it gets colored") towards locating oneself as acting in it ("I turn it on").[90] He understood these, using Merleau-Ponty's terminology, as a gradual extension of the users body space by which the interface became incorporated. This, according to him, is direct manipulation: An extension of the perceived locus of agency into an interface, which would explain why interaction can feel direct although it is mediated by physical interfaces (like the mouse) that are distant from their effects (apparent motion on screen).

For his subjects, with this incorporation came an "understanding" of the Square Worlds that grew from the sequence of their interactions. Users clicked, observed, clicked again and at some point would formulate a conceptualization of what they were dealing with, by saying, for instance, "It is a switch."[91] Notably, the switch was not there from the beginning. There was no symbolic representation of a switch to be seen and interpreted as such. Instead, it appeared to be encapsulated into the action sequence:

> When the subjects said »It is a switch«, they did not come to this conclusion from a formal analysis of the State Transition Diagram of the example. Nor did they conclude it from the visual appearance of the square, as the squares all looked the same. The switch behavior slowly emerged from the interaction as the square repeated its response to the subject's actions.[92]



A "switch" in the Square World.[93]

Interaction" (Dissertation, Norges Teknisk-Naturvitenskapelige Universitet Trondheim, 2000).

89 Svanæs, "Understanding Interactivity," 128.

90 Ibid. 159.

91 Ibid. 206.

92 Ibid.

93 Ibid. 147.

By physically engaging in the "syntax" of moving a mouse and pressing its buttons, the subjects established the "semantics" of the Square World by literally enacting it: co-creating the perceived objects in the world through their actions. As these objects existed only through being used, Svanæs described them as having Gestalt properties, naming them "Interaction Gestalts."[94] In Svanæs's words: "At the perceptual level closest to the computer are the rapid mouse movements and button clicks that the subjects did when they explored new examples. At the cognitive level above emerge the Interaction Gestalts that result from the interactions."[95]

In light of this, direct manipulation, in all its instances from Whirlwind's light-gun to mouse and keyboard, tangible user interfaces and today's ubiquitous touch-screens, can be seen as not the reduction of a psychophysical distance of material syntax and mental semantics. It can rather be understood as an interplay of syntax and semantics, perceptual level and cognitive level that together create the Gestalt of the interface.

As interfaces exhibit different levels of interactivity (few would disagree that a touchscreen somehow feels more interactive than a keyboard), they also exhibit different degrees of what really makes their interactivity direct: "spatial and temporal offset," the "the ratio between the number of degrees of freedom" and the "similarity between the physical actions of the users on the instrument and the response of the object."[96] These factors supporting di-rectness of interaction turn out to be the same factors supporting the influence of our actions on the perception of their results. Interaction thus seems to depend on how closely action and perception are fused by an interface, while this fusing is subject to their physical qualities and our acquired expectations. Wrapped in their reciprocal dependence, they create the Gestalt of that very interface.

It is the circular causality of cybernetic feedback, inherent to interactive computing since the very beginning, that encapsulates user and interface in a loop within which objects emerge through the process of acting with them. No matter how supposedly natural the latest interface might be, in the very moment when computers became feedback machines they set the stage for creating naturalness and its user in the reciprocal interplay of action, computer reaction and perception.

Any button we touch on our phones and tablets is, just like the switch in Svanæs' experiments, a button only because it is used as such. The interface in itself therefore only exists subjectively and is quite literally co-created, or enacted, every time it is used. While interaction design constantly creates new humans, it never has them or its interfaces fully under control. It may hence be time to start rethinking human-computer interaction as something that is, and always has been, fundamentally participatory.

94 Ibid. 218.
95 Ibid. 206.
96 Beaudouin-Lafon, "Instrumental Interaction," 446–453.

REFERENCES

Beaudouin-Lafon, Michel. "Instrumental Interaction: An Interaction Model for Designing Post-WIMP User Interfaces." In: *Proceedings of CHI*, 446-453. ACM, 2000.

Bennett, Stuart. *A History of Control Engineering 1930–1955.* Hitchin: Peter Peregrinus Ltd., 1993.

Card, Stuart K., and Thomas P. Moran. "User Technology: From Pointing to Pondering." In: *Proceedings of the ACM Conference on The History of Personal Workstations*, 183-198. ACM, 1986.

Card, Stuart K., Thomas P. Moran, and Allen Newell. *The Psychology of Human-Computer Interaction*. Hillsdale, NJ and London: Lawrence Erlbaum Associates, 1983.

Carter, Olivia, Talia Konkle, Qi Wang, Vincent Hayward, and Christopher Moore. "Tactile Rivalry Demonstrated with an Ambiguous Apparent-Motion Quartet." In: *Current Biology* 18 (2008): 1050–1054.

Chapman, Robert L., John L. Kennedy, Allen Newell, and William C. Biel. "The Systems Research Laboratory's Air Defense Experiments." In: *Management Science* 5, no. 3 (1959): 250-269.

Dourish, Paul. *Where the action is. The foundations of embodied interaction*. Cambridge, MA: MIT Press, 2001.

Dunne, Anthony. *Hertzian tales. Electronic products, aesthetic experience, and critical design*. Cambridge, MA: MIT Press, 2008.

Eagleman, David M. "Visual illusions and neurobiology." In: *Nature Reviews Neuroscience* 2 (2001): 920-926.

Everett, Robert. "Whirlwind." In: *A History of Computing in the Twentieth Century*, edited by J. Howlett, Gian Carlo Rota, and Nicholas Metropolis, 365-384. Orlando: Academic Press, 1980.

Fishkin, Kenneth P., Anuj Gujar, Beverly L. Harrison, Thomas P. Moran, and Roy Want. "Embodied user interfaces for really direct manipulation." In: *Communications of the ACM* 43, no. 9 (2000): 74–80.

Friedewald, Michael. *Der Computer als Werkzeug und Medium: Die geistigen und technischen Wurzeln des Personal Computers*. Berlin/Diepholz: Verlag für Geschichte der Naturwissenschaften und der Technik, 1999.

Gardner, Howard. *The Mind's New Science. A History of the Cognitive Revolution*. New York: Basic Books, 1985.

Hellige, Hans Dieter. "Krisen- und Innovationsphasen in der Mensch-Computer-Interaktion." In: *Mensch-Computer-Interface. Zur Geschichte und Zukunft der Computerbedienung*, edited by Hans Dieter Hellige, 11-92. Bielefeld: Transcript, 2008.

Hoffmann, Christoph. "φ-Phänomen Film. Der Kinematograph als Ereignis experimenteller Psychologie um 1900." In: *Die Adresse des Mediums*, edited by Stefan Andriopoulos, Gabriele Schabacher, and Eckhard Schumacher, 236-252. Cologne: DuMont, 2001.

Hutchins, Edwin L., James D. Hollan, and Donald A. Norman. "Direct Manipulation Interfaces." In: *Human-Computer Interaction* 1 (1985): 311–338.

Hutchins, Edwin. "Enaction, Imagination, and Insight." In: *Enaction: Towards a New Paradigm for Cognitive Science*, edited by John Robert Stewart, Olivier Gapenne, and Ezequiel A. Di Paolo, 425-450. Cambridge, MA: MIT Press, 2010.

Ishimura, G. "Visuomotor factors for action capture." In: *Investigative Ophthalmology and Visual Science* (Supplement) 36 (1995): S357.

Ishimura, G., and S. Shimojo. "Voluntary action captures visual motion." In: *Investigative Ophthalmology and Visual Science* (Supplement) 35 (1994): 1275.

Laurel, Brenda K. "Interface as mimesis." In: *User-Centered System Design: New Perspectives on Human-Computer Interaction*, edited by Donald A. Norman and Stephen Draper, 67-85. Hillsdale, NJ: Lawrence Erlbaum Associates, 1986.

Miller, George A. "The cognitive revolution: a historical perspective." In: *Trends in Cognitive Sciences* 7, no. 3 (2003): 141-144.

MIT. *Whirlwind I: A high-speed Electronic Digital Computer*. Promotional brochure. Cambridge, MA: MIT, 195.

Newell, Allen, and Herbert A. Simon. "Computer science as empirical inquiry: symbols and search." In: *Communications of the ACM* 19, no. 3 (1976): 113-126.

Noble, Douglas D. "Mental Materiel. The militarization of learning and intelligence in US education." In: *Cyborg Worlds. The Military Information Society*, edited by Les Levidow and Kevin Robins, 13-41. London: Free Association Books, 1989.

Norman, Donald A. "Cognitive Engineering." In: *User-Centered System Design: New Perspectives on Human-Computer Interaction*, edited by Donald A. Norman and Stephen Draper, 31-61. Hillsdale, NJ: Lawrence Erlbaum Associates, 1986.

O'Regan, Kevin, and Alva Noë. "A Sensorimotor Account of Vision and Visual Consciousness." In: *Behavioral and Brain Sciences* 24 (2001): 939-1031.

Pias, Claus. *Computer Spiel Welten.* Dissertation, Bauhaus-Universität Weimar, 2000.

Pold, Søren Bro. "Interface Perception: The Cybernetic Mentality and Its Critics: Ubermorgen.com." In: *Interface Criticism: Aesthetics Beyond Buttons*, edited by Christian Ulrik Andersen and Søren Bro Pold, 91-113. Aarhus: Aarhus University Press, 2011.

Redmond, Kent C., and Thomas M. Smith. *Project Whirlwind: the history of a pioneer computer*. Bedford, MA: Digital Press, 1980.

Repp, Bruno H., and Günther Knoblich. "Action Can Affect Auditory Perception." In: *Psychological Science* 18, no. 1 (2007): 6–7.

Rosenblueth, Arturo, Norbert Wiener, and Julian Bigelow. "Behavior, Purpose and Teleology." In: *Philosophy of Science* 10 (1943): 18–24.

Scherffig, Lasse. *Feedbackmaschinen. Kybernetik und Interaktion*. Dissertation, Kunsthochschule für Medien Köln, 2017.

Scherffig, Lasse. "Moving into View: Enacting Virtual Reality." In: *Mediatropes* 6, no. 1 (2016): 1-29.

Schumann, Frank. "Embodied Cognitive Science: Is it Part of Cognitive Science? Analysis within a Philosophy of Science Background." In: *PICS. Publications of the Institute of Cognitive Science* 3 (2004).

Shneiderman, Ben. "Direct Manipulation: A Step Beyond Programming Languages." In: *The New Media Reader*, edited by Noah Wardrip-Fruin and Nick Montfort, 486-498. New York, NY and London: W. W. Norton & Company, 2001.

Simon, Herbert A. "Allen Newell. 1927-1992." In: *National Academy of Sciences Biographical Memoirs* (1997): 139-173.

Sperry, Roger W. "Neural Basis of the Spontaneous Optokinetic Response Produced by Visual Inversion." In: *Journal of Comparative and Physiological Psychology* 43, no. 6 (1950): 482–489.

Steinman, Robert M., Zygmunt Pizlo, and Filip J. Pizlo. "Phi is not beta, and why Wertheimer's discovery launched the Gestalt revolution." In: *Vision Research 40* (2000): 2257–2264.

Svanæs, Dag. *Understanding Interactivity: Steps to a Phenomenology of Human-Computer Interaction.* Dissertation, Norges Teknisk-Naturvitenskapelige Universitet Trondheim, 2000.

Ullmer, Brygg, Hiroshi Ishii, and Dylan Glas. "mediaBlocks: Physical Containers, Transports, and Controls for Online Media." In: *Proceedings of SIGGRAPH*, 379-386. ACM, 1998.

von Foerster, Heinz. "Cybernetics of Epistemology." In: *Understanding Understanding: Essays on Cybernetics and Cognition*. Heinz von Foerster, 229–246. New York: Springer, 2003.

von Holst, Erich and Horst Mittelstaedt. "The Principle of Reafference: Interactions Between the Central Nervous System and the Peripheral Organs." In: *Perceptual Processing: Stimulus Equivalence and Pattern Recognition*, edited by Peter C. Dodwell, 464-476. New York: Appleton-Century-Crofts, 1971.

von Schiller, Paul. "Stroboskopische Alternativversuche." In: *Psychologische Forschung* 17 (1933): 179-214.

Walker, John. "Through the looking glass." In: *The Art of Human-Computer Interface Design*, edited by Brenda Laurel, 439-448. Redding, MA: Addison-Wesley, 1990.
Wegner, Peter. "Why interaction is more powerful than algorithms." In: *Communications of the ACM 40*, no. 5 (1997): 80-91.
Wertheimer, Max. "Experimentelle Studien über das Sehen von Bewegung." In: *Zeitschrift für Psychologie und Physiologie der Sinnesorgane* 61 (1912): 161-265.
Wiener, Norbert. *Cybernetics: or Control and Communication in the Animal and the Machine*. Cambridge, MA: MIT Press, 1961.
Wieser, C. R. *Cape Cod System and Demonstration, Technical report*. Cambridge, MA: Lincoln Laboratory – Division 6, 1953.
Winograd, Terry. "From Computing Machinery to Interaction Design." In: *Beyond Calculation: The Next Fifty Years of Computing*, edited by Peter Denning and Robert Metcalfe, 149-162. Berlin and New York: Springer, 1997.
Wohlschläger, Andreas. "Visual motion priming by invisible actions." In: *Vision Research* 40 (2000): 925–930.
Yabe, Yoshiko and Gentaro Taga. "Treadmill locomotion captures visual perception of apparent motion." In: *Experimental Brain Research* 191, no. 4 (2008): 487–494.

TRANSGRESSIONS AT THE POST OFFICE COUNTER

by Susanne Jany

“The counter, thus, was not a space where a simple difference – between clerks and customers, internal and external, operational and public – was established but where a complex and seemingly ambivalent system of mutually dependent acts of openings and closings were enforced to keep business up and running safe.”

Suggested citation: Jany, Susanne (2018). “Transgressions at the Post Office Counter.” In: *Interface Critique Journal* Vol.1. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44722

"Post office clerk behind letter collection counter in the post office Hamburg-Wandsbek 1" by courtesy of Museumsstiftung Post und Telekommunikation

The photograph depicts a postal counter in a post office in Wandsbek, Germany, during the first half of the twentieth century. A large wooden counter dominates two third of the image. The lower part of the massive wooden construction is paneled, the upper part is composed of windows that are either etched or blocked with translucent paper. A light source behind the counter is directed towards the opaque windows and produces hard contrasts; another lamp from above makes for dramatic shadows. The lower middle pane is cracked and seems to have been fixed with foil or additive paper that is partly torn down. Something lies on the small area in front of it – maybe the torn off remains as if the act of vandalism had just happened. On the left hand side, an opening can be made out, which is marked as a letterbox; an unreadable document is adhered to the glass underneath. On the right hand side stands a writing desk with a lamp drawn down and towards the wall. It is either switched off or broken because where its light-cone should hit the wall, its own shadow is cast. Behind the lamp hangs a calendar suggesting that it is or has been the tenth of some undecipherable month of some unmarked year. A blotting pad, a quill, and a pile of forms lie on the desktop with the blotting paper looming over the edge. It looks as if it is just about to fall and join the crumbled papers on the tiled floor that surround the wastebasket. In the middle of the photograph one of the counter windows is drawn to the side for potential customers. While the service hall seems abandoned, a postal clerk sits behind the opening gazing blankly at something in front of him that is concealed by the covered windows.

The original photograph is part of the image collection at the *Museumsstiftung für Post und Telekommunikation*. The 219x167 mm black-and-white-print is titled "post office clerk behind letter collection counter in the post office Hamburg-Wandsbek 1" and was shot by Hamburg based architect and photographer Hubert Kapusta.[1] It is one among hundreds of photographs in the collection picturing the modern history of the German post – its buildings, its uniforms, its stamps, its vehicles, its equipment as well as its day-to-day work routines. But does Kapusta's photograph really show an ordinary scene at the post office counter? Compared to other images in the comprehensive photographic documentation, the picture seems strangely staged. It almost appears like an artwork by photographer Jeff Wall who is known for taking pictures of orchestrated sceneries put together in studios, set up with props, and fitted with actors in costumes. There is a remarkable sense of artificiality to Kapusta's picture. The clerk, to begin with, doesn't look busy with counter duties but, rather, with holding completely still so that his head keeps perfectly fitting the counter opening. He is in fact so carefully placed that, firstly, his semi-profile is

1 "Postbeamter hinter Briefannahmeschalter im Postamt Hamburg-Wandsbek 1, Schloßstraße 39 [sic], mit Schild ›Briefeinwurf‹, Schreibpult, Wandlampe, Papierkorb, Deutschen [sic] Reichspost", Inventory number 3.2011.2955, Museumsstiftung Post und Telekommunikation, Museum für Kommunikation Berlin.

well lit despite being in the uttermost background and, secondly, that the light, which is reflected from his glasses, produces a shimmer in the camera lens. The paper on the floor is scattered a bit too evenly to be random – as if someone with an eye for the overall photographic composition has planted it. Likewise, the piled up paper sheets on the desk are evenly fanned out and the blotting paper is carefully balanced out. But if the photograph is that deliberately arranged, why didn't the photographer stage a more pleasant scene? Why does his depicting of a postal counter situation emanate an atmosphere of desertion, decline, and crisis? There might be an obvious answer: The clerk wears a uniform; his hat shows an imperial eagle and a swastika, making clear that the historical background is the National Socialist regime in Germany. Kapusta took the picture in early 1939. Accordingly, the reason for the photograph emitting an apocalyptic atmosphere of doom and menace could be that it is a document of everyday-life under the Hitler dictatorship. At least for the non-contemporary viewer it might also evoke the dooming World War II. The Allied air bombing operation ›Gomorrah‹, in fact, will eventually destroy this post-office building in 1943 together with vast areas of Wandsbek and Hamburg. Still, I think that this mesmerizing photograph has to be seen in the context of something more than that, something that has less to do with the historical background of the image but with the history of what it depicts: the postal counter itself. Kapusta's photograph, I would like to argue, envisions the counter as the highly critical and ambiguous space that it historically always has been since it first emerged.

SPATIAL AMBIVALENCES

Post office counters, bank counters, or ticket counters came up as a new service facility in Western European and North American public buildings during the nineteenth century. In most post-offices from the eighteenth century only a window towards the street allowed for business and communication with the public.[2] Later, a corridor was added where customers would wait before they were called up.[3] Finally, high industrialization with its increased amounts of traffic and operations led to functional and spatial differentiation within larger post offices. This process culminated in the introduction of larger service halls around 1870 with counters and internal areas behind – a spatial scheme that proved so successful that it was almost instantly adopted in banks, railway stations, theaters, and administration

2 See Walther Schmidt, *Amtsbauten. Aus Betriebsvorgängen gestaltet, dargestellt am Beispiel der bayerischen Postbauten* (Ravensburg: Otto Maier Verlag, 1949), 22.

3 See Rudolf Duffner, *Das deutsche Posthaus von seinen Anfängen bis zur Gegenwart* (Berlin: Triltsch & Huther, 1939), 75.

buildings as well.[4] The strategy of architecturally organizing postal and other workflows was to divide public and internal areas in order to prevent disturbances and keep postal operations – the packing, unpacking, sorting, labeling, and directing of mail – running smoothly.[5] Only at the counters were both spheres brought together spatially to allow for punctual interactions between employees and the public. The relation between internal and external spaces, architect Walter Schmidt wrote in his reference book on post office buildings, should be a tangential one: both areas should touch each other at the counter but never overlap.[6] Behind what seemed to be the architectural gesture of creating a service space for the public, lay the functional claim of strictly keeping it out of the operational realm.[7] To facilitate postal business was to isolate internal operations to the greatest possible extent. The counter as the inter-face between the post and the public, thus, produced a seemingly contradictory situation: It was supposed to serve the public by excluding it from the core if its business.

Kapusta's photograph from within the post office at Schloßstraße 41 in Wandsbek shows a typical counter used during the first third of the twentieth century. It comprised a wooden wall spanning from floor to ceiling with several openings for communication between clerks and clients.[8] Of the six to nine panes per workspace only the lower middle window had transparent glazing. This did not primarily serve the customer but the clerk's supervision of the service hall. The window could only be moved aside by the staff in order to open up communication with the client and to exchange money, stamps, or forms. The other panes were fixed and rippled, frosted, or simply covered with posters, announcements, or adverts so that "the public couldn't oversee the objects on the clerk's desk, namely the money stock".[9] Small openings allowed for the handling of small objects and were to be closed for climatic and security reasons whenever they were not in use. Some counters were so closed off that they were addressed and built as "glazed and barred cabins" with a flat money tray being the only opening towards the service hall.[10] Even verbal exchange was mediated by a so-called ›speech diaphragm‹ – a membrane made out of animal skin, silk, or rubber that transmits sound waves

4 See Susanne Jany, "Operative Räume: Prozessarchitekturen im späten 19. Jahrhundert," *Zeitschrift für Medienwissenschaft: Medien/Architekturen 12* (2015): 33–43.

5 See Susanne Jany, "Postalische Prozessarchitekturen. Die Organisation des Postdienstes im Medium der Architektur," *Archiv für Mediengeschichte*, eds. Friedrich Balke, Bernhard Siegert, and Joseph Vogl (Munich: Wilhelm Fink Verlag, 2013): 135–145.

6 See Schmidt, *Amtsbauten*, 16.

7 See Postdienst-Instruction in vier Bänden (reprint), Beisel, "Der Postbaudienst der Deutschen Reichspost, seine Entstehung und Entwicklung," *Archiv für Post- und Fernmeldewesen 3* (1951): 346f.

8 See Robert Neumann, Gebäude für den Post-, Telegraphen- und Fernsprechdienst. Handbuch der Architektur. 4. Teil, 2. Halbband, 3. Heft. 1. Auflage (Darmstadt: Bergsträsser, 1896), 22–24.

9 Ibid. 22. [All translations by the author]

10 For the ticket counter at the railway-station, see: [Carl] Cornelius, "Das Entwerfen und der Bau der Eisenbahn-Empfangsgebäude," *Zeitschrift für Bauwesen* 63 (1913): 434.

from inside the cabin to the customer's side.[11] The massive wall that was the counter pared every interaction between clients and clerks down to utterly minimal openings.[12] The counter, thus, provided for physical and verbal exchange under highly controlled circumstances; its opening was conditioned by the highest possible degree of closing. This generated a potentially conflict-laden situation: Communication and interaction at the counter were enabled by the fundamental acts of segregation and control.

SYMBOLIC TRANSGRESSIONS

Minimal architectural openings resulted in minimal modes of communication. Due to the specific counter architecture the post office clerk could avoid any eye contact with the customer and reduce conversation to its absolute necessities.[13] Not surprisingly, this caused unease, impatience, and disapproval with the public:

> Often, customers would complain vividly, when they had to stand behind closed windows and wait for service for an indeterminate period without being able to see what the clerk was actually doing behind the inscrutable counter wall.[14]

Even with only tiny transparently glazed openings left, "one has put up postings and inhibitions to complete the exclusion of the public." The result was: One "speaks against a wall and from another room hears the reply."[15] When a client was displeased with the post office workings and could only advance up to the counter, frustration was unloaded on what was within immediate reach: The clerk now served as an objective for objections, for distrust, resentment, and contempt. In addition, the client, as Couvé had observed, often perceived the postal clerks as exaggeratedly accurate and petty, as "strict, dry, matter-of-fact official[s]" sometimes "buttoned-up, at worst even grumpy".[16] These conceptions might appear stereotypical, but the clerk's arrogance and condescension towards clients was something that the authorities openly admitted:

> The improper conversational tone with the public that can often be heard at the counters is mostly due to apprentices and beginners, who while fulfilling this important civil service have an exaggerated

11 See Schmidt, Amtsbauten, 22; Dietrich Lang, *Briefschalterhallen der Deutschen Reichspost, ihre Entwicklung und ihr Aufbau* (Würzburg: K. Triltsch, 1932), 51.

12 For a mediatheoretical approach towards the opening in architecture: Wolfgang Schäffner, "Architecture of the Openings. Windows, Doors and Switches," in: *Architecture of the Medial Spaces*, eds. Joachim Krausse, and Stephan Pinkau (Dessau: Anhalt University of Applied Sciences, 2006), 74–79.

13 See Jürgen Bräunlein, "'Die Pflicht der Artigkeit'. Kundenfreundlichkeit bei der Post – damals und heute," *Das Archiv. Magazin für Post- und Telekommunikationsgeschichte 2* (2007): 94.

14 Wiese: "Neuzeitliche Schalter in Postgebäuden," *Deutsche Bauzeitung 61* (1927): 211.

15 Richard Couvé, *Beamte und Publikum: Richtlinien für die Bestgestaltung des Verkehrs der Beamten und des Publikums* (Leipzig: Weimann ,1930), 34f.

16 Couvé, *Beamte und Publikum*, 12.

> sense of their own dignity and exhibit a too ›spirited‹ appearance.[17]

In light of this, it became clear that the coming together of two qualitatively different spheres at the counter was *per se* a form of confrontation.[18] Clerk and customer, wrote railway professional Richard Couvé in 1930 about station buildings, tended to clash at the ticket counter because here they were "brought together particularly close to each other".[19] Due to the mutuality of this encounter, the clerk would not only annoy the customer but the customer would also annoy the clerk. The reason could be "unapt guests hindering" business because they didn't know what they wanted, because they were rude, or because they plainly talked too much.[20] This implied a not-to-be-underestimated potential for escalations: An agitated traveller, Couvé stated,

> who requests information and is treated brashly, doesn't understand the information, gets more agitated, asks again, threatens with complaints. If the clerk responds as agitatedly, a quarrel follows that slows the clerk's work down, makes the customer file an official report, and eventually claims the attention of further clerks.[21]

So, often enough, the counter became a scene of misunderstandings, insults, threats, and abuse;[22] the site for symbolic transgressions that clearly undermined the architectural principle of two spaces touching each other but never merging.

In order to prevent this, a whole apparatus of literature, guidelines, measures, and training films was enforced in the early twentieth century trying to educate both clerks and customers. While the public could only be kindly asked to behave and be prepared when approaching the counter, employees could actually be made to maintain strict rules, issued by the German *Reichspost*: All counters were to be opened during big rushes, personal conversations were to be omitted, clothes needed to be kept clean, and predefined polite phrases were to be used.[23] At the end of the nineteenth century, Heinrich von Stephan had aligned the German post with a modern, economical, and service-oriented enterprise. As the counter was the representative interface between the post and the general public – even more so than the direc-

17 Richard Couvé, *Vom Verkehr mit den Reisenden. Ein Ratgeber für Verkehrsbeamte* (Berlin: Verlag der Verkehrswissenschaftlichen Lehrmittelgesellschaft m.b.H. bei der Deutschen Reichsbahn, 1926), 15.

18 Jany, "Postalische Prozessarchitekturen," 142–145.

19 Couvé, Beamte und Publikum, 5.

20 Ibid., 3, 5; N.N., "Das Publikum," *Das Neue Posthorn. Illustriertes Familienblatt* 18 (1926/27): 294.

21 Couvé, *Vom Verkehr mit den Reisenden*, 12.

22 See Couvé, Beamte und Publikum, 5.

23 See Reichpostdirektion Berlin, *Hundert Fragen und Antworten am Schalter in deutscher, französischer und englischer Sprache* (Berlin: 1936); Taschenbuch für den Postbetriebsbeamten. Bd. 1: Schalterdienst, ed. Postinspektor Maetz (Berlin: Koenig. 1925), 20f.

tor's office or the façade of the building – the clerk had to weather any difficulties:[24] The postal clerk was

> the flagship of the company, the face of the German *Reichspost*. This he has to remember! According to his expertise, his sophistication, his appearance, and his manners the outsider judges the whole institution.[25]

The underlying logic was: A helpful employee makes for grateful and polite guests, which smoothens the overall operations – eventually leading to happy customers and maximum profits. One would think that behind all these measures stood the rational that critical and ambivalent situations at the counter ought to be neutralized instantaneously. This was not the case; at least not for the postal clerk. Efficient counter services were only guaranteed when the most central of all rules was met: Insults, impoliteness, and verbal transgressions from guests were never to be replied but to be tolerated and endured; any frictions whatsoever were to be obviated in order to avert the kind of escalations mentioned before. Couvé pushed for "most comfortable service", general acceptance of most customer wishes, and a general goodwill-attitude. Even though an open, equal, and balanced relationship between both parties was aimed for, at the core of counter duty stood the principle that differences between clerk and customer were not to be eliminated. Rather, power imbalances at the counter were kept up in favor for the client. The immanent ambiguity of the counter, thus, was actively enabled and maintained.

PHYSICAL TRANSGRESSIONS

Transgressions at the counter were not only tackled in the realm of the symbolic but also materially: In the 1920s and 1930s, the postal administration tried to improve counter communication by deconstructing its massive architecture. The novel ›open counters‹ were supposed to be a step towards the customer by getting rid of wooden panels and using glass walls as transparent divisions between the counters. Material separations between client and clerk were given up completely. The underlying idea was that architectural openness and proximity between clerk and client would automatically lead to a new kind of interpersonal closeness, openness, and cooperation. These transformations of the counter architecture were, in fact, validated positively. Architect Peisker observed in the main post office in Potsdam:

> On the strength of the past experiences, the following can be said about the purposefulness of the new counter facility. There is a bigger, almost solemn quietude in the service

24 See Peter Becker, "Überlegungen zu einer Kulturgeschichte der Verwaltung," *Jahrbuch für Europäische Verwaltungsgeschichte* 15 (2003): 332.

25 Schalterdienst, 19; cf.: Firsching, "Schalterräume," *Verkehrs- und Betriebswissenschaft in Post und Telegraphie* 8, no. 14/15 (1932): 214.

> hall. The guests experience the waiting for service as less tiring and irritating than the previous standing before a closed counter because the customer actually sees the clerks working. Heated disputes or discussions of people at the end of the queue are ceased almost completely. Frictions occur only rarely because both parties inflict more restraints on themselves. [...] The supervisors and counter clerks can easily oversee the service hall and in case of standstills quickly intervene. [...] The oral understanding without dividing walls is more convenient. The clerk can instantly and clearly see his opposite instead of just a head in a window. Therewith alone, both parties are brought closer to each other.[26]

Still, there was a reason that a full opening towards the general public was never realized: The walls and divisions at the glazed counter never completely disappeared because verbal transgressions were not the only transgressions at the post office counter. As the counter was the site for the exchange of various valuables, it, at the same time, became the very site for criminal acts: for theft, fraud, and robberies. Actually, these threats were the background against which the former massive and fully-closed cabin-counter was introduced in the first place: It "evolved out of a double need for security: Protection against clients as well as protection against colleagues."[27] The general suspicion was directed against greedy robbers and thieving staff alike. On February 12th in 1880, an armed robbery happened in the Wandsbek post office of the time, located at the corner of Lübecker Straße and Schulstraße, in which a twenty-two year old post office worker was killed. A man pretending to buy stamps lingered near the counters. In an unattended moment he opened a window lock in the service hall. During the following night he entered through the window, encountered the young night guard and subsequently killed him. Although there were more than 3900 Mark stored in the post office, the intruder could only lay hands on 500 Mark before he fled the scene. The next day, the employee of a nearby guesthouse noticed a man with a crowbar and a lock pick and called the police. Upon searching his room, the police found 500 Mark, burglary tools, bloody clothes, and a sleeping person that later confessed to both the robbery and murder. In another post office in the western part of Germany, to name just one more example, another incident took place. The report from 1883 recounts:

> An incredible brash robbery attack happened in the evening hours of January 13th to the counter of post office no. 1 in Hagen (Westphalia). It might have been 6.30 pm when two men appeared in the vacant

26 Peisker, "Die neuzeitlichen Schalteranlagen des Hauptpostamts in Potsdam," *Archiv für Post und Telegraphie* 55, no. 1 (1927): 4.

27 Schmidt, *Amtsbauten*, 22.

> service hall, one of which asked the postal clerk Langenbach at the counter for letters *poste restante* under the name ›Meyer‹. While Langenbach searched for the required mail, for which he had to turn towards the cabinet where the letters were stored, the man broke up the window at the counter with the help of a tool, reached for the cash box inside the bureau and together with it, he took to his heels.[28]

When towards the end of the nineteenth century, big amounts of money were no longer transported via overland mail coaches, but rather transfers were ordered telegraphically, the respective amounts of money were received, dispensed, and stored at local post offices. So eventually, the counter became the ultimate target for raids and robberies.

Generally speaking, for the operations manager, the counter was the operational space that stood for foreclosure, separation, and security, where internal information and values were closed off from the public. For the criminal, on the other hand, the counters in post offices and saving banks symbolized the best possible point of access, the operational weak-point. Physical transgressions actively undermined Schmidt's claim of never having public areas merge with internal ones. So, what seemed like an opening of the heavy and isolated counter cabin during the 1920s and 1930s in order to improve the material conditions of customer-clerk-relations, in fact, produced just more subtle separations. The counter stayed the central barrier between clerk and customer that it always had been. Glass walls displaced wooden walls and in order to keep valuables and documents safe, lockable compartments were introduced. Also, the clerk's desk was turned away from the customer in a 90° angle in order to preserve privacy of correspondence. Grids were drawn straight through the service hall to secure the building after hours.[29] Even if there were no divisions between clerk and client, walls behind the clerks' desks kept the general public away from internal areas and therefore from critical intelligence about workflows, money stashes, and security measures.[30] Just as the internal areas were hidden away, so were the emergency bells that the clerk could reach when he felt the need to call for help.[31] The architectural challenge, therefore, was not to plainly enforce security in a both symbolic and material way, but to guarantee for business under these conditions. The counter, thus, was not a space where a simple difference – between clerks and customers, internal and external, operational and public – was established but where a complex and seemingly ambivalent system of mutually dependent acts of openings and closings were enforced

28 "Gewaltsame Beraubung der Schalterkasse des Postamts in Hagen," *Deutsche Verkehrs-Zeitung* (1883): 20.

29 See Peisker, "Die neuzeitlichen Schalteranlagen," 2.

30 See Lang, Briefschalterhallen, 48.

31 See ibid., 47.

to keep businesses up and running safely.[32]

COUNTER STORIES

Spaces of exclusion fuel the collective imagination. In a post office like the one in Kapusta's photograh, a civilian could only advance up to the counters when entering a public agency. Wooden panels, frosted glass screens, and the barring of the counter wall normally blocked one's sight into the offices and the procedures there. Additionally, low and small windows, bill postings, and minimal pass-through features left anything beyond the counter in the dark. When the counter black boxes its business, an information gap between the involved parties is produced – the phantasm of an obscure, bureaucratic, and cumbersome apparatus emerges that Franz Kafka in his novel *The Trial* put into haunting literary form. Is that what Kapusta's photograph evokes? Does it express the experience of an obscure, conflict-laden, and highly critical counter that inheres the potential for diverse forms of transgressions? However, there is a historical explanation for its atmosphere of crisis, abandonment, and decadence.[33] When the photograph was taken in 1939, the building at Schloßstrasse, built in 1770 and remodeled as a post office in 1890, had become too small for the growing city of Wandsbek and its increasing mail quantities. The year before, in 1938, the official decision had been made to erect a new post office building. In early 1939, just when building work was about to start and Kapusta shot his photograph, a general building freeze for official non-military buildings was declared. Suddenly, the already given up post office was not demolished after all but had to keep up provisional postal service together with a nearby barrack, before later that year more and more clerks were called for military service. So, what we witness in the photograph is the moment when the postal service in Wandsbek was institutionally falling apart. Still, what the image also evokes, is the history of its very subject: the counter as a critical and highly ambivalent space where two qualitatively different spheres are brought together under highly controlled conditions; where they are supposed to touch each other but never to merge. The encounter at the counter, this is what I intended to show, turns it into a space of diverse transgressions, of misunderstandings and misbehavior, of insults and assaults; a space where an institution's reputation and profits, a person's strength of nerves and sometimes even an employee's life is at stake. The post office counter is by no means the dull, trivial, and predictable setting of conventional every-

32 As a general strategy in architecture: cf. Dirk Baecker, "Die Dekonstruktion der Schachtel. Innen und Außen in der Architektur," in *Unbeobachtbare Welt. Über Kunst und Architektur*, eds. Niklas Luhmann, Frederick D. Bunsen, and Dirk Baecker (Bielefeld: Haux, 1990), 99.

33 For the following historical synopsis see: *Postgeschichtliche Blätter Hamburg* (special issue *Wandsbek*) 23 (1890): 54–56.; Walter Kindermann, "Zur Postgeschichte Wansbeks", *Wandsbek früher und heute* (Hamburg-Wandsbek: 1965), 48–50.

day services. That it evinces just that – the ambiguity, perilousness, and uneasiness that comes with the counter – is what makes Kapusta's photograph exceptional within the hundreds of images conserved in the museum's collection documenting the modern history of the German post.

REFERENCES

Baecker, Dirk. "Die Dekonstruktion der Schachtel. Innen und Außen in der Architektur." In *Unbeobachtbare Welt. Über Kunst und Architektur*, edited by Niklas Luhmann, Frederick D. Bunsen, and Dirk Baecker, 67–104. Bielefeld: Haux, 1990.

Becker, Peter. "Überlegungen zu einer Kulturgeschichte der Verwaltung." In: *Jahrbuch für Europäische Verwaltungsgeschichte* 15 (2003): 311–336.

Bräunlein, Jürgen. "'Die Pflicht der Artigkeit'. Kundenfreundlichkeit bei der Post – damals und heute." In *Das Archiv. Magazin für Post- und Telekommunikationsgeschichte* 2 (2007): 90-97.

Cornelius, [Carl]. "Das Entwerfen und der Bau der Eisenbahn-Empfangsgebäude." In: *Zeitschrift für Bauwesen* 63 (1913): 235–262, 431–446, 621–630.

Couvé, Richard. *Beamte und Publikum: Richtlinien für die Bestgestaltung des Verkehrs der Beamten und des Publikums*. Leipzig: Weimann, 1930.

Couvé, Richard. *Vom Verkehr mit den Reisenden. Ein Ratgeber für Verkehrsbeamte*. Berlin: Verlag der Verkehrswissenschaftlichen Lehrmittelgesellschaft m.b.H. bei der Deutschen Reichsbahn, 1926.

Duffner, Rudolf. *Das deutsche Posthaus von seinen Anfängen bis zur Gegenwart*. Berlin: Triltsch & Huther, 1939.

Firsching. "Schalterräume." In *Verkehrs- und Betriebswissenschaft in Post und Telegraphie* 8, no. 14/15 (1932): 214-216.

Gesellschaft für deutsche Postgeschichte, ed. *Postgeschichtliche Blätter Hamburg* (Sonderheft Wandsbek), Heft 23, Hamburg: 1980.

Jany, Susanne. "Operative Räume: Prozessarchitekturen im späten 19. Jahrhundert." In *Zeitschrift für Medienwissenschaft: Medien/Architekturen* 12 (2015): 33–43.

Jany, Susanne. "Postalische Prozessarchitekturen. Die Organisation des Postdienstes im Medium der Architektur." In *Archiv für Mediengeschichte*, edited by Friedrich Balke, Bernhard Siegert, and Joseph Vogl, 135-145. Munich: Wilhelm Fink Verlag, 2013.

Lang, Dietrich. *Briefschalterhallen der Deutschen Reichspost, ihre Entwicklung und ihr Aufbau*. Würzburg: K. Triltsch, 1932.

Kindermann, Walter. "Zur Postgeschichte Wandsbeks." In *Wandsbek früher und heute*, 41–50. Hamburg-Wandsbek: 1965.

Neumann, Robert. *Gebäude für den Post-, Telegraphen- und Fernsprechdienst. Handbuch der Architektur*. 4. Teil, 2. Halbband, 3. Heft. 1. Auflage. Darmstadt: Bergsträsser, 1896.

N.N. "Das Publikum." In *Das Neue Posthorn. Illustriertes Familienblatt* no. 18 (1926/27): 294.

N.N.: "Gewaltsame Beraubung der Schalterkasse des Postamts in Hagen." In *Deutsche Verkehrs-Zeitung, 7, no. 3* (1883): 20.

Peisker. "Die neuzeitlichen Schalteranlagen des Hauptpostamts in Potsdam." In *Archiv für Post und Telegraphie*, 55, no. 1 (1927): 1-5.

Postdienst-Instruction in vier Bänden (reprint). In Beisel. "Der Postbaudienst der Deutschen Reichspost, seine Entstehung und Entwicklung," In *Archiv für Post- und Fernmeldewesen*, 3 (1951), 346f.

Reichpostdirektion Berlin. *Hundert Fragen und Antworten am Schalter in deutscher, französischer und englischer Sprache*. Berlin, 1936.

Schäffner, Wolfgang. "Architecture of the Openings. Windows, Doors and Switches." In *Architecture of the Medial Spaces*, edited by Joachim Krausse, and Stephan Pinkau, 74–79. Dessau: Anhalt University of Applied Sciences, 2006.

Schmidt, Walther. *Amtsbauten. Aus Betriebsvorgängen gestaltet, dargestellt am Beispiel der bayerischen Postbauten*. Ravensburg: Otto Maier Verlag, 1949.

Taschenbuch für den Postbetriebsbeamten. Bd. 1: *Schalterdienst*, edited by Postinspektor Maetz. Berlin: Koenig, 1925.

Wiese. "Neuzeitliche Schalter in Postgebäuden." In *Deutsche Bauzeitung* 61 (1927): 211–215.

INTERFACES OF IMMERSIVE MEDIA

By Julie Woletz

“Instead of trying to induce immersion by presenting ever more realistic image spaces, interfaces of immersive media have to address the body by enabling kinaesthetic action.”

Suggested citation: Woletz, Julie (2018). “Interfaces of Immersive Media.” In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44743

While proponents of new media or computer sciences regard current technologies of virtual realities such as the Oculus Rift (Oculus VR 2016) as constituting the pinnacle of immersive media, representations and illusions of three dimensional spaces start with early art forms. Coupled to the creation of illusionary spaces are the attempts of physically or mentally entering such designed, augmented or artificial environments. Hence, the concept of immersion can not be regarded solely as an effect of digital media technology or modern interfaces. Some immersive techniques can be connected to earlier forms of artistic media and cultural practices and thereby situated within general acts of perception. Other forms of immersion, especially those based on computing systems, derive from current innovations and technologies, and are therefore just being formed and stabilized as new cultural programs. Taking a closer look at some milestones of the art of illusionary spaces might help to liberate the concept of immersion from the technical or solely digitally-oriented rubrics under which it is often thought of. And instead of concentrating on technology, I suggest focusing on the interfaces of immersive media. To argue for this approach, I would like to elaborate how various interfaces of spatial media create effects of immersion by addressing the body in different ways.

EARLY FORMS OF IMMERSION IN ILLUSIONARY SPACES

Oliver Grau's extensive research has proven that the genre of immersive aesthetic spaces has been actively pursued since pre-modern times:

> The idea of virtual reality only appears to be without a history; in fact, it rests firmly on historical art traditions, which belong to a discontinuous movement of seeking illusionary image spaces.[1]

I will not try to rebuild this tradition from scratch, but I would like to highlight some ancestors of virtual environments. Early examples of illusionary spaces can be found in antiquity, with the paintings and frescoes covering the walls of Pompeii (60 BC)[2]. For example, in the Villa dei Misteri circular frescoes offered visitors a full 360º vision on surrounding walls.

In 1787, Robert Barker patented a rather similar technique of painting a completely circular canvas in correct perspective under the name of "Panorama" – derived from the Greek words "pan" for all and "orama" for view. Such panoramas were exposed in specially designed, circular buildings, so called rotundas,

1 Oliver Grau, *Virtual Art. From Illusion to Immersion* (Cambridge, MA, and London: MIT Press, 2003), 339.

2 See Grau, *Virtual Art. From Illusion to Immersion*, 25 et seq.

with a typical diameter of forty meters and a height of up to twenty meters. The panorama building "was so designed that two of the forces which militate against perfect illusion in a gallery painting – the limiting frame and standards of size and distance external to the picture itself – were eliminated."[3] Audiences standing in such an all-encompassing environment were thrilled by the illusion of being right inside the scene, and exhibitions with huge panoramas quickly turned into mass spectacles.

Since the seventeenth century, illusionary spaces became considerably smaller, left the walls of buildings, and entered the salons. During that period of immersive art, all sorts of smaller optical toys, peep boxes, and peep-throughs became very popular[4]. Instead of being surrounded by painted walls or huge paintings, optical illusions were now perceived by a single spectator using a small, mostly box-like object in front of the eyes.[5] Among the most popular devices was the Holmes Card Viewer (1915) with true stereopsis. Spectators would look through the handheld apparatus at two slightly different pictures (i.e. binocular disparity, one image for each eye) that were combined in a way that together created spatial stereo viewing. Instead of seeing two separated images, the picture could be perceived as one spatial scene – just like real physical objects.

The Holmes Card Viewer, image licensed by Dave Pape under Creative Commons

The next leap forward in the art of immersive spaces arose when techniques of optical illusions could be combined with motion. Fred Waller's Cinerama of 1952 did not just unite the words "Cinema" and "Panorama". In Cinerama, three cameras and a circular screen were used to offer panoramic viewing in correct perspective. But to transcend still images, this procedure was combined with motion pictures – much to the delight and sometimes to frightening effects for the audience.

> The shrill screams of the ladies and the pop-eyed amazement of the men when the huge screen was opened to its full size and a thrillingly realistic ride on a roller-coaster was pictured upon it, attested to the shock of the surprise.[6]

3 Richard Daniel Altick, *The Shows of London* (Cambridge, MA: Harvard University Press, 1978), 132.

4 See Grau, *Virtual Art. From Illusion to Immersion*, 50-52.

5 Hayes and Wileman present an extensive online exhibition of optical toys at http://courses.ncssm.edu/gallery/collections/toys/opticaltoys.htm.

6 Bosley Crowther, "New Movie Projection System Shown Here; Giant Wide Angle Screen Utilized," *New York Times*, October 1, 1952.

Very shortly after the Cinerama, in 1956, Morton Heilig wanted to create more than just optical illusions of movement in three dimensional space in his "reality machines".[7] Hence, he continued the "-orama" sort of naming tradition and turned it into a complete multi-sensorial experience in Sensorama:

> The Revolutionary Motion Picture System that takes you into another world with 3-D, wide vision, motion, color, stereo-sound, aromas, wind, vibration. (Sensorama Advertising, 1962)

In this one-person-reality machine, users could choose between five 'experiences'. Sensorama offered rides on a motorbike, a bicycle, a dune buggy, and a helicopter flight; the fifth experience was the show of a belly dancer. Putting aside musings on the belly dancer, with that choice of rides Sensorama brought one of the central motives of perceiving artificial space into focus: surrogate traveling by vehicle simulation. The concept of panoramic rendering had been expanded to a whole environment that could not only be seen, but also experienced with all senses. As an immersive technique, the vehicle provided the conceptual frame for matching sensory feedback such as wind or sound effects.

Sensorama Machine © Morton Heilig, http://www.mortonheilig.com/InventorVR.html

Besides vehicle simulation like in Sensorama, Morton Heilig also patented the first movable and Head Mounted Display (HMD) with 3D graphics, stereo sound, and an "Odor Generator",[8] but was never able to build one. But already in 1968, the first completely functional Head Mounted Display could be implemented by Ivan Sutherland at MIT. It consisted of stereoscopic displays for each eye and a mechanical tracking system for adapting the visual output to the current view point.[9]

7 Morton L. Heilig, "El Cine del Futuro: The Cinema of the Future." *Presence 1, no. 3* (1992): 279–294, reprinted from *Espacios* (1955): 23–24.

8 Morton L. Heilig, *Stereoscopic-Television Apparatus for Individual Use*. U.S. Patent No. 2,955,156, October 4, 1960.

9 Ivan E. Sutherland, "A Head-Mounted Three Dimensional Display," *Proceedings of the Fall Joint Computer Conference*, 1968, 757-764.

IMMERSION – SIMPLY AN EFFECT OF DEPTH CUES?

Immersive practices and techniques of spatial illusion make use of certain characteristics of human perception. The visual system uses various depth cues to extract spatial information out of its environment. For example, oculomotor cues (oculus is the Greek word for eye) mean spatial information that is derived from the motor function of the eye. In physical spaces, the stretching and relaxing of the muscles of the eye lens and the rotating of the eyes give information about the distance of objects. Of course, these cues do not work with illusionary spaces of paintings, walls, screens and so on as all these objects are placed in the same distance to the eyes. Nevertheless, two-dimensional images may give the impression of spatial depth by using monocular depth cues such as occlusion, relative size, texture gradient, and linear and aerial perspective (i.e. changes in contrast and color). With these techniques, an illusion of spatial depth can be perceived by just one eye. The most advanced technique to create illusionary image spaces is binocular disparity and stereopsis, as used in stereoscopic apparatuses since the 1900s.

Another technique for the creation of illusionary spaces is motion. The so-called kinetic depth effect[10] describes the optical illusion of three dimensions by motion, for example, in images that change from flat into a three dimensional figure just by rotating.[11] Furthermore, the moving of objects within the field of view can be used to create spatial effects in a whole scene. In real environments, motion parallax is a depth cue that results from our own motion. As we move, objects that are closer to us move further across our field of view than do objects that are in the distance. This effect can be used to create a kinetic illusion of depth, for example in films, if closer objects seem to move faster than those further away. A uniform motion of objects in the field of view may even be perceived as one's own body movements. That is why images of a street with objects passing by on the roadside are the simplest ways of simulating a ride, just like in the vehicle simulation of Sensorama.

What can be gathered from pre-digital examples of immersive media is that the ideas and techniques used in deceiving perception and to create illusions of artificial spaces in three dimensions are not new as such. Of course, the devices and technologies change with technological progress from control of lighting conditions to complex computer hardware and software, whereas the biological basis of the perception of space quite obviously remains the same. So why not simply

10 Hans Wallach and D.N. O'Connell, "The kinetic depth effect," *Journal of Experimental Psychology* 45 (1953): 205-217.

11 A very nice example of this effect can be found at http://www.lifesci.sussex.ac.uk/home/George_Mather/Motion/KDE.HTML

define immersion as an objectively measurable effect of certain parameters of media technology depending on human perception and presented depth cues? Following such a technological approach, the definition of three distinct degrees of immersion within computer science derives from devices only:

1) Virtual environments are regarded as *non-immersive*, when the device only enables a viewpoint from outside the environment and the user only looks at the artificial world.

2) Environments are called *semi-immersive*, when the viewpoint is inside the environment like in a cave,[12] but there are still other stimuli available.

3) Virtual environments are defined as *fully-immersive*, when they work with devices like a head mounted display that shows a viewpoint inside the environment and at the same time blocks out other sensory information.

And yet, the broad range of examples from antiquity to current media shows that immersion in artificial space, while certainly influenced by technology, is not dependent on technology alone. Immersion did not automatically increase with technological progress. Therefore, the concept of immersion can not be defined solely by physical models, be they based on technical specifications or on 'human factors' and biological capacities. What does change, besides technological progress, are the regimes of viewing, the staging, the ways of what is set into scene and to what end, and the cultural contexts of its perception or usage – from the staging of saints, religion and religious power in circular frescoes, to political expositions of battles as in the famous Sedan Panorama,[13] to mass entertainment like in Cinerama. Still, immersive practices, though subject to ongoing transformation, sometimes crystallize into cultural figures, "topoi", or even "moulds for experience".[14] And with that, the cultural programs how to read such images, how to decipher illusionary spaces, and how to handle perception and apperception of such "reality machines" become the central point of attention. Instead of concentrating on technology, I suggest focusing on the interplay between recipient and media, the interaction between user and technology, in short on the *interfaces of media practice*. It is only in the interfaces that it becomes evident how cultural practices, media techniques, and technological devices are intertwined in the creation and usage of immersive environments. And in shifting the focus towards the interfaces of immersive media – including devices, practices, and cultural programs – substantial insight on the concept of immersion in virtual environments can be gained without limiting it to technical

12 Carolina Cruz-Neira, Daniel J. Sandin and Thomas A. DeFanti, "Surround-Screen Projection-Based Virtual Reality: The Design and Implementation of the CAVE," *Proceedings of SIGGRAPH ´93*, 135-142. ACM, 1993.

13 Oliver Grau, "Immersion and Interaction. From circular frescoes to interactive image spaces." *MediaArtNet – 1: Survey of Media Art*, (Wien: Springer-Verlag, 2004) 292-313.

14 Erkki Huhtamo, "Armchair Traveller on the Ford of Jordan. The Home, the Stereoscope and the Virtual Voyager," *Mediamatic Magazine* 8, no. 2,3 (1995).

definitions on the one side or opening the term to arbitrariness on the other side. I will try to prove my point by picking out the topos of what has been called surrogate or "armchair travelling"[15] as an example, considering how various interfaces of immersive media address the body in different ways and to what effect.

INTERFACE TECHNIQUES AND PRACTICES OF IMMERSIVE MEDIA

In computer science, an interface is defined as the boundary or contact surface for human-computer interaction. The interface includes both sides of data exchange, via input devices such as keyboard and mouse as well as output devices such as the screen or loudspeaker. Even more important than these hardware and software components, the interface also 'translates' and mediates between the two unlike partners, for instance, by providing interaction techniques and metaphors based on cultural programs instead of digital code for the representations, signs, icons, and images that are used to communicate and interact via the screen. As it evolved, the concept of the interface has come to encompass the functions to be performed and cognitive, emotional, and cultural aspects of the user's experience as well[16]. Nowadays, interfaces enable all kinds of human-computer communication and interaction.[17] Nevertheless, because of the need for input and output devices, there has always been a request for the vanishing of the interface in the fully immersive "ultimate display"[18] or in "interfaceless interface(s)" of the future.[19] "The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such room would be fatal. With appropriate programming, such a display could literally be the Wonderland into which Alice walked."[20] So instead of just *looking at* the screen, interfaces of immersive media are described with metaphors such as "through the looking glass",[21] or as a "doorway to other worlds",[22] where users could literally *be inside* a virtual environment and act as they would in the real

15 Ibid.

16 Brenda Laurel and S. Joy Mountford, "Introduction." *The Art of Human-Computer Interface Design*, ed. Brenda Laurel (Reading, MA: Addison-Wesley, 1999).

17 Julie Woletz, *Human-Computer Interaction. Kulturanthropologische Perspektiven auf Interfaces*, (Darmstadt: Büchner, 2016).

18 Ivan E. Sutherland, "The Ultimate Display," *Proceedings of IFIP Congress,* 1965, 506-508.

19 Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media* (Cambridge, MA: MIT Press, 1999), 23.

20 Ivan E. Sutherland, "The Ultimate Display," *Proceedings IFIP Congress*, 1965, 508.

21 John Walker, "Through the Looking Glass." *The Art of Human-Computer Interface Design*, (Redding, MA: Addison-Wesley, 1999), 439-447.

22 Scott S. Fisher, "Virtual Environments: Personal Simulations & Telepresence," *Virtual Reality: Theory, Practice and Promise* (Westport: Meckler Publishing, 1991).

world. Though meant for seamless futuristic devices, the term "interfaceless interface(s)"[23] could also be used for pre-digital immersive media and art forms. Common to all of these early examples of illusionary spaces are that they are media, where the 'interface' – for lack of a better word – only allows the representation of the output side of the communication. There is no interacting with these media in the sense of mutual adaption, nor any kind of input from the user's side. That is why Lev Manovich uniformly uses the term "screen" for any "flat rectangular surface, existing in the space of our body and acting as a window into another space"[24] (Manovich 1995/96), including anything from renaissance paintings to photography and film. Although he divides his archaeology of screens after the temporality of what they show,[25] he points out that the relation of the body and the screen constantly remains that of an *immobilised body* in front of increasingly realistic images. So, what exactly constitutes immersive effects of being drawn into such "interfaceless" image spaces?

According to Oliver Grau, earlier illusionary spaces have a frame or a marked difference between the representation – the illusionary space – and the 'real' space. He argues that it is exactly this vanishing difference or border to reality that marks later concepts of "immersive" or what he calls "interactive image spaces".[26] If we do not have input devices for interaction, pre-digital immersion must rely purely on visual output and on optical illusions created by the aforementioned depth cues. But the border to reality does not only vanish in ever more realistic images, it literally becomes 'out of sight' by manipulating the limiting frame of the image and the field of view of the spectators. Basically, immersive strategies work along two main lines: On the one hand, there are illusionary spaces based on given spatial conditions such as circular frescos or wall paintings, and panoramas. These illusions actually *surround* the observer or many observers, if not always in 360°, at least partially. Consequently, the point of view of the spectator is always one from the inside – exactly as computer scientists requested for digital environments. And if the painting or the screen is just big enough, it fills out the entire field of view of the spectators, so that all they see is the surrounding image space. On the other hand, there are illusionary techniques and devices that work with so called *peep-throughs*. Here, just one observer looks into an artificial space through a small device that blocks out any other visual input. Although the viewer is not really inside the peep box, he is drawn into the image space by the immersive strategy of restricting his field of view to the

23 Bolter and Grusin, *Remediation: Understanding New Media*, 23.

24 Lev Manovich, "An Archeology of a Computer Screen." *Die Zukunft des Körpers I. Kunstforum International 132* (November 1995 – January 1996) 124- 135.

25 Lev Manovich divides screens into the classic screen that shows only static images, in dynamic screens of moving images like in film, in real-time screens of ‚life' observation technology, and in the interactive computer screen.

26 Oliver Grau, "Immersion and Interaction. From circular frescoes to interactive image spaces."

confined space of the peep-through. In both ways of manipulating the field of view of the spectators, the border to reality disappears from sight. In surroundings, the observer physically enters the media space, where he can turn his head, move around to a certain degree, and experience different views of the artificial environment. Though body movements may be restricted, viewers are certainly not immobilized. In contrast, early peep boxes could not enable movements or changes in the field of view and always presented the same image space. And yet, the disappearance of the (visual) presence of one's own body together with the depth cues and the infinity of details, for example contained in a stereograph, inspired euphoric descriptions about leaving one's body behind and traveling in spirit.[27] When Sutherland finally built and programmed the first digital Head Mounted Display, one distinctive innovation was that he added the tracking of head positions to earlier concepts of a movable display close to the head.[28] By position tracking of the head, images of the HMD could be adapted to the actual viewpoint, and for the first time, also the viewers of such smaller devices could change what they saw just by turning the head.

In fact, the *tracking of head or body positions* and using this kind of information in various feedback devices and 'machines' marks a turning point in the interfaces of immersive media. The former "interfaceless" media could only work with visual immersive strategies, where the body, if at all, could only be used for a change of view. When interfaces with feedback or input from the user side were developed – no matter how basic in terms of technology and not necessarily digital – image spaces started to become not only passive output, but responsive to the viewer, immersive strategies leapt to a next level, and last but not least, the body returned.

Myron Krueger was the first artist to shift emphasis from optical illusions to full body interaction in his *Responsive Environments*:

> It is the composition of these relationships between action and response that is important. The beauty of the visual and aural response is secondary. Response is the medium![29]

Starting in the late 1960s, Krueger developed numerous artistic projects such as *Videoplace*, where projectors, video cameras, and onscreen silhouettes were used to place users – respectively their images – within a surrounding environment that responded to their movements and actions. Audience members could playfully interact with the computer or each other, for example by finger

27 Erkki Huhtamo, "Armchair Traveller on the Ford of Jordan. The Home, the Stereoscope and the Virtual Voyager."

28 Ivan E. Sutherland, "A Head-Mounted Three Dimensional Display," *Proceedings of the Fall Joint Computer Conference*, 1968, 757-764.

29 Myron W. Krueger, "Responsive Environments," in *AFIPS 46 National Computer Conference Proceedings* (N.J. AFIPS Press: 1977). Reprinted in: Noah Wardrip-Fruin, and Nick Montfort, ed., *The New Media Reader* (Cambridge, MA: MIT Press 2003), 385.

painting or touching each other's silhouettes, and see the response on huge screens.[30]

User interaction with Videoplace, © Myron W. Krueger

It is because of this motion tracking in his *Responsive Environments* that Myron Krueger has been called the 'father' of artificial reality,[31] although his earliest installations did not even use computers.

Also in the field of digital technology, from the manipulation of viewpoints in Head Mounted Displays, the idea of changing the positions by movements of viewers was not far away. And with manipulating body positions, the motif of traveling through artificial space returned as an immersive practice. The starting point for the idea of surrogate traveling within computer science was a student project of Peter Clay at the Massachusets Intstitute of Technology (MIT), who suggested 'mapping' the floors of MIT and videotaped his paths with the help of Bob Mohl und Michael Naimark.[32] As Michael Naimark states,

> Peter and Bob made a simple computer program that allowed control of speed and direction moving up and down the hallways. Voila! 'Virtual travel'.[33]

By following the principle of movie mapping – that is "the process of rigorously filming path and turn sequences to simulate interactive travel and to use as a spatial interface for a multimedia database"[34] – the team of Andy Lippman from the MIT Architecture Machine Group created a simulated ride through Aspen in Colorado and called it the "Aspen Movie Map".

Earlier examples of the cultural topos of surrogate traveling rose with motion pictures, for example, in the rollercoaster-scene of *Cinerama*'s first show or in Heilig's *Sensorama* rides. Instead of being passively moved through an environment like in these surrogate travels, the Aspen Movie Map of 1978 was the first travel application to enable *active control* of the ride by providing an interface for navigation, for example via arrows for changes in direction or by choosing a destination or a path in the map. By

30 A detailed description of Videoplace with images can be found at the online Ars Electronica Archive at http://www.aec.at/en/archives/prix_archive/prix_projekt.asp?iProjectID=2473

31 Myron W. Krueger, Artificial Reality (Reading: MA Addison-Wesley, 1983)

32 Peter E. Clay, *Surrogate Travel via Optical Videodisc,* (Boston, MA: MIT 1978).

33 Michael Naimark, "Aspen the Verb: Musings on Heritage and Virtuality," *Presence, Special Issue on Virtual Heritage* 15, no. 3 (2006), 331.

34 Ibid. 330.

using a spatial interface, the virtual environment was made accessible through locomotion – if not by physical movements, at least by a sensory illusion of movement.

In the following years, a broad variety of interfaces with input devices for locomotion was developed, both in computer science and in artistic contexts, such as the Legible City by Jeffrey Shaw that could be explored on a bicycle.[35]

All of them used body movements as a means to actively explore virtual environments and to increase the sense of immersion and 'being there'. Besides locomotion devices, researchers also explored interfaces for the manipulation of objects. The first input device for the manipulation of virtual objects by hand was the Sayre Glove of 1977.[36]

The VPL DataGlove of Thomas Zimmermann and Jaron Lanier[37] was the first commercially used device that used the hand for glove-based input and integrated an image of the hand into the virtual environment. So technically speaking, in recent virtual environments, we usually have a

Aspen Movie Map, © MIT Architecture Machine Group

35 A detailed description of Legible City with images and a video can be found at Medien Kunst Netz at http://www.medienkunstnetz.de/werke/the-legible-city/

36 Tom A. Defanti and Daniel J. Sandin. "Final Report to the National Endowment of the Arts." *Technical Report US NEA R60-34-163* (Chicago: University of Illinois at Chicago Circle, 1977).

37 Thomas G. Zimmermann, Jaron Lanier, Chuck Blanchard, Steve Bryson, and Young Harvill, "A Hand Gesture Interface Device," *Proceedings Human Factors in Computer Systems and Graphics Interface*, 1987, 189-192.

"goggles and gloves"[38] interface constellation to enable input and output between digital image spaces and viewers.

Nowadays, 3D images can be seen with a conventional computer monitor for monocular cues only, or using a monitor in stereo mode with stereo glasses and head tracker like with a so called Fishtank Virtual Reality System.[39] The main principle of stereoscopy with up-to-date stereo glasses is, still, to separate one image into two pictures, one for each eye. But today we have a variety of glasses for 3D image effects: Passive stereo glasses use either polarization or spectral filters. While spectral displays present overlaid images in different colors and use corresponding glasses with red/blue, red/green, or red/cyan films, polarized glasses create the illusion of three-dimensional images by restricting the light that reaches each eye. To present a stereoscopic motion picture, two images are projected superimposed onto the same screen through orthogonal polarizing filters. In contrast to such passive glasses, active shutter glasses are synchronized to open and close their shutters very fast so that the two images are perceived as one.[40] Most interface output systems use additional glasses, for example, the CAVE (Cruz-Neira 1993),[41] a system that works like a digital panorama with input devices. Furthermore, we have hemispheric displays and of course, advanced head mounted displays like the Oculus Rift now with included earphones (Oculus VR 2015). So far, there are not so many differences in technological settings – surrounding walls are computer screens now, but still circular, cubic, or curved to fill out the user's field of view. Glasses are much more advanced compared to the Holmes Card Viewer, but work on the same principles. Nevertheless, some considerable changes have taken place in the interfaces of media spaces and in the strategies of inducing immersion.

Evidently, recent immersive media such as virtual environments draw on regimes of viewing and on visual strategies of immersion in artificial space. And in doing so, they can be connected to immersive cultural practices within the evolution of media realities. What distinguishes today's virtual environments from their ancestors, is that the concept of immersion in artificial space has been expanded from *calm aesthetic contemplation* and mere *optical illusions* for a passive observer, to a means of *participation* and *interaction* for the active user, where participation is enabled by interface with *position tracking* and various new *input devices*. Hence, a Virtual Environment is defined as

38 Jaron Lanier, "Beyond Goggles and Gloves," *Byte 22*, no. 9 (1997): 32-42.

39 The name fish tank VR system derives from the fact that you look at the virtual space from the outside like into a fish tank.

40 For details on 3D input and output devices see hardware technologies as explained in Doug A. Bowman, Ernst Kruijf, Joseph J. LaViola, Jr. and Ivan Poupyrev, *3D User Interfaces: Theory and Practice* (Boston: Addison-Wesley, 2005), 27-133.

41 Carolina Cruz-Neira et al., "Surround-Screen Projection-Based Virtual Reality: The Design and Implementation of the CAVE."

> A synthetic, spatial (usually 3D) world seen from a first-person point of view. The view in a Virtual Environment is under the real-time control of the user.[42]

As has been shown by empirical research, it is exactly that real-time control and the possibility to participate that leads to much higher ratings on perceived immersion and presence or "being there" than solely advanced 3D images.[43] But not any kind of control, participation, or interaction works equally well as an immersive interface strategy. I have argued that besides perceptive illusions and viewpoint control, the central strategy of spatial media consists of *addressing the body*. Accordingly, the main interaction technique with interfaces of immersive media is to make the virtual environment accessible for the user through movement in space. But this immersive media practice, which again relates to the much older topos of exploring artificial space by traveling, is no longer characterized as being moved around passively in rides. Instead, recent interfaces enable users to actively navigate, explore, and manipulate the environment, using special input devices for locomotion such as treadmills, bicycles etc., as well as all kinds of steering devices fitting for the presented environment, and input devices for object manipulation like special touch controllers, 3D mice, or data gloves. Right now, the most advanced devices in the high-tech sector are so called *force feedback devices* that couple input with immediate haptic or tactile feedback. Instead of trying to induce immersion by presenting ever more realistic image spaces, interfaces of immersive media have to address the body by enabling kinesthetic action. Or as Myron Krueger points out in an interview:

> Whereas the HMD folks thought that 3D scenery was the essence of reality, I felt that the degree of physical involvement was the measure of immersion.[44]

42 Doug A. Bowman et al., *3D User Interfaces: Theory and Practice*, 7.

43 Bob G. Witmer and Michael J. Singer, "Measuring Presence in Virtual Environments: A Presence Questionnaire" *Presence: Teleoperators and Virtual Environments 7*, no. 3 (1998): 225-240.

44 Jeremy Turner, "Myron Krueger Live. Interview by Jeremy Turner," *CTheory a104* (2002).

REFERENCES

Altick, Richard Daniel. *The Shows of London*. Cambridge, MA: Harvard University Press, 1978.

Bolter, Jay David, and Richard Grusin. *Remediation: Understanding New Media.* Cambridge, MA: MIT Press, 1999.

Bowman, Doug A., Ernst Kruijf, Joseph J. LaViola, Jr., and Ivan Poupyrev. *3D User Interfaces: Theory and Practice*. Boston: Addison-Wesley, 2005.

Clay, Peter E.. *Surrogate Travel via Optical Videodisc.* Thesis Urb. Stud B.S., Boston, MA: MIT, 1978.

Crowther, Bosley. "New Movie Projection System Shown Here; Giant Wide Angle Screen Utilized." *New York Times*, October 1, 1952. http://www.nytimes.com/movie/review?res=9E0DE6DF1E3CE23BBC4953DFB6678389649EDE

Cruz-Neira, C., Daniel J. Sandin, and Thomas A. DeFanti. "Surround-Screen Projection-Based Virtual Reality: The Design and Implementation of the CAVE." In: *Proceedings of SIGGRAPH ´93*, 135-142. ACM, 1993.

Defanti, Tom A., and Daniel J. Sandin. "Final Report to the National Endowment of the Arts." In: *Technical Report US NEA R60-34-163*, Chicago: University of Illinois at Chicago Circle, 1977.

Fisher, Scott S. "Virtual Environments: Personal Simulations & Telepresence." In: *Virtual Reality: Theory, Practice and Promise*, edited by S. Helsel and J. Roth. Westport: Meckler Publishing, 1991. http://www.itofisher.com/PEOPLE/sfisher/VirtualSimPresence-pdfrev.pdf.

Grau, Oliver. *Virtual Art. From Illusion to Immersion*. Cambridge, MA: MIT Press, 2003.

Grau, Oliver. "Immersion and Interaction. From circular frescoes to interactive image spaces." In: *MediaArtNet - 1: Survey of Media Art*. Joint project of ZKM and Goethe Institute, edited by Dieter Daniels, and Rudolf Frieling, 268-291 (German version), 292-313 (English version). Wien: Springer-Verlag, 2004.

Heilig, Morton L. Stereoscopic-Television Apparatus for Individual Use. U.S. Patent No. 2,955,156, October 4, 1960.

Heilig, Morton L. "El Cine del Futuro: The Cinema of the Future." In: *Presence 1*, no. 3 (1992): 279–294, reprinted from Espacios (1955): 23–24.

Huhtamo, Erkki. "Armchair Traveller on the Ford of Jordan. The Home, the Stereoscope and the Virtual Voyager." In: *Mediamatic Magazine 8*, no. 2,3 (1995), https://www.mediamatic.net/en/page/8934/armchair-traveller-on-the-ford-of-jordan.

Krueger, Myron W. "Responsive Environments." In: *AFIPS 46 National Computer Conference Proceedings*, 423-433. Montvale: N.J. AFIPS Press, 1977. Reprinted in: Wardrip-Fruin, Noah, and Nick Montfort, ed. The New Media Reader (Cambridge, MA: MIT Press 2003), 379-389.

Krueger, Myron W. *Artificial Reality*. Redding: Addison-Wesley, 1983.

Lanier, Jaron. "Beyond Goggles and Gloves." In: *Byte 22*, no. 9 (1997): 32-42.

Lambourne, Lionel. *Victorian Painting*. London: Phaidon Press, 1999.

Laurel, Brenda, and S. Joy Mountford. "Introduction." In: *The Art of Human-Computer Interface Design*, edited by Brenda Laurel, xi-xvi. Reading: MA Addison-Wesley, 1999.

Licklider, Joseph Carl Robnett. "The Computer as a Communication Device." In: *Science and Technology 76* (April, 1968): 21-31. http://memex.org/licklider.pdf.

Manovich, Lev. "An Archeology of a Computer Screen." In: *Die Zukunft des Körpers I. Kunstforum International* 132 (November 1995 - January 1996): 124- 135.

Naimark, Michael. "Aspen the Verb: Musings on Heritage and Virtuality." In: *Presence, Special Issue on Virtual Heritage* 15, no. 3 (2006): 330-335. http://www.naimark.net/writing/aspen.html.

Oculus VR LLC. "Oculus Rift". Accessed August 2017. https://www.oculus.com/rift/

Sutherland, Ivan E. "The Ultimate Display." In: *Proceedings of IFIP Congress,* 506-508. 1965. http://www.cs.utah.edu/classes/cs6360/Readings/UltimateDisplay.pdf.

Sutherland, Ivan E. "A Head-Mounted Three Dimensional Display." In: *Proceedings of the Fall Joint Computer Conference*, AFIPS Conference Proceedings 33. 757-764. ACM, 1968.

Turner, Jeremy. "Myron Krueger Live. Interview by Jeremy Turner." In: *CTheory a104* (2002). http://www.ctheory.net/articles.aspx?id=328.

Walker, John. "Through the Looking Glass." In: *The Art of Human-Computer Interface Design*, edited by Brenda Laurel, 439-447. Redding, MA: Addison-Wesley, 1999.

Wallach, Hans and D.N. O'Connell. "The kinetic depth effect." In: *Journal of Experimental Psychology* 45 (1953): 205-217.

Witmer, Bob G., and Michael J. Singer. "Measuring Presence in Virtual Environments: A Presence Questionnaire" In: *Presence: Teleoperators and Virtual Environments 7*, no. 3 (1998): 225-240.

Woletz, Julie. *Human-Computer Interaction. Kulturanthropologische Perspektiven auf Interfaces*. Darmstadt: Büchner, 2016.

Zimmermann, Thomas, G., Jaron Lanier, Chuck Blanchard, Steve Bryson, and Young Harvill. "A Hand Gesture Interface Device." In: *Proceedings Human Factors in Computer Systems and Graphics Interface*, 189-192. ACM, 1987.

1970: AUTOMOBILE AND INFORMATION: THE SELF, THE AUTOMOBILE AND TECHNOLOGY

By Max Bense

Translated by Joel Scott
With kind permission by Elisabeth Walther-Bense

Suggested citation: Bense, Max (2018 [1970]). "The Self, the Automobile and Technology." In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44745

"[…] it is almost as if a new kind of existence had occured: the consciousness-like machine, the self-like automobile, a perfect human-machine team, an existential partnership between disturbances and fears, between mechanical actions and human reactions, between signals and impulses, noises and decisions."

Max Bense's 1970 essay "Auto und Information. Das Ich, das Auto und die Technik", which title is here translated as "Automobile and information. The Self, the Automobile and Technology", deals with a man-machine interaction common to most members of industrialised societies. Bense describes a relation between two entities as an interdependent one: man becoming a driver in the function of the machine, the machine becoming auto-mobile as a function of its driver. Bense emphatically outlines a techno-ontological relation which offers the man-machine interface paradigm in a nutshell – "the consciousness-like machine, the self-like automobile, a complete human-machine team". The essay was first published in the Swiss journal DU, vol. 30, in October 1970 and has been rereleased in the collected papers: Max Bense, Ausgewählte Schriften, vol. 4: Poetische Texte, ed. by Elisabeth Walther-Bense (Stuttgart and Weimar: Metzler, 1998). The English version published here has been translated from the German by Joel Scott. We would like to dedicate it to Max Bense's wife and intellectual collaborator Elisabeth Walther-Bense who kindly granted us permission to translate and republish this wonderful analytical artefact that emphasizes a non-trivial relation between man and machine. Elisabeth Walther-Bense passed away on January 10, 2018 in Stuttgart at the age of 95 years.

Daniel Irrgang

A self is not something that one has, but that one is. However one has an automobile and is not it, and hence the automobile has a self but is not one, and a self has an automobile but is not itself a car. This is a text about the difference between having and being, and this difference between having and being is also the difference between the car that drives and the self that drives it, but since that which drives can be both the car and the self, that which drives sublates the difference between self and car, and with this, the text about having and being, or car and self, becomes a text about driving, in which the car becomes the self, and the self the car.

A car is only a classical machine insofar as it produces energy and performs a task, like all classical machines. But it is also a 'transclassical machine' insofar as it processes data and produces communication, like all transclassical machines. As such, it necessarily belongs to the modern, advanced class of machines of data processing engines. The self that it has provides it with the data that it processes. The processing consists in the translation of the data provided by the self into the movements that the car delivers. Because it drives, the car is afforded the status of a place, a line, a kind of margin where the world and consciousness are continually clashing; we could also say: where being and thought clash. This is a motif from Hegelian metaphysics, and thus the car, or more precisely, its essential condition – namely movement – achieves the attractiveness of a metaphysical vehicle. Unintentionally, this makes the text about the difference between the self and the car into a technical text, and the technical text into a metaphysical one.

The car does not only move the self, it also moves the reflection of the self; that silent contour of thought relative to the noisy contour of driving. Undoubtedly, at the outset the silent contour of reflection precisely follows the noisy contour of driving; the self diligently follows the car; the thinking being is entirely fixated on the driving being. Only later, when the self has gradually adapted to the automobile, is the information provided which the car requires in order to be able to convert it into motion – automatically, without a thought, during the tender conversation with the girlfriend in the passenger seat about the flight to Madeira – suddenly everything seems to happen on its own. It becomes utterly evident that consciousness is in principal without place, does not constitute a substance, but rather a function, as old William James once put it. In that the thinking being becomes accustomed to the driving being, self and car melding increasingly into an almost surreal automaton – however with each also remaining separate and always continuing to signify independent entities to us, namely a driving being and a thinking being – it is almost as if a new kind of existence had occured: the consciousness-like machine, the self-like automobile, a perfect human-machine team, an existential partnership between disturbances and fears, between mechanical actions and human reactions, between signals and impulses, noises and decisions.

If one proceeds with this reflection, especially at increasing velocity, one quickly discovers that this double being of a driving self and acting car also possesses its difficulties between existential desire and worldly reason. The categorical imperative of moral action is continually endangered by the intimate experience of aesthetic desire. But since the sense of the world of this mechanical being can only be an artistic one, and all such artistry consists in the production of a total equilibrium between security and precision (security for the self and precision for the car), this very artistic sense of the world launches the double being of the car-self through the conflict between sensuous action and empirical desire. But if the moment of maximum velocity which realises the complete balance between precision and security has arrived, this difficult reflection must undoubtedly be abandoned. So let us abandon it.

Slowing down, the self discovers that it is simultaneously sitting and driving. However the driving being has irreparably damaged (if not demolished) the sense of settledness in the thinking being. Primarily through the car, the human being has taken on a tourist-like existence, and the principle of tourism has become a principle of existence. The placelessness of consciousness that is confirmed in the automobile also confirms the alterability of place for the body. Automobiles inhabit the cities as people do, and when people leave the cities, so do the automobiles. Through the car, the city has ceased to be a clear principle of settledness. The automobile-self demands the automobile-city and the automobile-street. Only here can human beings be in principle the stronger being, while in nature they will presumably always be the weaker being.

It is almost impossible to calculate just how many findings and innovations, how much scientific data, how many decisions about truthfulness and falsity were necessary to create the automobile, which therefore constitutes an immense reservoir of human knowledge, humanity's capacity for creativity. If we consult Leibniz on the differentiation between human creativity and its divine counterpart, then "the all-powerful word Fiat" (as Leibniz formulated it) sufficed for divine creativity to create the world; while for human creativity, the creation of the automobile required a long chain of pleasure and pain, experiences and disappointments, decisions about the truthfulness and falsity of findings. But it is precisely the intelligence stored within it which makes the automobile into an being which is receptive of human intelligence.

The image is taken from the user manual of a Citroën GSA, which came on the market around the same time as the essay was written and which was famous for its elaborated cockpit control elements (the image has been selected by the editors and is not part of the original publication).

PHILOSOPHIES

APPLIED METAPHYSICS – OBJECTS IN OBJECT-ORIENTED ONTOLOGY AND OBJECT-ORIENTED PROGRAMMING

By Gabriel Yoran

"As computer science works on domain-specific models in order to find solutions to practical problems, employing models of the world, informatics is – like any proper science – applied metaphysics."

Suggested citation: Yoran, Gabriel (2018). "Objects in Object-Oriented Ontology and Object-Oriented Programming." In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44744

ONTOLOGY AFTER INFORMATICS

"What can I know? What must I do? What may I hope for? What is man?"[1] The four Kantian questions, as universal as they seem, pivot around the I. All knowledge gained is knowledge only in the cognitive relation between acts of consciousness and an outside world, which is deemed more or less inaccessible. Every ethical demand is demanded of an I. Every hope experienced is experienced by an I. Kant holds that answering these three questions will inevitably lead to an answer of the fourth: What is man? And it is again an I who questions what it is. The Western world lives in the Kantian horizon. It pivots around the I.

Speculative realists set out to change that. While not representing a unified theory, this line of thought encompasses different non-anthropocentric positions striving to, in Ray Brassier's words, "re-interrogate or to open up a whole set of philosophical problems that were taken to have been definitively settled by Kant, certainly, at least, by those working within the continental tradition."[2] As overcoming the human as the epistemic center of the cosmos necessarily leads to both a speculative stance and a more or less realist position, speculative realism is a feasible term. In accordance with the tradition in which Kant named metaphysics "a wholly isolated speculative cognition of reason,"[3] speculative realism merely makes the nature of its task obvious by naming it accordingly.

The variant of speculative realism which will be looked into here, is object-oriented philosophy (more often referred to as object-oriented ontology and thus abbreviated OOO), a theory by contemporary American philosopher Graham Harman, who also coined the term. Even though OOO is subsumed under the speculative realism movement, Harman claims to be "the only realist in speculative realism."[4]

OOO, even though this is most likely unintended, is a substance ontology developed under the impression of informatics. It "might be termed the first computational medium-based philosophy, even if it is not fully reflexive of its own historical context in its self-understanding of the computation milieu in which it resides."[5] As "perhaps the first Internet or born-digital philosophy has certain overdetermined characteristics that reflect the medium within which [it has] emerged."[6] Such notions usually refer to the leading figures of speculative realism using blogs and social media to distribute their thoughts

1 Immanuel Kant, *Critique of Pure Reason*, ed. Paul Guyer and Allen W. Wood, The Cambridge Edition of the Works of Immanuel Kant (Cambridge: Cambridge University Press, 1998), A805/B833.
2 Ray Brassier, Iain Hamilton Grant, Graham Harman, and Quentin Meillassoux, "Speculative Realism," in *Collapse*, ed. Robin Mackay, vol. III (Oxford: Urbanomic, 2007), 308.
3 Kant, CPR, B xiv.
4 Graham Harman, personal communication with the author, March 12, 2017.
5 David M. Berry, Critical Theory and the Digital, *Critical Theory and Contemporary Society* (New York: Bloomsbury, 2014), 103.
6 Ibid., 104.

quickly and engage in lively discussions with the academic community online. OOO however has a deeper relation to the computational sphere: while Harman first publicly mentioned the term object-oriented philosophy in 1999,[7] object-oriented programming was already invented in the late 1960s – and the parallels between these two domains are noteworthy.

Working at the Norwegian Computing Center in Oslo, Ole-Johan Dahl und Kristen Nygaard in the 1960s conceived a new way of computer programming, in which what was separate before, namely data and functions, were molded into combined and somehow sealed logical units. Dahl and Nygaard named these units "objects" and the programming language they developed, Simula 67, is regarded the first to allow for software development following the paradigm of object-oriented programming (OOP).[8]

OOP has been in use for nearly five decades now and while it is still a popular way of structuring software development projects large and small today, its critics have become more vocal. OOP's unnecessary complexity is just one of the issues computer language designers bring up: "The problem with object-oriented languages is they've got all this implicit environment that they carry around with them. You wanted a banana but what you got was a gorilla holding the banana and the entire jungle."[9] Regardless of OOP coming under fire lately, the striking parallels between the aesthetic and technological praxis of object-oriented programming on the one side and a new metaphysics on the other side, promise a fruitful contribution to the ontographic project.

As a science investigating "the structure and properties (not specific content) of scientific information, as well as the regularities of scientific information activity, its theory, history, methodology and organization," informatics was defined in the 1960s.[10] Since then the task of informatics has been extended beyond the analysis of scientific information and deepened by performing this task using the means of computing. Thus, informatics today has become the science that investigates the structure and properties of information. The similarities between object-oriented programming and object-oriented ontology do not come as a surprise, given that informatics is traditionally occupied with metaphysics: both computer science and philosophy "do not address the materiality of things such as physics, they are not confined to the 'science of quantity' (= mathematics)."[11] Since computer science strives to map reality onto computational structures,

7 Graham Harman, *Bells and Whistles: More Speculative Realism* (Winchester: Zero Books, 2013), 6.

8 Bjarne Stroustrup in: Federico Biancuzzi and Shane Warden, eds., *Masterminds of Programming* (Sebastopol, CA: O'Reilly, 2009), 10.

9 Joe Armstrong, *Coders at Work: Reflections on the Craft of Programming*, ed. Peter Seibel (New York: Apress, 2009), 213.

10 A.I. Mikhailov, A.I. Chernyl, and R.S. Gilyarevskii, "Informatika – Novoe Nazvanie Teorii Naučnoj Informacii," *Naučno Tehničeskaja Informacija*, no. 12 (1966): 35–39.

11 Alessandro Bellini, "Is Metaphysics Relevant to Computer Science?," *Mathema* (June 30, 2012), http://www.mathema.com/philosophy/metafisica/is-metaphysics-relevant-to-computer-science/.

employing substance ontologies seems obvious. As computer science works on domain-specific models in order to find solutions to practical problems, employing models of the world, informatics is – like any proper science – applied metaphysics.

PARALLELS

> Computational metaphors share a lot of similarity in object-oriented software to the principles expressed by [ooo's] speculations about objects as objects.[12]

There are astonishing parallels between object-oriented ontology and object-oriented programming, even though the former only borrowed the name from the latter.[13]

When object-oriented programming was invented, the dominant approach to computer programming was imperative or procedural. Imperative programming means conveying computational statements that directly alter the state of the program. A program designed in this way roughly works by linearly processing a list of functions step by step. When these statements are grouped into semantic units, "procedures," one can speak of procedural programming. Procedures are used to group commands in a computer program in order to make large programs more easily maintainable. Groups of statements also make code reusable, since the same set of statements can be invoked again and again. It also makes code more flexible, since parameters can be handed to a procedure for it to process. Parameters can be thought of as values handed to functions (the x in f(x)). While the function follows the same logics, the operation's result depends on the parameters passed.

These improvements however were not sufficient to handle complex computational tasks like weather forecasts. Tasks like this require simulations. And even though Alan Shapiro mockingly notes that "the commercialized culture of the USA is substantially not a real world anymore: it is already a simulation. Object-oriented programming is a simulation of the simulation,"[14] the necessity of simulating weather systems or financial markets called for more sophisticated strategies to structure computer programs. Instead of grouping lists of statements into procedures and have these statements directly manipulate a program's state, object-oriented programming offers a vicarious approach. Computational statements and data are being bundled together in objects. These objects are being closed off to the rest of the program and can only be accessed indirectly by means of defined interfaces. Under this new programming paradigm computer programmers became object designers – they were forced to

12 Berry, Critical Theory and the Digital, 205.

13 Graham Harman, personal communication with the author, August 18, 2013.

14 Alan Shapiro, *Die Software der Zukunft oder: das Modell geht der Realität voraus*, International Flusser Lectures (Cologne: König, 2014), 7; translation by the author.

come up with an object-oriented ontology for the world they wanted to map into the computer's memory.

The invention of object-orientation made object-oriented computer languages a necessity. The available computer languages did not possess the grammar necessary to describe objects and their relations. It becomes clear that "computer language" or "programming language" are misleading terms. These languages are products of human invention. They are human-designed, human-understandable languages, which computers can process in order to fulfill certain tasks. Designing a programming language is an attempt at producing the toolset for future developers to solve as yet unanticipated problems, sometimes in ways that were previously inconceivable. Object-oriented ontologies in informatics are pragmatic and open, they are realist in a sense of being a useful system of denotators of things outside the computer (or the programming language). They aim for reusable program code, which only needs to be written once, so problems do not need to be solved twice and errors do not have to be fixed in multiple places. Thus, the programming language designer's task is meta-pragmatic: designing a language as a tool for others to build tools to eventually fulfill certain tasks. Object-orientation discards lists of statements in favor of objects as the locus of, to use a Simondonian term, "problem solving." Simondon's notion of the individual describes objects as "agents of compatibilisation," solving problems between different "orders of magnitude."[15] With this notion Simondon seems to have anticipated the object in object-oriented programming; or at the very least, the actual implementation of objects in OOP prove to be in line with the traits of the individual Simondon described.

Object-oriented programming became so widely adopted partly because it is close to the everyday experience of objects. It also makes strong use of hierarchies, another everyday concept. Objects may remain identifiable and stable from the outside, even when their interior changes dramatically. The "open/closed principle" is evidence of this: a component, not necessarily an object, needs to be open for future enhancement, but closed with regards to its already exposed interfaces. This "being closed" ensures that other components depending on the component can rely on the component's functionality displayed earlier – unexpected changes in behavior need to be prevented.[16] Being closed can be read as unity, as a certain stability of an object that makes it identifiable. Object-oriented programming however reaches some of this stability by interweaving objects into a hierarchy, an idea that object-oriented ontology rejects.

In both object-oriented programming and object-oriented ontology objects are the dominant structural ele-

15 Gilbert Simondon, "The Genesis of the Individual," in *Incorporations*, ed. Jonathan Crary and Sanford Kwinter (New York: Zone, 1992), 301.

16 Bertrand Meyer, *Object-Oriented Software Construction*, Prentice-Hall International Series in Computer Science (New York: Prentice-Hall, 1988), 23.

ments. In object-oriented programming, objects are supposed to be modeled after real-life objects as the aim is to provide a sufficiently precise representation of the reality to be simulated. In practice this undertaking often fails. Objects are being created in code for things that do not exist outside the program. Functionality is forced into object form even when the result is awkward and unsatisfying. As a result, alternative programming paradigms are getting more interest lately and new programming languages like Apple's Swift are designed undogmatically, mixing different paradigms with the goal to always deliver the solution that's least error-prone for the use-case. But this should not be of any concern as we are focusing on the multitude of traits that OOP and OOO share:

1. Objects are both systems' basic building blocks.
2. Objects can be anything from very simple to extremely complex.
3. Objects have an inner life, which is not fully exposed to the outside.
4. Objects interact with other objects indirectly and do not exhaust other objects completely.
5. Objects can destroy other objects.
6. Results of interactions between objects may or may not be predictable from outside an object.
7. Objects can contain objects.
8. Objects can change over time, but at the same time stay the same object in the sense of an identifiable entity.
9. No two objects are the same.

OBJECTS AS UNPREDICTABLE BUNDLES

The first programming language regarded as object-oriented was Simula 67, invented in the 1960s by Ole-Johan Dahl und Kristen Nygaard at the Norwegian Computing Center in Oslo. Simula 67 was designed as a formal language to describe systems with the goal of simulation (thus the name Simula, a composite of simulation and language). Simula already incorporated most major concepts of object-orientation. Most importantly, Dahl's and Nygaard's object definition still holds today: objects in object-oriented programming are bundles of properties (data) and code (behavior, logics, functions, methods). These objects expose a defined set of interfaces, which does not reveal the totality of the object's capabilities and controls the flow of information in and out of the object. These two specifics are subsumed under the "encapsulation" moniker.[17]

Objects in programming are another variant of "the ancient problem of the one and the many":[18] they exist as abstract definitions, called

17 Biancuzzi and Warden, *Masterminds of Programming*, 350.

18 Graham Harman, *The Quadruple Object* (Winchester: Zero Books, 2011), 69.

"classes" or "object types," and as actual entities, called "objects" or "instances." So, while a class is the Platonic description of an abstract object's properties and behavior, instances are the actual realization of such classes in a computer's memory.[19] There can be more than one instance of any class, and it is possible and common for multiple instances of the same class to communicate with each other.

Let us look at a concrete example of the difference between procedural and object-oriented programming. In procedural programming, a typical function would be y=f(x), where f is the function performed on x and the function's result would be stored (returned) in the variable y. In object-orientation however, an object x would be introduced, which would contain a method f. An interface would be defined that would allow for other objects to call f, using a specified pattern. And so, by invoking f, the member function being part of object x – or x.f() for short – the object, containing both data and functionality, stays within itself. In our case, there is no return value, so no y to save the results of function f to. This is not necessary as the object itself holds all the data it operates on.

Object-oriented programming has been criticized for the fact that the behavior of object methods (functions inside objects) is unpredictable when viewed from a strictly mathematical perspective. A mathematical function y=f(x) is supposed only to work on x and return the result in y. An object method however can also modify other variables inside its object and thus lead to unpredictable results. A function is supposed to return its result – an object method however modifies its object, but does not necessarily return a copy of (or a pointer to) the whole modified object. When manipulating an object through one of its member functions, it is not known from the outside which effects this manipulation will have on the object internally. This means the object's behavior following such a method call is not predictable from outside of the object. While software developers generally try to prevent unpredictability, the object-oriented philosopher will hardly be surprised: it is a key characteristic of OOO that objects can behave in unpredictable ways and that their interiority is sealed off from any direct access:

> I think the biggest problem typically with object-oriented programming is that people do their object-oriented programming in a very imperative manner where objects encapsulate mutable state and you call methods or send messages to objects that cause them to modify themselves unbeknownst to other people that are referencing these objects. Now you end up with side effects that surprise you that you can't analyze.[20]

19 Vlad Tarko, "The Metaphysics of Object Oriented Programming," May 28, 2006, http://news.softpedia.com/news/The-Metaphysics-of-Object-Oriented-Programming-24906.shtml.

20 Biancuzzi and Warden, *Masterminds of Programming*, 315.

While in object-orientation data and operations performed on it need to be bundled into one object, the competing paradigm of functional programming means that operations and data are separated. In the functional programming language Haskell for example, functions can only return values, but cannot change the state of a program (as is the case in object-orientation).

THE PLATONIC CLASS

While objects may have complex inner workings (code as well as data), they usually do not share all this information with other objects. An object exposes certain well-defined interfaces through which communication is possible. In line with object-orientation's original application, we want to discuss the key concepts of OOP using a simulation program. We will imagine a program simulating gravitational effects in our solar system. Such a program, if designed in an object-oriented way, would most definitely contain an object type – or Platonic "class" – representing a planet. Such a class would contain variables to describe a planet's physical and chemical properties like its diameter, atmosphere, age, current average temperature, its position in relation to the solar system's sun, etc. It would also contain methods, which would be used to manipulate class data. A method to change the average temperature (to account for the case of a slowly dying sun for example) would need to be implemented as well. In a solar system simulation, there would be multiple instances – objects – of the planet class; in the case of our solar system one would create objects for Earth, Jupiter, Saturn etc.

The simulation would manipulate any planet's data by calling the object's respective method, for example the one to change the planet's average temperature on the surface. The actual variable holding the average temperature itself would not be exposed to the object's outside. So, any interaction with the object must be mediated through the interface methods provided by the object. All interactions with an object become structured by this intermediate layer and can be checked for faulty inputs. Instead of directly changing the temperature on a planet to a value below absolute zero (which would be possible if direct access was given), the intermediate data setting method provides its own logic, and thus limitations, to prevent such a "misuse" of the object.

But all planets are different and to take this into consideration in our simulation, we would need to set any instance's properties (data) accordingly. To do so, classes provide special "constructor" methods, which bring an instance of a class into existence. Constructors take parameters needed to initially construct an object and then create an instance accordingly. (To destroy objects, so-called "destructors" can be used as well.)

As mentioned, object-oriented programming differentiates between classes (object types) and objects (there is other terminology, but in this work, we will use these classic terms as defined in the C++ programming language). What makes this parallel interesting is that it is an interplay between a fixed structure and free-floating accidents that constitutes an object. This interplay is what OOO deems an object's essence. As not to stretch the analogies between OOO and OOP too far, this interplay takes place on the inside of an object in OOO, but in OOP it crosses borders between objects. But similar to the situation in OOO, objects can come into existence without actively enacting any reality. However, the object structure in OOP (which we would call the counterpart to OOO's real-object-pole) defines what an object can do. This is to be understood as a potential and not as an exhaustive description of the object's capabilities. In OOP, the instance of an object (what we have come to see as its real-qualities-pole) cannot be reduced to the object itself (the real-object-pole) – an object therefore is always more than its rigid structure. If the object has any interface to the outside, which is the case with most objects in OOP, there is still no way to know the results of all possible interactions with the object.

HIERARCHY AND INHERITANCE

Let us assume all planets in our solar system simulation have been sufficiently defined. We would still need an object representing the sun. The sun is not a planet, but a star, yet there are properties and probably methods both share, something all celestial bodies incorporate. Since its first incarnation in Simula 67, using the object-oriented programming paradigm is synonymous with organizing objects hierarchically in tree-like structures. Every object has at least one parent object (a superclass) and can have child objects (subclasses). An object then inherits all properties and methods of its superclass (or, in some cases, superclasses) and hands them and its own properties and methods down its subclasses, which can then add additional properties and methods. So, both classes representing planets and suns should be derived from a superclass representing any celestial body. This celestial body class would then handle properties and methods shared by all its subclasses. Only methods and data necessary for more specific celestial bodies like planets or stars would be defined in their respective subclasses. In OOP, a principle of reversed subsidiarity is at work: anything that can be handled at the highest, most abstract level is being handled there; only more specific tasks are being handled further down the object hierarchy.

OOP's terminology, talking of "parent classes," "child classes," and "inheritance," shows the hierarchical tradition in which OOP is rooted. Any object in the hierarchy "inherits" all traits from its parent object. Such a hierarchy has at its root an abstract object (CObject in Microsoft's MFC model), which only consists of abstract methods that make no statement about the specifics of this object at all. Such an object is rarely being used directly by software developers, but only through one of its more concrete subclasses. But not all objects are part of such a hierarchy, like for example the CTime object in the MFC model.[21] CTime is used to represent an absolute time value. Operations on such a value are very basic and needed in a multitude of methods, but it would be hard to logically position a time object somewhere in an all-encompassing hierarchical system. The question of what a representation of a specific time should be derived from is hard to answer. This concept is too basic to be inserted into a hierarchy. So, while CTime objects can be integrated into custom-made hierarchies, they themselves are not derived from any superclass: representations of time are solitary objects within the MFC model.

INTERFACE AND IMPLEMENTATION

Now that we have a small hierarchy of celestial bodies represented in our object-oriented program design, we still face the task of implementing the actual simulation algorithm. Discussing this algorithm itself is outside our scope. We are more interested in where such an algorithm would be placed in an object-oriented design. This touches a key question of any object-oriented system: where and how do processes take place? Do they happen within objects, between objects, or in both places? While Simondon stresses the notion of objects as being through becoming,[22] the concepts of both OOP and OOO define objects qua their relative stability.

In object-oriented ontology, real objects need sensual objects as a bridge between them, leading to a chain of objects. Sensual or real objects cannot touch each other directly. The sensual object acts as an interface between real objects – or the real object as the interface between sensual objects. In object-oriented programming, objects cannot touch directly as well: they are broken down in interface and implementation parts. The interface part acts as an – incomplete – directory of methods and variables made available to other objects. It never exposes everything on an object's inside to the outside. It can even announce methods, which at the time of such an announcement are not even fully defined. Only when these methods are being invoked, a real-time decision will be made in regard to which version of the method would be appropriate to use in the current situation. So, OOP's interface is on the one hand a sensual object since it serves as the interface to other objects while not exposing the whole enactability on reality of its real object – which would be the implementation. Methods can execute different code, depending on criteria inaccessible from the outside, allowing for a program to change during runtime without damaging the

21 Microsoft, "CTime Class," 2015, https://msdn.microsoft.com/en-us/library/78zb0ese.aspx.

22 Simondon, "The Genesis of the Individual."

object's identifiability. The implementation part on the other hand represents the real object in the totality of its enactability in the program.

As for the solar system simulation, in object-oriented programming the obvious implementation would be a superclass representing all the components of a solar system needed for its simulation on a celestial bodies' level. An instance of such a solar system class would then have to incorporate member classes for every celestial body in the solar system. But which object would be the one to describe the relations between all the data and methods of the solar system object? One could create methods in the solar system class that would contain the algorithm needed for the simulation, like modifying a planet's position in space depending on the position and movement of other celestial bodies as time progresses. But the intended way of handling such a simulation is a technique called message-passing.

Objects can send and receive messages. The concept of message-passing allows for messages to be sent to an object, which then decides how to handle the message. This way an object is able to handle requests dynamically, depending on the type of data sent to it. This illustrates how both sides in an object-to-object interaction are involved. This interaction is not a simple sender-receiver relationship, but a rich exchange in which both objects involved do not fully touch each other, but are selective with regards to which input to accept at all. An object representing a planet could send a message to other planet objects, informing them about its own location in space. These other planets then would change their position in space accordingly. This way one could create a very simple simulation of gravity, but none of the objects involved would have any access to other object properties not needed for the calculation of gravitational effects.

So, message-passing is not just a concept of inexhaustibility, it is also a concept of indirection. Objects do not exhaust each other, they do not even touch directly, but they communicate by messages, which can be seen as an implementation of the concept of sensual objects.

INEXHAUSTIBILITY OF PROGRAMS

Let us go back to the solar system simulation example one last time. We found that the object ontology offered by object-oriented programming languages is a lax one, since there can be objects outside the hierarchy.

The solar system object, the object which hosts our simulation, would need to be instantiated at some point, since it cannot create itself. There has to be code outside the solar system class. Of course, there might be another object, which again incorporates the solar system class (a superclass to the solar system) representing a galaxy. But the Milky Way is not useful for simulating the gravitational effects in our solar system, and this would just move the problem to another level. The object-oriented programming paradigm is an *abstraction* from the hardware the program will eventually be running on, since the central processing unit (CPU) does not "know" objects. The compiler or interpreter program must have done its task of translation to machine code before the CPU can run the program – and after this translation the object concept is lost to the CPU. These translator programs reduce object-orientation to a very basic sequence of memory operations, which the chip can process. This would only change if object-oriented hardware were being built, hardware that would render compilers or interpreters useless – but object-oriented chip designs like the Intel iAPX 432, which was introduced in 1981, eventually failed. They were slow and expensive and new technologies more suitable to the limitations of hardware prove more efficient – and so the idea of object-orientation in chips has only found very limited application.[23]

Programming languages came a long way in the last 60 years. They moved from a primitive set of commands in order to directly access a processor's memory to complex semantics, completely abstracted from the hardware its programs will run on. All high-level programming languages need an intermediary between statements made in such a language and the hardware programs are supposed to run on – these intermediaries are either compilers (programs that in a time-consuming way translate high-level programming languages to machine code the processor can work with) or interpreters (which basically fulfill the same task in real-time). In any case, there is a medium between the high-level language and the machine.[24]

While objects in object-oriented ontology are described as broken down in a real and a sensual part (what we superficially likened to the concepts of implementation and interface in programming), we need to understand that the whole relation of the statements made in a high-level programming language to the hardware the written program will run on is the relation of model and reality. The hardware of the chip forms the ultimate reality of the program, since the hardware defines the reality against the model put on top of it must work. The reality of the hardware again is its context, the wider environment of the machinery, its applications, and the people using it.

The limits of a program's enactability of its reality are in the hardware it runs on and the time available. A self-modifying program could enact an infinite amount of reality given there is enough time. So, the real object is inexhaustible by the relations it enters into with sensual objects. Programs running on a chip can never exhaust it. It is impossible to list all the programs that could be executed on the chip. It is not even possible to know in advance if all these programs will actually come to an end. Alan Turing described this phenomenon, which later became known as the

23 David R. Ditzel and David A. Patterson, "Retrospective on High-Level Language Computer Architecture"(ACM Press, 1980), 97-104, doi:10.1145/800053.801914.

24 A new generation of chips might end this separation. FPGAs are chips whose hardware can be modified by means of software, effectively blurring the line between software and hardware.

"halting problem": it is undecidable if an arbitrary computer program will eventually finish running or will continue running forever.[25] The halting problem extends inexhaustibility to the proof of inexhaustibility.

Object-oriented ontology aims at treating all objects equally – which rules out a central perpetrator. In object-oriented programming, it seems that there is no central perpetrator as well and objects act independently from a central instance. In reality, object-orientation today is a paradigm put on top of hardware, which is incapable of working without a central perpetrator. So, while the language in which the program is modeled, is object-oriented, it is important to understand that these objects are constructions in a language, which again tries to mimic things and relations in reality.

Objects act on behalf of themselves as long as one stays at the object's level of abstraction. On the chip's level these objects are nonexistent – the CPU only acts upon memory, where certain information is stored. The CPU and the operating system will make decisions without the objects "knowing," for example for dispatching: since programs today mostly run on computers with more than one central processing unit, it is necessary to distribute tasks (or object methods) to different CPUs.

The intuition of being surrounded by objects with a certain independence from each other is at the root of both models, OOP and OOO. But object-oriented ontology rejects the concept of a reducibility of objects to other objects: even though every object can be broken down to its parts (representing new objects): these objects do not exhaust the bigger object they form. There is nothing "below" objects in OOO. OOP however is a model, which is deliberately put on top of the more primitive and non-intuitive computational concept of memory.

This shows how object-oriented programming works only at a certain level of abstraction, thus constituting the major difference between object-oriented programming and object-oriented ontology: the earlier being a model applied pragmatically in one domain, the latter aiming for a complete metaphysics.

25 Alan M. Turing, "On Computable Numbers, with an Application to the Entscheidungsproblem," *Proceedings of the London Mathematical Society* s2-42, no. 1 (January 1, 1937): 230-65, doi:10.1112/plms/s2-42.1.230; Alan M. Turing, "On Computable Numbers, with an Application to the Entscheidungsproblem. A Correction," *Proceedings of the London Mathematical Society* s2-43, no. 6 (January 1, 1938): 544-46, doi:10.1112/plms/s2-43.6.544.

REFERENCES

Armstrong, Joe. Interview by Peter Seibel. In: *Coders at Work: Reflections on the Craft of Programming*, edited by Peter Seibel, 205-239. New York: Apress, 2009.

Bellini, Alessandro.“Is Metaphysics Relevant to Computer Science?”Mathema (June 30, 2012). http://www.mathema.com/philosophy/metafisica/is-metaphysics-relevant-to-computer-science/.

Berry, David M. *Critical Theory and the Digital. Critical Theory and Contemporary Society*. New York: Bloomsbury, 2014.

Biancuzzi, Federico, and Shane Warden, eds. *Masterminds of Programming*. Sebastopol, CA: O’Reilly, 2009.

Brassier, Ray, Iain Hamilton Grant, Graham Harman, and Quentin Meillassoux. “Speculative Realism.” In: *Collapse*, edited by Robin Mackay, III:306-449. Oxford: Urbanomic, 2007.

Ditzel, David R., and David A. Patterson. “Retrospective on High-Level Language Computer Architecture.”In: *Proceedings of the 7th annual symposium on Computer Architecture*, 97-104. ACM, 1980. doi:10.1145/800053.801914.

Harman, Graham. Bells and Whistles: *More Speculative Realism*. Winchester: Zero Books, 2013.

Harman, Graham. *The Quadruple Object*. Winchester: Zero Books, 2011.

Kant, Immanuel. *Critique of Pure Reason*. Edited by Paul Guyer and Allen W. Wood. The Cambridge Edition of the Works of Immanuel Kant. Cambridge: Cambridge University Press, 1998.

Meyer, Bertrand. *Object-Oriented Software Construction*. Prentice-Hall International Series in Computer Science. New York: Prentice-Hall, 1988.

Microsoft. “CTime Class,” 2015. https://msdn.microsoft.com/en-us/library/78zb0ese.aspx.

Mikhailov, A.I., A.I. Chernyl, and R.S. Gilyarevskii. “Informatika – Novoe Nazvanie Teorii Naučnoj Informacii.” In: *Naučno Tehničeskaja Informacija*, no. 12 (1966): 35-39.

Shapiro, Alan. *Die Software der Zukunft oder: das Modell geht der Realität voraus*. International Flusser Lectures. Cologne: König, 2014.

Simondon, Gilbert. “The Genesis of the Individual.” In: *Incorporations*, edited by Jonathan Crary and Sanford Kwinter, 297-319. New York: Zone, 1992.

Tarko, Vlad. “The Metaphysics of Object Oriented Programming.” *Softpedia News* (May 28, 2006). http://news.softpedia.com/news/The-Metaphysics-of-Object-Oriented-Programming-24906.shtml.

Turing, Alan M.“On Computable Numbers, with an Application to the Entscheidungsproblem.” In: *Proceedings of the London Mathematical Society* s2-42, no. 1 (January 1, 1937): 230-65. doi:10.1112/plms/s2-42.1.230.

Turing, Alan M. “On Computable Numbers, with an Application to the Entscheidungsproblem. A Correction.” In: *Proceedings of the London Mathematical Society* s2-43, no. 6 (January 1, 1938): 544–46. doi:10.1112/plms/s2-43.6.544.

THE CONCEPTUAL DEBTS AND ASSETS OF THE INTERFACE

By Konstanty Szydłowski

“There is a growing need to rethink the notion of interface within a broader conceptual perspective, but it is important to be wary of calling for an interface philosophy based on technological enthusiasm and, more particularly, on a variety of metaphors derived from technical terms or marketing jargon—one that often tries to impose itself on discussions about technically mediated communication.”

This article first appeared in: Hadler, Florian and Haupt, Joachim, eds.: *Interface Critique*. Berlin: Kulturverlag Kadmos, 2016, 39-45

Suggested citation: Szydłowski, Konstanty (2018 [2016]). “The Conceptual Debts and Assets of the Interface.” In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44742

The notion of interface is more of a conceptual challenge than it is any kind of self-explanatory keyword adequate for opening the door to an understanding of the contemporary techno reality. It is used and misused to describe virtually everything. This inquiry is a mere attempt at clarifying the philosophical debt owed by the notion as well as identifying its potential, in order to make sense of it and restrict its meaning within philosophical positions on the artificial and on mediation. To be reflected upon, thereby, is the extent to which historical ideas might be able to replace, philosophically, the term interface. In other words, we shall examine whether using the notion of interface entails a new conceptual quality or simply constitutes a rebranding of an older concept. Furthermore, we shall establish whether there is any possibility of reinforcing an interpretation of interface that is of conceptual consequence, equipped for being taken seriously as a theoretical concept, and not just a technical term or metaphor. This observation will be followed by an attempt at identifying a tendency in the most recent development of the meaning of interface, possibly imbuing it with a more specific profile.

The concept of interface has been gradually introduced and accompanied by various fashionable appeals for the new philosophy: software philosophy, digital philosophy, the philosophy of communication, to name only a few of them. Certainly, there is something about this phenomenon that reflects the contemporary reality—something not fully compatible with the reality of everyday practices just a couple of decades ago, not to mention distant centuries. Nevertheless, it does not necessarily mandate any conceptual revolution and might not provide sufficient grounds for celebrating interface as a key philosophical concept. The technical or, more precisely, scientific origin of the term as a reaction surface does not shed much light upon its meaning, although it may suggest interaction as a determining factor. Still, the notion of interface provokes more questions than answers as a conceptual challenge. Can we measure the limits and conceptual efficiency of interface, comparing it with terms like tool, access, mediation, translation, prosthesis, controller, or terminal? No concept appears from nowhere, and none can work without depending upon established conceptual networks. The discourse on models of technically determined interaction with machines and humans, however, takes the term for granted, or even claims to have invented it from scratch. Though there are a number of exceptions that have attempted methodical examination of the meaning of interface, these nonetheless remain unsatisfactory. What is interface then, if not merely descriptive of the shared environment of objects, tools and people. The tendency to extend the meaning of media would be sufficient to signify the idea of environment. To put it more bluntly, the contemporary habitat is a *media environment*, wherein objects are potential media. Social relations are being confined, determined and maintained by media in the sense of interfaces. Therefore, *interface* is not

just an operable surface of media, because it exceeds a purely technical meaning.
It would seem that this perspective reduces the notion of interface to that of a *human-machine-interface*, whereas, in fact, all interfaces, including machine-machine-interfaces,[1] have to be designed in advance to be possible at all. This means that, behind each of these constellations, there is an intention or an understanding that somebody is designing them, and, as soon as machines cooperate without error, they become not only invisible, but also integrate devices to create the appearance of a single entity. As soon as a given constellation is disrupted, design appears again in the form of a broken piece that requires either replacement or reworking. From this philosophical perspective, the interface is an element of a kind of interaction that always implies human participation. That is why machine-machine-interfaces cannot involve the same theoretical level as human-machine-interfaces and should remain a description of the technical complexity of a particular device. In the most abstract way, it is possible, then, to say that interface is something, which enables interaction between a subject with an intention (for example a human) and a responsive tool. It is something that combines the sensible, in the sense of accessible to experience, and the ideal in the sense of the imaginable. Of course, being in interaction with an interface does not necessarily mean that the user understands it, but they can discover its means of functioning and make use of those.

Structurally, this theoretical figure mirrors a Kantian understanding of imagination. Cognition in Kant's philosophy is a construction of reality that implies a creative perception of the world, which appears in consciousness as an artificial product of individual faculties, among which is imagination. The human activity of perception constructs and structures the experienced world through representations. These are possible thanks to the power of imagination [Einbildungskraft], which provides the general conditions for apperception, a synthetic order of the sensible experience and the possibility of understanding.

> Synthesis in general is, as we shall subsequently see, the mere effect of the imagination, of a blind though indispensable function of the soul, without which we would have no cognition at all, but of which we are seldom even conscious. Yet to bring this synthesis to concepts is a function that pertains to the understanding, and by means of which it first provides cognition in the proper sense.[2]

1 Machine-machine-interface is used as a generic term for all kinds of interfaces that do not need to engage human activity in order to continue functioning, so it also refers to softwarehardwareinterface, software-software-interface and so on.

2 Immanuel Kant, *Critique of Pure Reason*, trans. Paul Guyer and Allen W. Wood (Cambridge: Cambridge University Press, 1998), 211.

However, cognition proceeds in three logical steps: those "of the *apprehension* of the representations, as modifications of the mind in intuition; of the *reproduction* of them in the imagination; and of their recognition in the concept."[3] There is an immanent tension to Kant's attribution of the role of imagination to cognition. In fact, it is not just requisite for any one of these stages but is rather fundamental to combining sensibility with understanding.[4] Both "the synthesis of apprehension" and "the synthesis of reproduction" of representations or sequences of representations are inseparable,[5] as Kant clearly emphasises in the following passage:

> Through the relation of the manifold to the unity of apperception, however, concepts that belong to the understanding can come about, but only by means of the imagination in relation to the sensible intuition. We therefore have a pure imagination, as a fundamental faculty of the human soul, that grounds all cognition a priori. By its means we bring into combination the manifold of intuition on the one side and the condition of the necessary unity of apperception on the other. Both extremes, namely sensibility and understanding, must necessarily be connected by means of this transcendental function of the imagination, since otherwise the former would, to be sure, yield appearances but no objects of an empirical cognition, hence there would be no experience.[6]

The unity of sensibility and understanding is, for the subject, a conceptual bridge that leads to the space in which it can take action. Though it cannot, as long as it resides in the centre of its powers, be treated as interface in the strict sense, yet, should the Kantian structure of imagination be borrowed and transposed to the surface of the subject, it would become an efficient explanatory model of how, philosophically, interface could be explained. This operation of cutting out the concept of imagination from the core of Kant's philosophy and re-appropriating it, inserting it into the new context is legitimate, because the original intention of this concept is to define the mechanism creating a space of interaction between the individual and the reactive object, or more directly the tool. In this sense, the *imagination* fulfils the role of an interactive contact surface between the two and makes manipulation of the object possible, while allowing for learning about its usage and presenting the possibility of discovering more.

A look at the remaining issue in the *Critique of the Power of Judg-*

3 Ibid., 228.

4 Heidegger points out that the double role of imagination in Kant's philosophy as sensibility and understanding might have its antecedent already in Aristotle's De Anima, book G3, where φαντασία stands αἴσθησις between νόησις, see Martin Heidegger, *Kant and the Problem of Metaphysics*, trans. Richard Taft (Bloomington: Indiana University Press, 1997), 91.

5 Kant, *Critique of Pure Reason*, 230.

6 Ibid. , 240–241.

ment can further reinforce this argument. Therein, Kant uses the expression "the technique of nature"[7] when considering the functioning of machines, particularly those that perform a particular change in conformity with the natural force and principles. The fact that they work is based on nature, or a natural design of their construction, but the way they are understood and operated by humans requires their faculty of imagination. The user should have not only intention, but also a capacity to understand and learn, so as to make the tool carry out a particular task. In other words, the user projects his representation of causality onto an object, thereby transforming it into a tool of action. More precisely the subject puts representations into an order that is based on his or her idea of time (causality) and space within the synthetic power of imagination.

This interaction, therefore, involves not simply control over a tool or adjustment of a single mechanism to comply with another, but rather imagining a possibility of control based on the representation of cause and effect. This brief interpretation is also about the difference between the notion of *tool* and that of *interface*. A psychological dimension is thus implicit to the use of the word *interface*, as is often apparent in discourses on user-friendly interface design, for example.

The interaction with tools, as described here, provides a basis for further consideration on how the interface, as an element connecting the subject and the tool, enables not only an action, but also the discovery of access to something otherwise impossible, or at least difficult. Some light can be shed on this by another philosophical figure contained in Heidegger's concept of the work of art.[8] There is a particular difference between the utensil and the work of art. Humans discover the world through the use of tools. The objects they use serve to achieve a particular goal; they are instruments of human action and such an object maintains its character of a thing that is "in itself", so that, as utensils, they have no being on their own but consist of their degree of serviceability. Though the case with a work of art would at first seem similar, the character of a thing or thing-likeness is not necessarily a condition for a work of art. In fact, the thing-like aspect of a work of art can even obscure any real understanding of the work and lose much of its sense if isolated and objectified. The materiality of a work of art cannot be its condition. Hence, there are temporal forms of artwork and the artistic quality does not relate directly to the material existence. Neither can the form of any particular work of art be its condition, because it expresses a historically determined unique culture, which inspires its own artistic production.

7 Immanuel Kant, *Critique of the Power of Judgment*, trans. Paul Guyer and Eric Matthews (Cambridge: Cambridge University Press, 2000), among other passages: Introduction VII, § 74, § 78.

8 Main text of reference is Martin Heidegger, "The Origin of the Work of Art (1935–36)," in *Off the Beaten Track*, eds. and trans. Julian Young and Kenneth Haynes (Cambridge: Cambridge University Press, 2002), 1–56.

This proposal of Heidegger seems interesting because it formulates the idea of the unfolding of a world through a work of art. It entails the ability to connect with *a* reality just as if it were a node point through which to access various networks or disclose a collection of contents, potentially reactive or interactive contents or networks. The work of art seems to be a structural prototype for what is intended by the notion of interface. Of course, this does not mean that interfaces are works of art, although many artists have claimed that computer programs and interface design could be (especially with early "Net Art"—most of which now has increasing difficulty finding recognition as art). Instead, it simply means that they are not utensils in the simple sense. They give direction to experience and offer, in each particular case, some limited and determined possibilities of access. They are still prisoners of their serviceability, but, structurally, are more than simple utensils. Indeed, the capacities of interface often exceed those of a simple tool, and, while perhaps failing to open a whole new world to a user, these capacities impart complex ideas of the culture and society that produced and uses them. This is well exemplified by the infrastructure of so-called *social media* or GUI in different operating systems.

Opening or determining something in this case is often connected with an exclusion of something else, or at least with difficulties in achieving the desired performance of the operated device. In addition to this, there is also the aspect of steering attention. The viewer (or user) is subjected to a particular experience and pushed toward a possibility. However, it is not exactly right to call it a possibility, when it, in fact, is a constraint. On the one hand, interface opens up a certain space, but it does that on its own conditions. It is not bad as such, but if we imagine an interface designer who wants not only to provide a possibility for access, but also program the user to access a particular content in a particular way, then the neutrality of the concept becomes doubtful, just as it does when art is forced into the framework of propaganda (making something friendly that does not necessarily mean what it means).

There is a growing need to rethink the notion of interface within a broader conceptual perspective, but it is important to be wary of calling for an interface philosophy based on technological enthusiasm and, more particularly, on a variety of metaphors derived from technical terms or marketing jargon—one that often tries to impose itself on discussions about technically mediated communication. Expressions like "interface between power and society" do not seem to do justice to what interface is and turn the notion, instead, into a synonym for connection of any kind, obfuscating its political character through a meticulously designed filter. There are many ways to connect society and power and it is possible to name these more precisely, as has been done in a wide range of other essays. It is not only the technical design of an access that is involved but also the design of rules that shape the technology-based interaction—a concern which considerably exceeds a basic understanding of the term.

Though *Interface*, along with other long-popular terms like user, can recall the hidden structure, the something in between, that operates the interactions, the dominant imperative toward designing interfaces so as to make them more and more discrete, or even invisible, reinforces the illusion of immediacy. The trend toward creating an impression of easy or "friendly" interfaces casts, to the extent that people rely on these, a growing shadow over the freedom of choice, giving rise to the suspicion that the user is being used. Within the context of the Internet, this carries particularly weighty consequences.

> In the lifeworld the Internet takes on meanings and connotations having to do with intimacy, human contact, self-presentation, creativity, and so on. The Internet is not merely instrumental to these life-worldly ends; it belongs to the lifeworld itself as a richly signified artefact. This is more than a matter of subjective associations since it affects the evolution and design of the network and the interface, which cannot be understood in terms of an abstract idea of efficiency. This has become clear with the struggle over network neutrality. The intertwining of function and meaning exemplified by the Internet is general in modern societies.[9]

It is certainly not possible to talk about interface while omitting the issue of the strategic dimensions of media. Interface design could easily stand for its symbol. That is why, in light of the many texts using the term interface, a precise analysis would be helpful. Interface is not neutral. Interface is designed, and every design is political.

9 Andrew Feenberg, *Between Reason and Experience. Essays in Technology and Modernity* (Cambridge, MA: MIT Press, 2010), 60.

REFERENCES

Feenberg, Andrew. *Between Reason and Experience. Essays in Technology and Modernity*. Cambridge, MA: MIT Press, 2010.

Heidegger, Martin. *Kant and the Problem of Metaphysics*. Translated by Richard Taft. Bloomington: Indiana University Press, 1997.

Heidegger, Martin. "The Origin of the Work of Art (1935–36)." In: *Off the Beaten Track*, edited and translated by Julian Young, and Kenneth Haynes. Cambridge: Cambridge University Press, 2002.

Kant, Immanuel. *Critique of Pure Reason*. Translated by Paul Guyer and Allen W. Wood. Cambridge: Cambridge University Press, 1998.

Kant, Immanuel. *Critique of the Power of Judgment*. Translated by Paul Guyer and Eric Matthews. Cambridge: Cambridge University Press, 2000.

1986: LETTER TO THE EDITOR OF LEO-NARDO

By Vilém Flusser (†)

Suggested citation: Flusser, Vilém (2018 [1986]). "Letter to the Editor of Leonardo." In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44747

This document is referenced in the Vilém Flusser Archive under M60-62.

"[...] the apparatus does what man wants it to do, and men can only want to do what the apparatus can do. In fact: apparatus and man form a single functional unit."

In this paragraph, Vilém Flusser articulates his theory of apparatus, as opposed to the classical machine, in a remarkably condensed manner. It is taken from a letter to Leonardo journal from January 1986, Flusser's reaction to a Leonardo article (in vol. 19, no. 1) on the artist Gottfried Jäger. Flusser – the philosopher of the technical image – was very much interested in Jäger's experimental generative photography. Taking the camera as particular apparatus as a starting point, Flusser formulated his general concept of apparatus in this letter. Here, the human operator is reduced to a "functionary" (Flusser) of the given programme operating hidden inside the black box which is the apparatus. According to Flusser, this techno-determinism can be countered by critical artistic practice, intervening in the programme of the apparatus – as a way to go beyond its interface surface into the darkness of the black box, in order to produce new, surprising results.
The letters are excerpts taken from the collection of the Vilém Flusser Archive (document number M60-62) and are published here with the archive's as well as Miguel Gustavo Flusser's kind permission.

Daniel Irrgang

Sir:

The article by Gottfried Jaeger on “Generative Photography”, appearing in your Vol. 19, No. 1, is dense, and it contains several fundamental ideas, to two of which I should like to comment.

(a) Reproduction versus production:

This ancient distinction between “mimesis” and “poiesis” is, as Jaeger's work shows, no longer valid. When photography was invented, people believed that it would permit an even more faithful reproduction of the objective world than the most “realistic” of paintings. Because apparently the objects impress themselves upon the sensitive surface of the film, like they do in fingerprints or footprints. Thus photos seem to be not “symbols” of objects, (conventional signs which mean them), but “symptoms” of objects, (signs caused by the objects themselves). As one began to consider photography more closely, however, it became obvious that a very complex codifying process goes on between object and photo: the rays reflected by objects are submitted to complex processes before they become an image. The non-objective, symbolical character of the photos became ever more conscious. Thus it became obvious that in photos, even more evidently than in painting, a codyfying, “sense-giving”, intention intervenes between image and object. Thus there is no such thing as a purely reproducing, mimetic image, and that there is a producing, poetic quality to every image. Jaeger takes advantage of this theoretical insight, and he attempts to accentuate the poetic parametre of image-making.

(b) Apparatus versus man:

Apparatus seem to be complex machines, which again seem to be complex tools, so that there seems to be no essential difference between using a brush and using a computer. Both are tools at the service of those who use them. This is not so. The relation between man and tool is different from the one between man and machine, and the one between man and apparatus. With tools, man is the constant, and the tool is the variable: man is surrounded by tools and he may exchange one tool for another. With machines, the machine is the constant and man is the variable: the machine is surrounded by men which may be substituted one for another. With apparatus there is an intricated co-relation of functions: the apparatus does what man wants it to do, and men can only want to do what the apparatus can do. In fact: apparatus and man form a single functional unit. Jaeger is one of those who understand this. He concentrates his attention at least as much on apparatus function as on his own intention. He knows that the problem is not so much of man “governing” apparatus, or apparatus “governing” man, but of a creative man-apparatus interaction. In this he contributes to the avoidance of the danger that automatic apparatus take over, and relegate men to mere apparatus functions.

Jaeger's work (and his theoretical considerations), are important steps on the way towards the emerging culture of images generated by apparatus.

Sincerely,

January 31, 86.

Liz Crumley,
Associate Editor,
LEONARDO,
2112 Berkeley Way, Berkeley CA 94704

Dear Liz Crumley,

thank you for your kind letter of January 13. I wrote to Lisa R. Bornstein on January 26 that I could write the letter on Gottfried Jaeger's article in March only. I now found the time to do it immediately. Please find it enclosed.

I hope that [??] it is what you expected from me. I know Jaeger well, (I gave lectures at his Bielefeld school), and I think I know the driving intention behind his work and his teaching. Therefore I hope that my letter will help your leaders to appreciate what he is doing.

Thanking you again for having invited me to write this comment,

I am sincerely yours,

PROJECTS

MNT REFORM: DIY PORTABLE COMPUTER

By Lukas Hartmann

“I know that there are some who would like to better understand and take control of their device — for reasons of security, curiosity, or the desire for personal customization and hackability.”

Suggested citation: Hartmann, Lukas (2018). “MNT Reform: DIY Portable Computer.” In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44735

GOALS

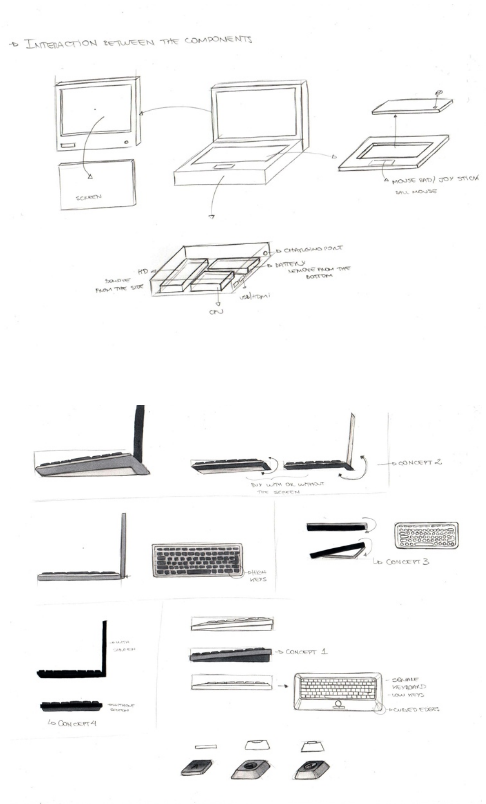
SECURITY, TRANSPARENCY, HACKABILITY

Like many of you, I spend a lot of time using computers: to write, draw, render, make music and program. I understand that most people want a digital appliance to get out of the way and make their lives easier, but I know that there are some who would like to better understand and take control of their device — for reasons of security, curiosity, or the desire for personal customization and hackability.

For a long time, I wanted a portable personal computer which you can…

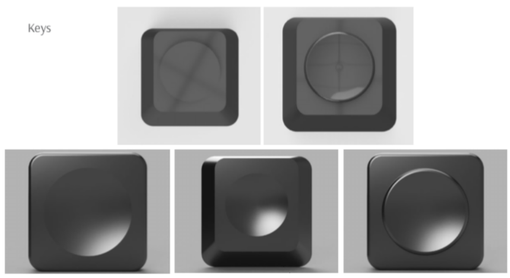
- Repair by yourself with parts from the hardware store or 3D printing
- Thoroughly understand on any level
- Take apart, modify and upgrade without regret
- Adapt to your tastes and use cases, staying with you for many years

In Summer/Autumn 2017, I teamed up with industrial designer Ana Dantas to make this machine happen. Three months later, I can type this article on the first prototype of Reform, our DIY portable computer.



Main Part

Keys



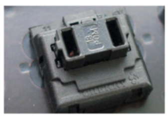
FIRST SKETCHES AND 3D MODELS

OVERALL STYLE

I grew up with home computers like the Sinclair ZX Spectrum, Commodore 64 and Amiga 500. These were quirky and limited in their capabilities, but they had a lot of character and invited to experiment and take apart. It was normal to find complete schematics and programming tutorials in their user manuals.
For the design of Reform, I wanted to incorporate a nod to these and other early personal computers and laptops, so that the look would convey an invitation to hack.
I created a mood board of the approximate style that I had in mind and Ana used this as a reference for the shapes and colors of her first hand sketches. As a product designer, she also came up with several alternatives for dealing with the goal of modularity. While she came up with some more advanced options, we decided to go with simplicity and chose a boxy design for the first prototype.

MODULARITY

Modularity was an important goal and differentiator from the beginning. You should be able to swap in the type of keyboard, pointing device and screen (E-Ink, anyone?) of your choice or even go without an internal screen at your desk.



We decided to include these modules in the first version:

- Chassis: a main body box with mounting facilities for motherboard, battery, SSD storage, input device controllers
- Exchangeable keyboard PCB, swappable by sliding out to the right
- Exchangeable pointing device (we would implement a trackball first, but you can also use a trackpad)
- A slot for SATA SSDs (reminiscent of floppy drive slots)
- Detachable display housing (with standard screws), with a future E-Ink option
- Standard LiPo batteries

ELECTRONICS

TARGET SPECS

The goal for selecting the core hardware was to strike a balance between openness and performance. On the one hand, I wanted to be able to get real work done on the machine, like compiling code, editing images or video/audio and browsing the web. On the other hand it had to be as open and documented as possible, avoiding closed source drivers. I came up with these requirements:

- CPU/SoC parts should be as open, documented, backdoor- and blob-free as possible
- At least 1 GHz and 2 cores
- At least 4 GB of RAM to avoid swapping
- At least SATA-2 for reasonably fast and big storage
- At least HD-ready screen resolution
- PCIe for expandability

SYSTEM ON A CHIP: NXP i.MX6 / i.MX8

After reviewing most available SoCs and SBCs, I settled (like Bunnie in the Novena) on the NXP i.MX6 QuadPlus SoC, which has four ARM Cortex-A9 cores running at up to 1.2 GHz and a Vivante GC2000 GPU for which completely open source drivers are available (etnaviv). Complete documentation for the SoC is available from NXP as PDFs without registration or NDAs. I chose the TinyRex Ultra by Fedevel/Voipac as our evaluation board, because it is a tiny, low-cost system-on-module with 4GB of memory, and it can be plugged into an open source carrier board. For the next iteration, I might go with the open schematics version iMX6 Rex[1].

While the i.MX6 looks a bit dated on paper and can't compete with the Core i7 in my old MacBook Pro, its real-world performance is good enough for the kind of work I wanted to use it for. Also, the much more powerful 64-bit, 6-core i.MX8[2] is around the corner.

1 http://www.imx6rex.com/

2 https://www.nxp.com/products/microcontrollers-and-processors/arm-based-processors-and-mcus/i.mx-applications-processors/i.mx-8-processors/i.mx-8-family-arm-cortex-a53-cortex-

With a bit of luck, the second prototype of the computer will coincide with its launch.

CONNECTIVITY: USB, PCIe, SATA, Wi-Fi

While i.MX6QP has an integrated USB2.0 Host Controller, which is fine to connect the input devices and a sound module, USB3.0/3.1 are attractive because of their high bandwidth and charging via USB-C. These could be integrated on the new motherboard and a chip attached to the PCIe bus. I tested the Penguin Wireless N Mini PCIe card[3] in the dev board's Mini PCIe slot and it works great with the open source ath9k drivers.
The system starts U-Boot from a MiniSD card which in turn loads Linux from a 120GB SanDisk SATA SSD. We included a compartment and a slot that accepts 2.5" SATA SSD drives for easy swapping.

PRICING AND USER PRE-TESTING

Ana encouraged me to set up a user pre-validation test to check if we were on the right track concerning the overall concept, choice of parts and pricing. We put together a fake Amazon page[4] with renderings and a description of our device surrounded by two alternative choices. We positioned our computer in the middle of the price range (500-700 EUR) and focused on offering a complete DIY package (not only a board) and higher specs and customizability than another low-cost project. The mainly positive interviews with pre-filtered testers made us confident that we were on the right path.
All testers were excited about an optional E-Ink display, but this drives up the price by at least 200-300 EUR. Also, controller options were unclear, so we postponed prototyping of this option.

MAKING IT WORK

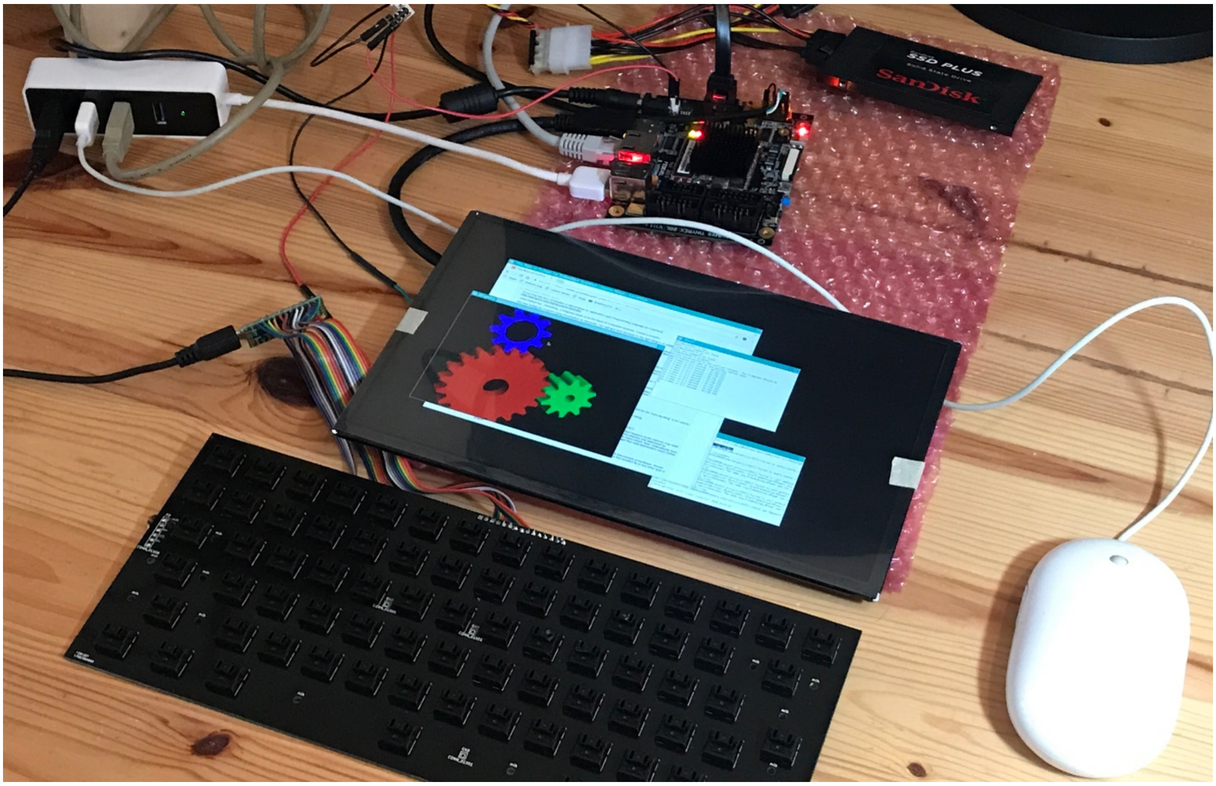
OPERATING SYSTEM VALIDATION

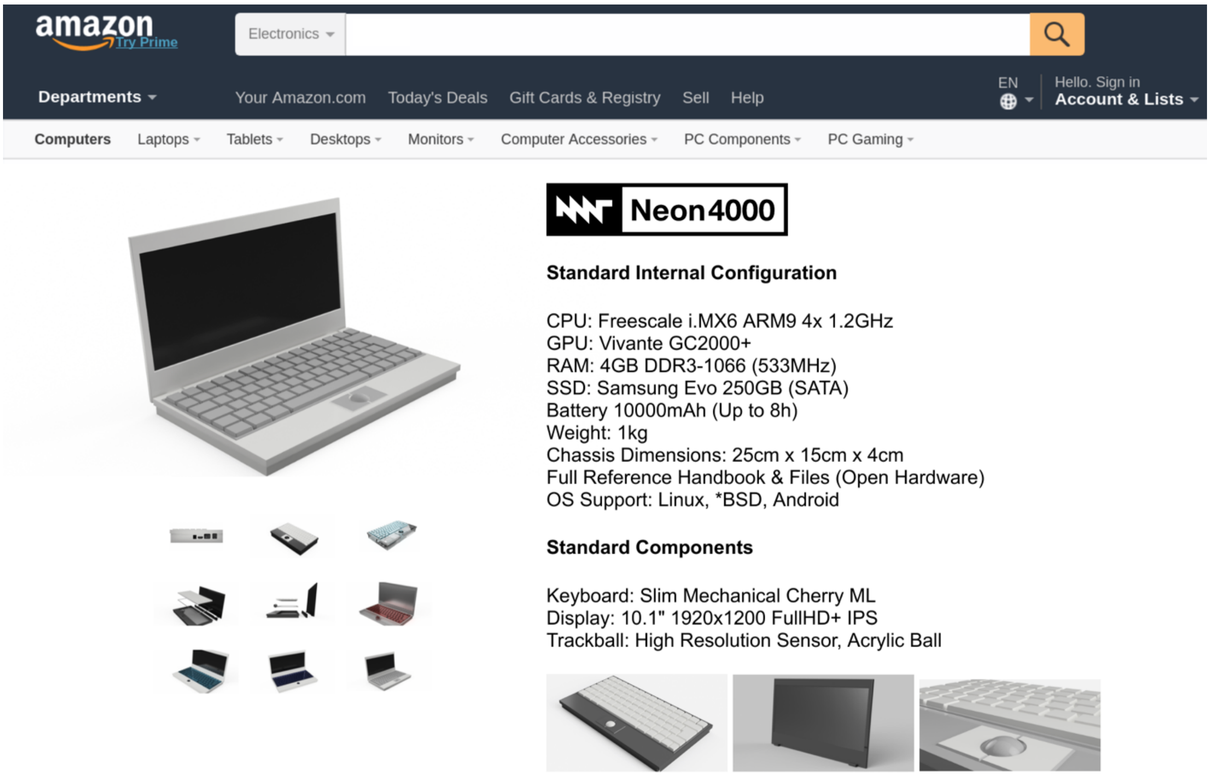
The first thing I wanted to make sure was the possibility of running mainline Linux on the machine, without using any proprietary binary blobs or drivers — while still being able to use basic GPU acceleration. With some important hints from kernel developer Lukas Stach I was able to bring up a usable Linux desktop with Debian userland and OpenGL on my TinyRex development board hooked up to a battery. This validated the main technology decision.

a72-virtualization-vision-3d-graphics-4k-video:i.MX8

3 https://www.thinkpenguin.com/gnu-linux/penguin-wireless-n-mini-pcie

4 http://dump.mntmn.com/neonmock/product.html

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EN
Hello. Sign in
Account & Lists
Computers
Laptops
Tablets
Desktops
Monitors
Computer Accessories
PC Components
PC Gaming
Neon4000
Standard Internal Configuration
CPU: Freescale i.MX6 ARM9 4x 1.2GHz
GPU: Vivante GC2000+
RAM: 4GB DDR3-1066 (533MHz)
SSD: Samsung Evo 250GB (SATA)
Battery 10000mAh (Up to 8h)
Weight: 1kg
Chassis Dimensions: 25cm x 15cm x 4cm
Full Reference Handbook & Files (Open Hardware)
OS Support: Linux, *BSD, Android
Standard Components
Keyboard: Slim Mechanical Cherry ML
Display: 10.1" 1920x1200 FullHD+ IPS
Trackball: High Resolution Sensor, Acrylic Ball

KEYBOARD, SWITCHES AND CAPS

For the first variant of the keyboard, I was looking for DIY- and typing-friendly key switches. The Cherry ML switch[5] sits in a sweet spot between full-size mechanical keys and laptop chiclet keys, but I couldn't get them at Digikey or Mouser. Calling Cherry's headquarters in Munich was fruitful: they pointed me to a partner company that would then sell me a minimum quantity of 2000 switches. I made a KiCAD component for them, drew up a keyboard PCB and ordered it at Dangerous Prototypes. Hooking the assembled board up to a Teensy LC yielded a usable laptop keyboard.

Because our layout was custom and injection molding is too expensive for small hardware projects, Ana suggested printing our keycaps in a Formlabs Form 2 SLA resin printer[6]. This approach resulted in surprisingly pleasant-to-touch, slim caps for the MLs that we could easily customize. A proper wire mechanism to stabilize the space bar and other long keys is still on the to-do list, but the keyboard already works well enough for first application testing.

POINTING DEVICE

Ana also used the Form 2 for printing a custom designed housing for the PWM3360 motion sensor[7] that would form the base of our trackball module. The ball itself is a standard acrylic sphere from Modulor, and the left and right buttons are Cherry ML as well.

Both the Keyboard and the pointing device are driven by Teensy LC[8] Cortex M0+ boards that speak USB HID. To connect these internally to the SoC, I chose the incredibly small USB NanoHub board[9] by Muxtronics.

DISPLAY

For the first display prototype, I compromised and chose a 10" 1920x1200 panel with a corresponding HDMI to dual LVDS adapter by Chalkboard[10]. I felt that although this approach requires a little dangling HDMI cable on the outside of the prototype, it would save considerable development time to quicker reach a functioning system for further user testing. In the next iteration, this cable will be eliminated.

CHASSIS

For printing the chassis, encompassing the main box and the display assembly, we chose to go with Shapeways[11] with good results, although at a later stage these might be candidates for resin cast-

5 http://cherryamericas.com/product/ml-series/
6 https://formlabs.com/3d-printers/form-2
7 https://www.tindie.com/products/jkicklighter/pmw3360-motion-sensor/
8 https://www.pjrc.com/store/teensylc.html
9 https://www.tindie.com/products/mux/nanohub-tiny-usb-hub-for-hacking-projects/
10 https://www.chalk-elec.com/?page_id=1280#!/10-FullHD+-LCD-with-HDMI-interface/p/41737268/category=3094859
11 https://www.shapeways.com/

ing or CNC milling, or other technologies that are available to a user that wants to customize the housing.

ASSEMBLY

After around 8 weeks of working on all the pieces, we met in FabLab Berlin[12] to assemble the first working system over an intense course of around five hours. Many little things went wrong — from wrongly placed holes to bad solder joints to pieces of 3D printed material breaking off — but because we were surrounded by all necessary production equipment and Ana's never ending supply of improvising techniques, we made it happen and our DIY laptop booted for the first time.

SIZE, WEIGHT, BATTERY LIFE

The first prototype of Reform is quite a brick. While it is only 28cm wide and 17.5cm deep, its complete height including the display adds up to 5.5cm to accommodate for all the connectors of the development board and to allow room for experimentation before shrinking everything down. Its 1.5kg including the battery feel OK, though. The battery is an off-the-shelf RC 7.4V LiPo battery with a modest 3000 mAh capacity. Running a full linux desktop on full LCD brightness clocks in at around 1.8A, 5V, which yields 2.5 hours of continuous usage on this battery. Doubling that number would be a good target.

APPLICATIONS

I successfully tested software packages like LibreOffice, Blender, GIMP, Inkscape and Audacity on the laptop. I managed to run Quake 3 Arena using the GPU, but I had to manipulate the OpenGL version number, which leads to some glitches that should be fixed. It can also play H.264 movies with mplayer and surf the web with QupZilla or Chromium (JavaScript heavy websites drive up the core

12 https://fablab.berlin/en/

temperature, though). Because they are connected and flashable internally via USB, you can even update the keyboard and trackball firmware using the Arduino tools.

MAKING IT AVAILABLE

BUY KITS OR PRINT YOUR OWN

All in all, although it has a number of rough edges, we're very happy with how this first prototype turned out. Of course we want to make it better, thinner, get rid of external cables, publish schematics and documentation and set up an online shop where you can order DIY kits or single parts. And with the 3D files, you will be able to print chassis parts in any color or modified shape you want. We want to encourage experimentation and tinkering, and bring back some hacking fun to mobile personal computing.

MOTHERBOARD PRODUCTION

Fedevel[13] and Voipac[14], the Designers/Manufacturers of TinyRex, agreed to help with the production SoC/SOM, and Voipac offered an upgrade path to the next generation i.MX8 SoC that will be launched in the coming 3-6 months. My job will be to design a slimmed-down base board, an integrated charger/power brick and work with Ana on making the interconnect between chassis, display and input devices clean and easy. Ultimately, we will launch a crowdfunding or pre-order campaign. The latter worked well to make my previous hardware project, the VA2000 Amiga FPGA Graphics Card a reality.

13 http://fedevel.com/

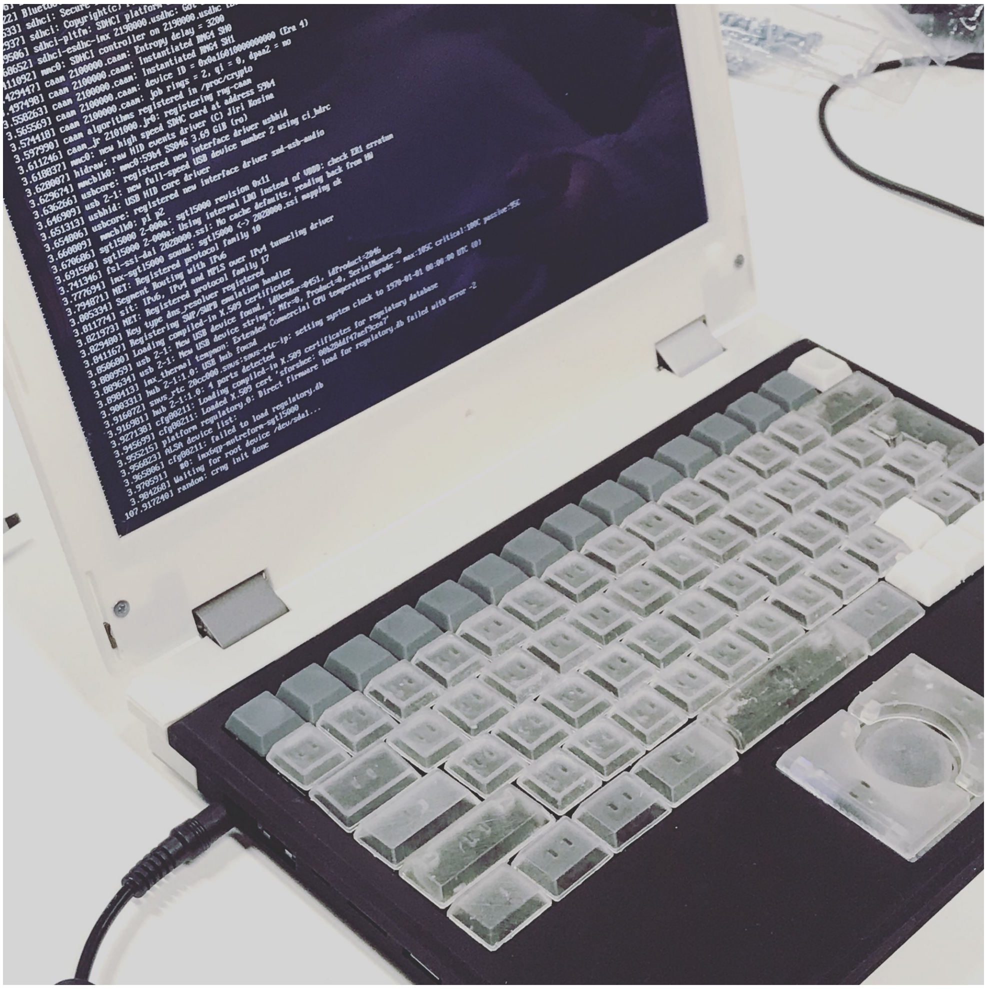
14 http://www.voipac.com/

YOUR OPINION

At this point, we're eager to hear your early feedback about Reform. What would you like to see in an open, portable computer system? What did we miss? Send your thoughts to lukas@mntmn.com.
Or subscribe to the Reform newsletter[15] and we will update you on further progress of the project.

Check out other MNT Projects[16]

Related DIY laptop projects:
Novena[17], Olimex Teres-1[18]



15 http://letters.mntmn.com/lists/reform/join
16 http://mntmn.com/
17 https://www.crowdsupply.com/sutajio-kosagi/novena
18 https://olimex.wordpress.com/2017/02/01/teres-i-do-it-yourself-open-source-hardware-and-software-hackers-friendly-laptop-is-complete/

TRAINING SETTING

By Branden Hookway and Maria Park

“Just as flight instruments are means of reconciling the subjective experience of flight to a reality that might contradict it, the exhibition seeks to bring a heightened awareness of controlled environments and to mediate the tension between structured information and intuitive decisions.”

Collaborative artwork and statement by Maria Park and Branden Hookway, first exhibited at the College of Art, Architecture, and Planning at Cornell University in Fall 2017.
The artwork will travel to Nancy Toomey Fine Art, San Francisco, CA, in Spring 2018

Suggested citation: Park, Maria and Hookway, Branden (2017). “Training Setting.” In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44736

This work is part of an exhibition titled *Training Setting*, a collaboration between Maria Park and Branden Hookway that investigates social and control protocols using a diagrammatic language of flight cockpits and table settings. To train within a technologized environment is to mediate formal and informal instruction — where a formal understanding of information and procedure coexists with an informal understanding gained through embodied action. In this sense, training is inherently an orientation toward both the actual and the virtual, as performance draws upon tacit knowledge according to formalized protocols.

Central to this exhibition is an installation of 26 shaped paintings, under the same title, depicting fragments of a cockpit and a twenty-first century airfield as seen through the windscreen of a grounded B-29. The iconic bomber of WW2 and the start of the Cold War, the B-29 heralded a new era of globalization in which territory would increasingly be defined by targeting. The windscreen is rendered as a diagram that cuts through both an interior and exterior view, circumscribing a visual manifold encompassing flight instrumentation, ground equipment and crew, airfield and landscape. The curvature of the horizon across the peripheral field frames an oculus with an inactive Norden bombsight at its center. The work describes an environment alive with interconnected protocols, from altitude displays to taxi patterns, but also neutralized: a view of the twenty-first century from the perspective of a decommissioned twentieth century plane.

The paintings are reverse-painted on transparent sheets of Plexiglas and mounted on plywood panels. Their reflective surfaces refer to the difficulty of separating out the place of this historical artifact in the lineage of contemporary techniques of picturing the world through satellite imagery and global communication. Encased between wood and glass, the images occupy a space between painting and diagram, where they are interrupted continuously across the visual field. As in a mockup of a control room with a multiple-image display, it mimics the screen without the inferred veracity of televisuality.

While the vernacular of diagrams found in manuals and instructional guides delimit a set of conditions and actions, their reconfiguration here addresses how the systems of control that underlie formal diagrams are propagated through everyday life. Just as flight instruments are means of reconciling the subjective experience of flight to a reality that might contradict it, the exhibition seeks to bring a heightened awareness of controlled environments and to mediate the tension between structured information and intuitive decisions.

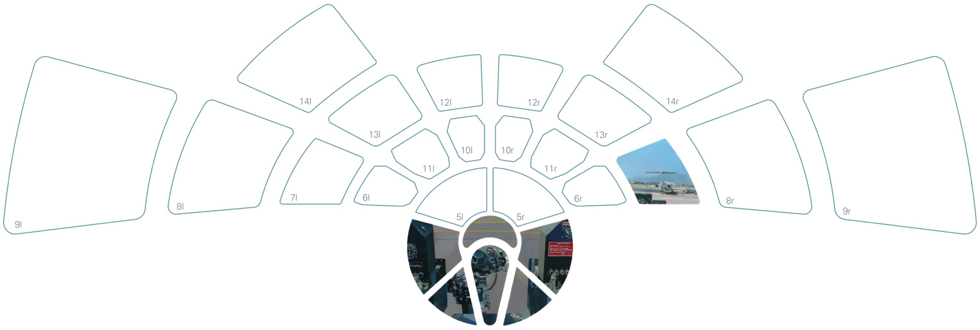
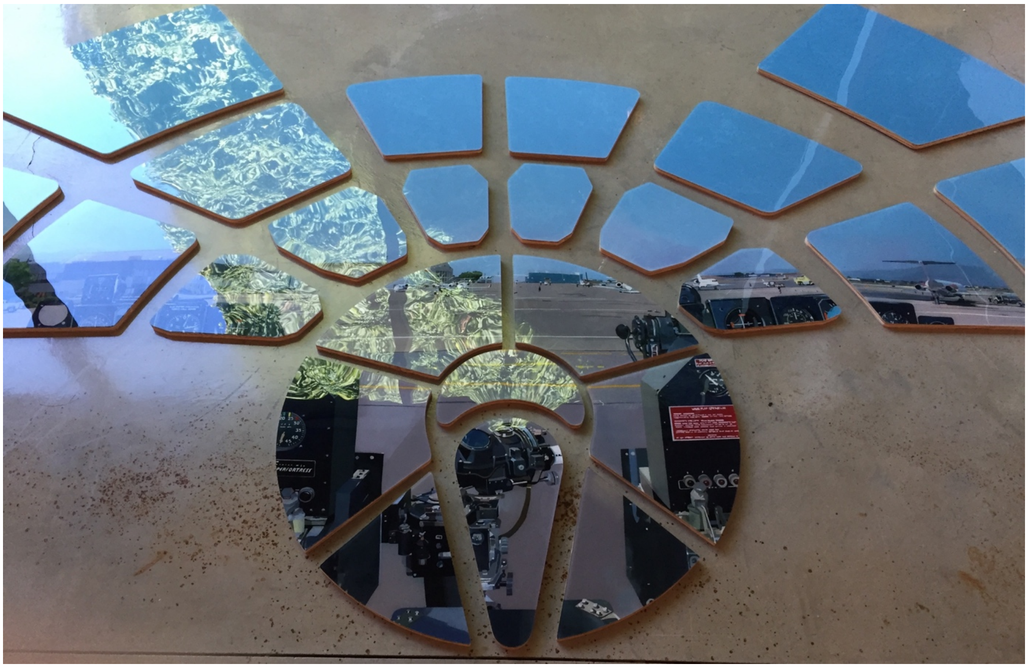


Diagram of *Training Setting* (2017), overall dimensions 4.2m x 1.4m.

Diagram of *Training Setting* installation, showing panels 6l, 7l, 8l, 9l, and 11l.

Diagram of *Training Setting* installation, showing panel 7r and detail of panel 6r.

Diagram of *Training Setting* installation, showing panels 1, 2, 3l, 3r, 4l, 4r, 5l, and 5r.



Installation View

POLITICS

COMMONS FOR THE CARTOGRAPHY: HOW SOCIAL COMPUTING CHANGES THE DESIGN OF INTERFACES

By Christine Schranz

“The transformation of the map into an interface medium has not only changed the use and aesthetics of maps, but has also caused a new spatial perception.”

Suggested citation: Schranz, Christine (2018). “Commons for Mapping: How Social Computing changes the Design of Interfaces.” In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44740

Left: Port au Prince on OSM (OpenStreetMap) January 12, 2010
Right: Port au Prince 28 days later
Source:
https://www.slideshare.net/Sev_hotosm/hot-osm-community-mapping-in-lower-shire-malawi

A remarkable example for commons in mapping is the *Haiti Map* 2010, which has changed humanitarian aid from the ground up. After the severe earthquake in Port-au-Prince, a crisis map was created using OpenStreetMap (OSM). Just a few hours after the earthquake, a high-resolution satellite image of the region was usable, and after a few days, several hundred volunteers had supplemented the online map with life-saving information. For this purpose, the map provided all the available topographical data that are helpful after such a disaster—open hospitals, running water and energy supplies, damaged roads, the condition of buildings, and more. Such a map was only possible with a surface that is a mashup (a combination of text, image, and audio with the map) and with a new paradigm of the map as an interface. Here, interface means the user-centered design of the connection between humans and machines.

This article intends to show how the use, interface, and creation of maps has changed since the ubiquitous use of mobile devices and georeferenced data have arisen. It will also show how web-based maps commons can be a powerful alternative to commercial online map services.

On the one hand, mobile devices have changed the interfaces of maps, and on the other hand, they have changed how and by whom maps are produced. Cartography once served to represent the world. With the rise of the Google Cartography monopole (there are hardly any alternative services for free online maps), this has changed. Since Google makes a profit mainly through advertising revenue, its online map services pursue no cartographic purpose, but rather a commercial one. The result is that its representation of the world is manipulative, incorrect, and oriented to the search query. To create maps, geo-data is acquired by license from one of the few providers and supplemented with satellite images, street view recordings, and local information. The method differs little from previous analogue mapping systems. At that time, there was a so-called "base plate," which was supplemented with layers of map-relevant information and revised every few years. What is new is the speed of the data (real-time), the interactive contents (personalized), and the fact that today's online commercial map services are more or less a monopolistic market field. The process is complex and expensive and requires a vast level of knowledge. In a few years, Google has built up its online map services around Google Maps (2005) and is now a world power of cartography without any significant competition.

It is estimated that one billion people use the free online map services by Google. As geographic data or geographic access to information becomes more and more important, Google has set itself the target of measuring and locating not only the entire world, but also the ocean, the moon, and the universe. The company explains its intention, stating that the existing map material is not good enough or that no suitable material exists. The intention and production of good map material (especially for developing and emerging countries) is certainly justified; it is the monopoly behind the ambitious project that should be considered. Google Maps serves as an interface to Google's search engine, and the search queries provide Google with access to a huge data pool that allows them to build an immense archive of geo-referenced data. As a result, the company is continually expanding its position of supremacy and thereby possesses a data sovereignty. In times of big data, collecting and possessing data is linked to a power monopoly. Creating a good map from scratch requires a lot of knowledge and resources. The billion-dollar-strong Google (which, in addition to Apple, Microsoft, Amazon, and Facebook, Jaron Lanier includes in his Big Five; Lanier 2013) has the necessary infrastructure, finances, and competence.

As a result, the company not only improves its dominant position but ultimately also decides on the content of its maps. This data sovereignty is a critical distinction; British historian Jerry Brotton points out that Google keeps the codes on which its maps are based, secret. He puts it this way:

> For the first time in recorded history, a world view is being constructed according to information which is not publicly and freely available.[1].

This power is perhaps most clearly illustrated by the idea that anything not located on Google Maps does not exist. This is relevant insofar as maps are of increasing importance. It is estimated that more than half of the information on the Internet is already geo-referenced, meaning the content is located and localizable. Further, as noted by Gordon and De Souza e Silva:

> As localities become networked, maps serve as representations of those networks

1 Jerry Brotton, *A History of the World in 12 Maps* (New York: Penguin Books, 2012), 431.

(this is in addition to their function as tools)[2].

With the launch of driverless cars, the importance of geo-referenced data will become even more enhanced. According to Google itself, their existing maps are inadequate for the new technology because they lack detailed information.

An alternative to commercial online map services is the Commons project OpenStreetMap (OSM) (Arsanjani et al. 2015; Ramm, Topf, and Chilton 2011, amongst others). Commons are socially supported projects that use generally accessible resources and collaborative processes that lead to innovative solutions. They are characterized by the fact that they are based on participatory initiatives and managed and organized jointly (Helfrich and Bollier 2015). Commons models are also interesting because they are an alternative to data sovereignty and market-oriented monopolies. This data is open to all and free for use and further processing. Open data is an important prerequisite for the democratic use of the power of these algorithms[3]. The quality of the maps is so good that these are quite competitive with online map services (even if Google has a market share of 70%). Commons projects and open data are also therefore successful because they are based on the participation of users and are continually self-regulated, reworked, and improved upon.

The free online map OSM was founded by Steve Coast in 2004 and is based on the Wiki principle. The map content is created and brought together by the crowd and put to a cartography commons. Currently, there are about 3 million users (https://wiki.openstreetmap.org, accessed July 20, 2017). The user-generated content is collected via personal GPS-enabled devices such as smartphones, and then it is tagged and uploaded. In addition, satellite images are digitized, and existing materials are collected from public sources. The collected geo-referenced material is open source, meaning it can be used free of charge and license-free to create new maps (Open Data Commons and Open Database License; Ramthun 2012). Google also worked together with the crowd to create their maps. However, their Map Maker project (2008) was closed due to abuse. Today, Google decides what is added to their maps and what is not. Unlike Map Maker, OpenStreetMap works very well, having no commercial intent behind it, and the crowd is interested and motivated in pushing the project forward. Mapping commons are particularly successful in countries where there is no public material to purchase and the need for qualitative maps is significant.

Since the *Haiti Map*, free online maps have proved particularly valuable in disaster relief. After the severe earthquake and the powerful aid of a mapping commons, a Humanitarian OSM Team (HOT) was

2 Eric Gordon and Adriana de Souza e Silva, *Net Locality. Why Location Matters in a Networked World* (West Sussex: Wiley-Blackwell, 2011), 33.

3 Felix Stalder, *Kultur der Digitalität* (Berlin: Suhrkamp Verlag, 2016), 270.

founded for natural catastrophes and crisis situations. HOT is part of a growing global commons of volunteers who are entering geo-referenced data into maps using the principles of open source and open data sharing. Thus, free data helps to save lives or improve conditions in terms of lifestyles as well as work and living circumstances, especially after areas are affected by natural disasters or other crises like Ebola (Chapman 2015).

With the advent of mobile GIS web data as well as the support of appropriate devices, the interface becomes spatial and is transformed by a "graphic user interface as desktop to new metaphors of rooms, streets, cities and even the planet as a whole"[4]. Such interfaces require a networked system and social computing. Thus, the paradigm of communication and interaction of one person with their computer is transformed into a paradigm of communication and interaction with many[5]. Classical data structures in the form of lists are replaced by geo-referenced visualizations. Therefore, the map is used as an interface for finding, locating, and distributing information.

Such an interface is particularly effective for humanitarian OSM maps. The possibility of a user-centered interface is a boon for digital disaster relief. With the help of OSM, a detailed and effective free online map can be built by a decentralized crowd in a short time. Such an interface contains much greater levels of detailed information than other online maps like Google Maps. It can contain all the information that is particularly relevant to emergency teams after disasters: water points, sanitary facilities, road quality, fire hydrants, power grids, streetlights, and social facilities[6] . In this way, these maps differ greatly from existing online maps that contain only general topographic data as well as possibly commercial information (points of interest).

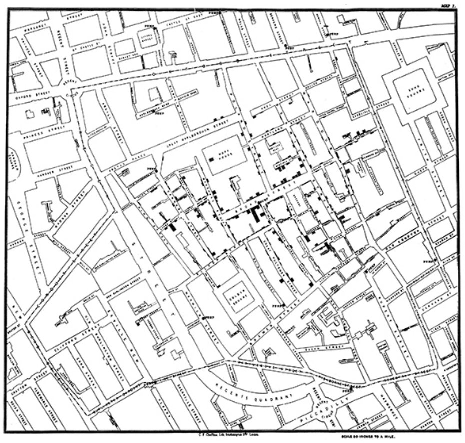
A very early example of a similar approach to that which HOT is doing now is the 1865 *Cholera Map* from the British physician John Snow (1813–1858). Snow noticed that the cholera epidemic that raged in London in 1854 occurred primarily in one district. Asking all the inhabitants of the district from which pump they accessed their water, he visualized the deaths on a map and was able to narrow down and locate the contaminated water pump on Broad Street. The map was primarily produced to spatialize information rather than provide information about a space. This was an important step in the history of cartography and a shift from mapping social information rather than purely geographic data. The

4 Marc Tuters and Michiel de Lange, "Executable Urbansims: Messing with Ubicomp's Singular Future," in *Locative Media. Medialität und Räumlichkeit. Multidisziplinäre Perspektiven zur Verortung der Medien*, eds. Regine Buschauer and Katharine S. Willis (Bielefeld: Transcript, 2013), 49.

5 Julie Woletz, Human-Computer Interaction. Kulturanthropologische Perspektiven auf Interfaces (Darmstadt: Büchner-Verlag, 2016), 61.

6 Kate Chapman, "Commoning in Katastrophenzeiten. Das OpenStreetMap-Team für humanitäre Einsätze," in *Die Welt der Commons: Muster gemeinsamen Handelns*, ed. Silke Helfrich, David Bollier, and Heinrich Böll Foundation (Bielefeld: Transcript, 2015), 203.

Cholera Map has been cited as an example by recent maps that show economic, social, and ecological connections, enabling a different kind of reading of the world.



Cholera Map
Source: Published by C.F. Cheffins, Lith, Southhampton Buildings, London, England, 1854 in Snow, John. On the Mode of Communication of Cholera, 2nd Ed, John Churchill, New Burlington Street, London, England, 1855.

Both the *Cholera Map* and the HOT projects were concerned with the visualization of data into maps to gain an overview and coordinate missions. In these times of geo-referenced data, digital maps, and social media, such a map can have an even greater impact. The *Haiti Map*, which was initiated by an individual in response to an emergency (Meier 2015), quickly developed into a commons project, where voluntary helpers were involved around the clock to create the map. With the support of the crowd, a project started by a single person grew within a few days to a professional tool serving as a master plan for coordinating humanitarian aid missions attempting to locate victims. The map was created on an Open Data Commons and supplied by SMS and tweeted (#Haiti and #Earthquake) messages to the volunteers from people outside of Port-au-Prince and victims inside the area. If a message could not be geo-referenced, satellite imagery was used to try to locate its point of origin. Within a short time, a globally acting crowd created a highly complex map without being on-site. The map was continuously updated, distributed, and shared via social media. For the first time in history, an area that was barely accessible after a disaster, and for which practically usable maps did not exist before, was quickly and effectively made clear for local helpers.

The transformation of the map into a digital interface medium has not only changed the use and aesthetics of maps, but has also caused a new spatial perception. As a result of the human-machine-space relationship and the presence of digital communication technology, hybrid spaces are created. Hybrid spaces are here understood to be the merging of a physical space with a digital service. Hybrid spaces are characterized by the fact that they are part of the physical world as well as part of a digital network. If the interface is understood as a medial space for interaction, the map changes to a medium between the user and the world around him and thus becomes a new paradigm. Since the map has become a digital interface, more and more users are looking for information on map-based services. This logic creates a new application where the map becomes an interface between us and the things that surround us, causing a shift of interaction—interaction with the environment is replaced by interaction with the map as an environment[7].

7 Christine Schranz, "Die Karte als Interface," in *Jahrbuch Immersive Medien. Interaktive Medien: Interfaces – Netze – Virtuelle Welten*, ed. Institut für immersive Medien (ifim) (Marburg: Schüren Verlag, 2017), 27–37, 28.

REFERENCES

Arsanjani, Jamal Jokar, Alexander Zipf, Peter Mooney, and Marco Helbich, eds. *OpenStreetMap in GIScience: Experiences, Research, and Applications*. Cham, Switzerland: Springer, 2015.

Brotton, Jerry. *Die Geschichte der Welt in zwölf Karten*. Translated by Michael Müller. Munich: C. Bertelsmann Verlag, 2014.

Brotton, Jerry. *A History of the World in 12 Maps*. New York: Penguin Books, 2012.

Chapman, Kate. "Commoning in Katastrophenzeiten. Das OpenStreetMap-Team für humanitäre Einsätze." In: *Die Welt der Commons: Muster gemeinsamen Handelns*, edited by Silke Helfrich, David Bollier, and Heinrich Böll Foundation, 200–203. Bielefeld: Transcript, 2015. http://band2.dieweltdercommons.de/index.html.

Gordon, Eric and Adriana de Souza e Silva. *Net Locality. Why Location Matters in a Networked World*. West Sussex: Wiley-Blackwell, 2011.

Helfrich, Silke, and David Bollier, eds. *Die Welt der Commons: Muster gemeinsamen Handelns*. Bielefeld: Transcript, 2015. http://band2.dieweltdercommons.de/index.html.

Lanier, Jaron. *Who owns the future?* London: Allen Lane, 2013.

Meier, Patrick. "The Rise of Digital Humanitarians." In: *Digital Humanitarians: How Big Data is Changing the Face of Humanitarian Response*, 1–22. Boca Raton, FL: CRC Press, 2015.

Ramm, Frederik, Jochen Topf, and Steven Chilton. *OpenStreetMap. Using and Enhancing the Free Map of the World*. Cambridge: UIT Cambridge, 2011.

Ramthun, Roland. "Offene Geodaten durch OpenStreetMap." In: *Open Initiatives. Offenheit in der digitalen Welt und Wissenschaft*, edited by Ulrich Herb, 159–184. Saarbrücken: Universaar, 2012.

Schranz, Christine. "Die Karte als Interface." In: *Jahrbuch Immersive Medien. Interaktive Medien: Interfaces – Netze – Virtuelle Welten*, edited by Institut für immersive Medien (ifim), 27–37. Marburg: Schüren Verlag, 2017.

Stalder, Felix. *Kultur der Digitalität*. Berlin: Suhrkamp Verlag, 2016.

Tuters, Marc, and Michiel de Lange. "Executable Urbansims: Messing with Ubicomp's Singular Future." In: *Locative Media. Medialität und Räumlichkeit. Multidisziplinäre Perspektiven zur Verortung der Medien*, edited by Regine Buschauer and Katharine S. Willis, 49–69. Bielefeld: Transcript, 2013.

Woletz, Julie. *Human-Computer Interaction. Kulturanthropologische Perspektiven auf Interfaces*. Darmstadt: Büchner-Verlag, 2016.

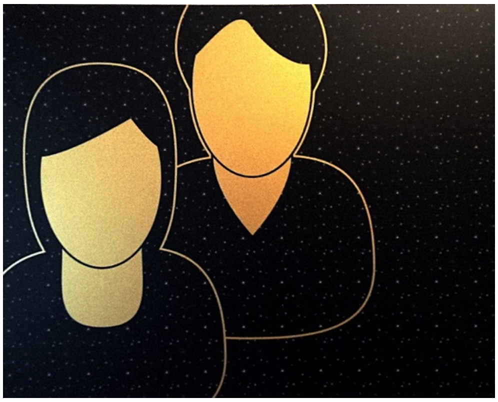
RICH USER EXPERIENCE, UX AND THE DESKTOPIZATION OF WAR

By Olia Lialina

"'Don't call them Icons,' the team leader encouraged her, 'call them User Experience!' And his laughter sunk in with everybody else's.."

This essay is based on a keynote given at the Interface Critique Conference, Berlin University of the Arts, November 7th 2014 and was first published online at http://contemporary-home-computing.org/RUE/ in 2015 and printed in: Lialina, Olia: "Rich User Experience, UX and the Desktopization of War", in: *Interface Critique*, Florian Hadler and Joachim Haupt, eds., Berlin: Kulturverlag Kadmos, 2016, 135-150.

Suggested citation: Lialina, Olia (2018 [2015]). "Rich User Experience, UX and the Desktopization of War." In *Interface Critique Journal Vol.1*. Eds. Florian Hadler, Alice Soiné, Daniel Irrgang
DOI: 10.11588/ic.2018.0.44737



Olia Lialina & Dragan Espenschied: "Rich User Experience" from the series With Elements of Web 2.0, 2006.

"If we only look through the interface we cannot appreciate the ways in which it shapes our experience"[1]

I'm talking as the Geocities Institute's Head of Research, an advocate for computer users' rights, and interface design teacher.

RUE

I've been making web pages since 1995, since 2000 I'm collecting old web pages, since 2004 I'm writing about native web culture (digital folklore) and the significance of personal home pages for the web's growth, personal growth and development of HCI.

So I remember very well the moment when Tim O'Reilly promoted the term Web 2.0 and announced that the time of Rich User Experience has begun. This buzzword was based on Rich Internet Applications, coined by Macromedia,2 that literally meant their Flash product. O'Reilly's RUE philosophy was also rather technical: The richness of user experiences would arise from of use of AJAX, Asynchronous Javascript and XML.

The web was supposed to become more dynamic, fast and "awesome," because many processes that users would have to consciously trigger before, started to run in the background. You didn't have to submit or click or even scroll anymore, new pages, search results and pictures would appear by themselves, fast and seamless. "Rich" meant "automagic" and … as if you would be using desktop software. As Tim O'Reilly states in September 2005 in blogpost What is Web 2.0?:[3] "We are entering an unprecedented period of user interface innovation, as web developers are finally able to build web applications as rich as local PC-based applications."[4]

But Web 2.0 was not only about a new way of scripting interactions. It was an opportunity to become a part of the

1 Gromala Bolter, *Windows and Mirrors* (Cambridge, MA: MIT Press, 2003).

2 Jeremy Allaire, "Macromedia Flash MX—A next-generation rich client," Macromedia whitepaper (San Francisco: Macromedia, 2002).

3 Tim O'Reilly, "What is Web 2.0," O'Reilly, 2005, http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html?page=5.

4 A decade later, when "the cloud" has become the symbol of power and the desktop metaphor is getting obsolete, this comparison looks almost funny. As this article seeks to demonstrate, the power of the desktop should not be underestimated.

internet also automagically. No need to learn HTML or register a domain or whatever, Web 2.0 provided pre-made channels for self expression and communication, hosting and sharing. No need anymore to be your own information architect or interface designer, looking for a way to deliver your message. In short: no need to make a web page.

The paradox for me at that time was that Rich User Experience was the name for a reality where user experiences were getting poorer and poorer. You wouldn't have to think about web or web specific activities anymore. Also, Web 2.0 was the culmination of approximately seven years of neglecting and denying the experience of web users—where experience is Erfahrung, rather than Erlebnis.[5] So layouts, graphics, scripts, tools and solutions made by naïve users were neither seen as a heritage nor as valuable elements or structures for professional web productions.

That's why designers of today are certain that responsive design was invented in 2010, mixing up the idea with coining the term; though it was there from at least 1994.

And it also explains why the book Designing for Emotion[6] from the very sympathetic series "books apart" gives advises how to build a project "from human to human" without even mentioning that there is much experience of humans addressing humans on the web that is decades old.

"Guess what?! I got my own domain name!" announces the proud user who leaves Geocities for a better place. – "So if you came here through a link, please let that person know they need to change their link!"

"If you take the time to sign my guest book I will e-mail you in return." writes another user in an attempt to get feedback. Well, this one might be more of an example for early gamification than emotional design, but this direct human to human communication–something current designers have the largest desire to create–is very strong.

A few days ago, my team at the Geocities Research Institute found 700 answers to the question "What did peeman pee on?" Peeman is an animated GIF created by an unknown author, widely used on "manly" neighborhoods of Geocities to manifest disgust or disagreement with some topic or entity, like a sports team, a band, a political party, etc., kind of a "dislike" button.

It isn't a particularly sophisticated way to show emotions or manifest an attitude, but still so much more interesting and expressive than what is available now: First of all, because it is an expression of a dislike, when today there is only an opportunity to like. Second, the statement lays outside of any scale or dualism: the dislike is not the opposite of a like. Third: it is not a button or function, it works only in combination with another graphic or word. Such a graphic needed to be made or found and collected, then placed in the right context on the page—all done manually.

5 Wiktionary explains the different possible meanings of "experience" in the English language.

6 Aaron Walter, *Designing for Emotion* (New York: A Book Apart, 2011).

I am mainly interested in early web amateurs because I strongly believe that the web in that state wasthe culmination of the Digital Revolution.[7]
And I don't agree that the web of the 1990's can just be considered as a short period before we got real tools, an exercise in self-publishing before real self-representation. I'd like to believe that 15 years of not making web pages will be classified as a short period in the history of the WWW.

There are a few initiatives right now supporting my observation that home page culture is having a second come back, this time on a structural rather than just visual level.[8]

- neocities.org – free HTML design without using templates.
- tilde.club – as the above, plus URLs as an expression of users belonging to a system; and web-rings as an autonomy in hyper linking.
- superglue.it – "Welcome to my home page" taken to the next level, by hosting your home page at your actual home.

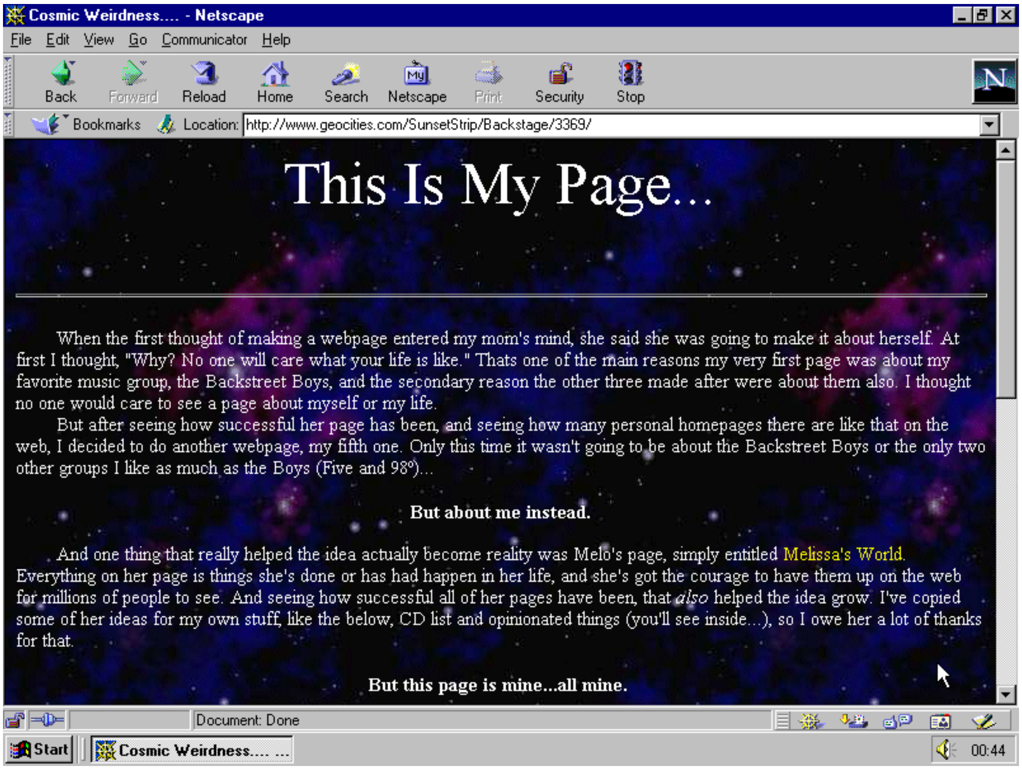
* * *

I had the chance to talk at the launch of superglue.it at WORM in Rotterdam a month ago. Five minutes before the event, team members were thinking who should go on stage. The graphic designer was not sure if she should present. "I've only made icons," she said. "Don't call them Icons," the team leader encouraged her, "call them User Experience!" And his laughter sunk in with everybody else's.

EXPERIENCE DESIGN AND USER ILLUSION

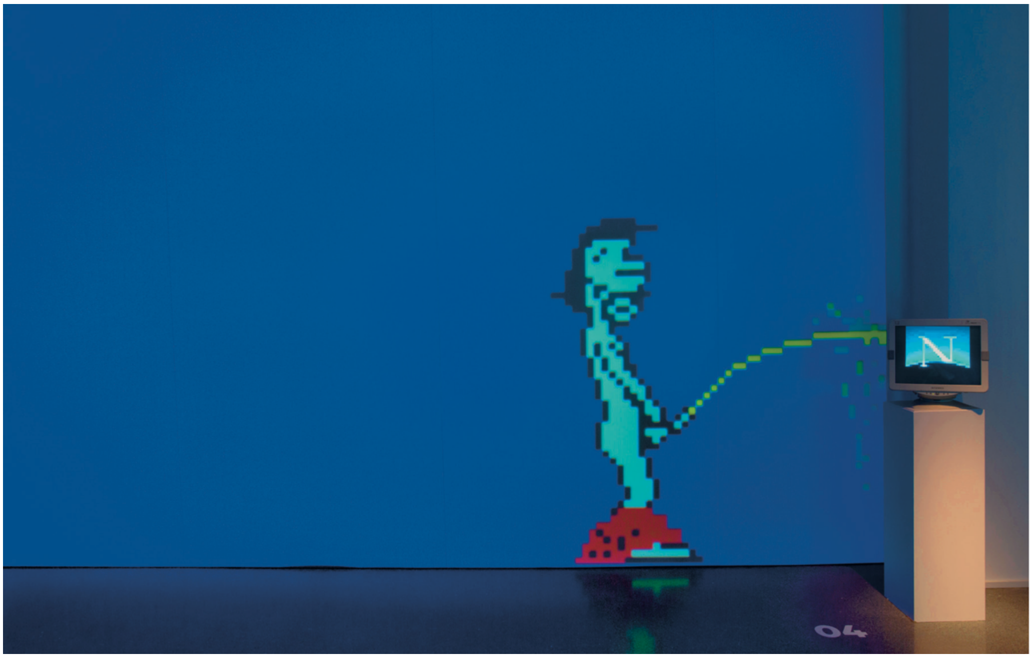
We laughed because if you work in new media design today, you hear and read and pronounce this word every day. Rich User Experience maybe was a term that kept its proponents and critics busy for some time, but it never made it into mainstream usage, it was always overshadowed by Web 2.0.
With User Experience (UXD, UX, XD) it is totally different:
The vocabulary of HCI, Human Computer Interaction design, that has been only growing since its inception, keeps shrinking since two years. Forget, input and output, virtual and augmented, focus and context, front-end and back-end, forms, menus and icons.

7 … as opposed to Chris Anderson and Michael Wolff, "The Web Is Dead. Long Live the Internet," *Wired*, last modofoed August 17, 2010, https://www.wired.com/2010/08/ff_webrip/all/1/.
8 The first comeback was around five years ago when designers started to pay attention to elements of the early web: animated GIFs, under construction signs. See Olia Lialina, "Geocities as Style and Marketing Gimmick @divshot," One Terabyte of Kilobyte Age, April 4, 2013, http://blog.geocities.institute/archives/3844.



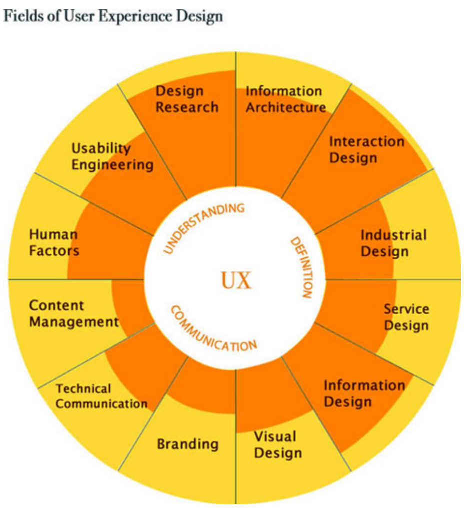
Homepage, last modified 1999-07-15 17:43:15, from the Geocities Research Institute collection

Peeman as seen in the exhibition "Digitale Folklore", Dortmund, 2015.



This all is experience now. Designers and companies who were offering web/interface solutions a year ago are now committed to UX.

Former university media design departments are becoming UX departments. The word interface is substituted by experience in journalistic texts and conference fliers. WYSIWYG becomes "complete drag and drop experience," as a web publishing company just informed me in an email advertising their new product.[9]



Source: Elizabeth Bacon, Defining UX, Devise Consulting, 2014-01-28.

UX is not new, the term is fully fledged. It was coined by Don Norman in 1993 when he became a head of Apple's research group: "I invented the term because I thought human interface and usability were too narrow. I wanted to cover all aspects of the person's experience with the system including industrial design graphics, the interface, the physical interaction and the manual."[10]

Recalling this in 2007, he added: "Since then the term has spread widely, so that it is starting to lose its meaning." Other prophets are complaining for years already that not everybody who calls themselves "experience designer" actually practices it.

This is business as usual, terms appear, spread, transform, become idioms; the older generation unhappy with the younger one, etc. I don't bring this up to distinguish "real" and "fake" UX designers.

I'm concerned about the design paradigm that bears this name at the moment, because it is too good at serving the ideology of Invisible Computing. As I argued in Turing Complete User,[11] the word "experience" is one of three words used today referring to the main actors of HCI:

HCI	UX
Computer	Technology
Interface	Experience
Users	People

9 Weebly, Inc., "Introducing Weebly for iPad," Weebly newsletter, received by author on November 16, 2014.

10 Peter Merholz, "Peter in Conversation with Don Norman About UX & Innovation," Adaptive Path, last modified December 13, 2007, http://adaptivepath.org/ideas/e000862/.

11 Olia Lialina, "Turing Complete User," October 2012, http://contemporary-home-computing.org/turing-complete-user/.

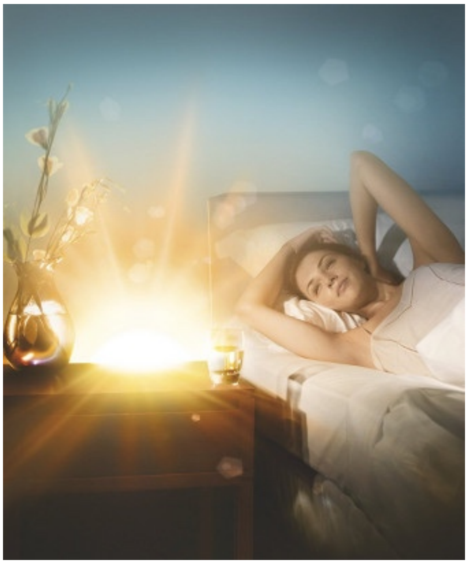
The role of "experience" is to hide programmability or even customizability of the system, to minimize and channel users' interaction with the system.

"User illusion" was a main principle of interface designers since XEROX PARC, since the first days of the profession. They were fully aware about creating illusions, of paper, of folders, of windows. UX creates an illusion of unmediated natural space.[12]

UX covers holes in Moore's Law; when computers are still bigger than expected, it can help to shrink them in your head. UX fills awkward moments when AI fails. It brings "user illusion" to a level where users have to believe that there is no computer, no algorithms, no input. It is achieved by providing direct paths to anything a user might want to achive, by scripting the user[13] and by making an effort on audiovisual and aesthetic levels to leave the computer behind.

The "Wake-up Light" by Philips is an iconic object that is often used as an example of what experience design is. It is neither about its look nor interaction, but about the effect it produces: a sunrise. The sunrise is a natural, glorious phenomenon, as opposed to artificial computer effects created from pixels, or, let's say, the famous rain of glowing symbols from The Matrix. Because an experience is only an experience when it is "natural."

There is no spoon. There is no lamp.



Source: Philips' promotional image for Wake-up Light, 2010, lifted from Amazon.

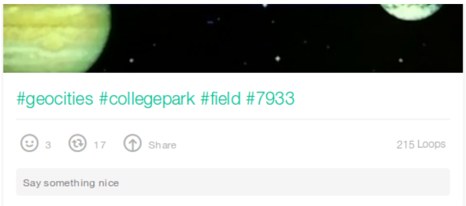
When Don Norman himself describes the field, he keeps it diplomatic: "[W]e can design in the affordances of experiences, but in the end it is up to the people who use our products to have the experiences."[14]—Of course, but affordances are there to align the users' behaviors with a direct path. So it is not really up to the "people," but more up to the designer.

12 Alan Kay, "User Interface: A Personal View," in *The Art of Human-Computer Interface Design*, eds. Brenda Laurel and S. Joy Mountford (Reading, MA: Addison Wesley 1990), 191–207.

13 Janet Murray, *Hamlet on the Holodeck* (New York: The Free Press, 1997). In later editions of the book and her recent writings she refers to this concept as scripting the interactor.

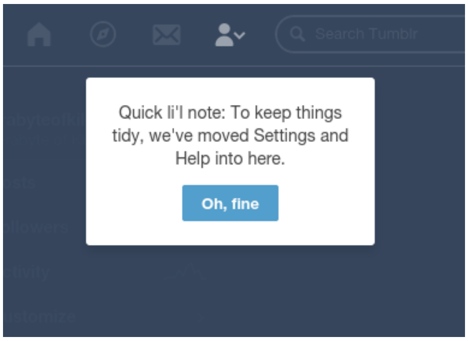
14 Donald A. Norman, "Commentary on: Hassenzahl, Marc (2014): User Experience and Experience Design," in *The Encyclopedia of Human-Computer Interaction*, 2nd edition, eds. Mads Soegaard and Rikke Friis Dam (Aarhus: The Interaction Design Foundation, 2014), https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/user-experience-and-experience-design.

One of the world's most convincing experience design proponents, Marc Hassenzahl, clearly states: "We will inevitably act through products, a story will be told, but the product itself creates and shapes it. The designer becomes an 'author' creating rather than representing experiences."[15]
That's very true. Experiences are shaped, created and staged. And it happens everywhere:
On vine, when commenting on another user's video, you are not presented with an empty input form, but are overwriting the suggestion "say something nice."



Screenshot of vine.co, taken 2015-01-02.

On Tumblr, a "close this window" button becomes "Oh, fine." I click it and hear the UX expert preaching: "Don't let them just close the window, there is no 'window,' no 'cancel' and no 'OK.' People should greet the new feature, they should experience satisfaction with every update!"
As the Nielsen Norman Group puts it: "User experience design (UXD or UED) is the process of enhancing user satisfaction by improving the usability, ease of use, and pleasure provided in the interaction between the user and the product."[16]



Screenshot of tumblr.com, taken 2014-12-28.

Such an experience can be orchestrated on a visual level: In web design, video backgrounds are masterly used today to make you feel the depth, the bandwidth, the power of a service like airbnb, to bring you there, to the real experience. On the structural level, a good example is how facebook three years ago changed you tool for everyday communication into a tool to tell the story of your life with their "timeline."
You experience being heard when Siri got a human voice, and an ultimate experience when this voice is calm, whatever happens. (The only thing that actually ever happens is SIRI not understanding what you say, but she is calm!)
You experience being needed and loved when you hold PARO, the most sold lovable robot in the world, because it has big eyes that look into your eyes. And you can pet its nice fur. Though smart algorithms, lifelike

15 Ibid.
16 The Nielsen Norman Group's defintion of User Experience dates back to December 1998, http://web.archive.org/web/19981201051931/http://www.nngroup.com/about/userexperience.html.

appearance and behavior alone wouldn't suffice to not make users feel like consumers of a manufactured programmable system.
Critics of AI like Sherry Turkle warn that we must see and accept machines' "ultimate indifference,"[17] but today's experience designers know how to script the user to avoid any gaps in the experience. There is no way to get out of this spectacle. When PARO is out of battery, it needs to be charged via a baby's dummy plugged into its mouth. If you possess this precious creature, you experience its lifelines even when it is just a hairy sensors sandwich.

Source: PARO Robots, Robo Japan 2008 exhibition.

This approach leads to some great products on screen and IRL, but alienates as well. Robotics doesn't give us a chance to fall in love with the computer if it is not anthropomorphic. Experience design prevents from thinking and valuing computers as computers, and interfaces as interfaces. It makes us helpless. We lose an ability to narrate ourselves and—going to a more pragmatic level—we are not able to use personal computers anymore.
We hardly know how to save and have no idea how to delete. We can't UNDO!

* * *

UNDO was a gift from developers to users, a luxury a programmable system can provide. It became an everyday luxury with the first GUI developed at Xerox[18] and turned into a standard for desktop operating systems to follow. Things changed only with the arrival of smart phones: neither Android nor Windows phone nor Blackberry provide a cross-application alternative to CTRL+Z. iPhones offer the embarrassing "shake to undo."
What is the reasoning of these devices' developers?
Not enough space on the nice touch surface for undo button; the idea that users should follow some exact path along the app's logic, which would lead somewhere anyway; the promise that the experience is so smooth that you won't even need this function.

Should we believe it and give up? No!
There are at least three reasons why to care about UNDO:

1. UNDO is one of very few generic ("stupid") commands. It follows a convention without

17 Sherry Turkle, Alone Together. *Why We Expect More from Technology and Less from Each Other* (New York: Basic Books, 2011), 133.

18 Butler Lampson and Ed Taft, *Alto User's Handbook*, (Palo Alto: Xerox Corporation, 1979), 36.

sticking its nose into the user's business.

2. UNDO has a historical importance. It marks the beginning of the period when computers started to be used by people who didn't program them, the arrival of the real user[19], and the naive user. The function was first mentioned in the IBM research report Behavioral Issues in the Use of Interactive Systems:[20] They outlined the necessity to provide future users with UNDO: "the benefit to the user in having—even knowing—of a capability to withdraw a command could be quite important (e.g, easing the acute distress often experienced by new users, who are worried about 'doing something wrong')."

3. UNDO is the border-line between the Virtual and the Real World everybody is keen to grasp. You can't undo IRL. If you can't undo it means you are IRL or on Android.

* * *

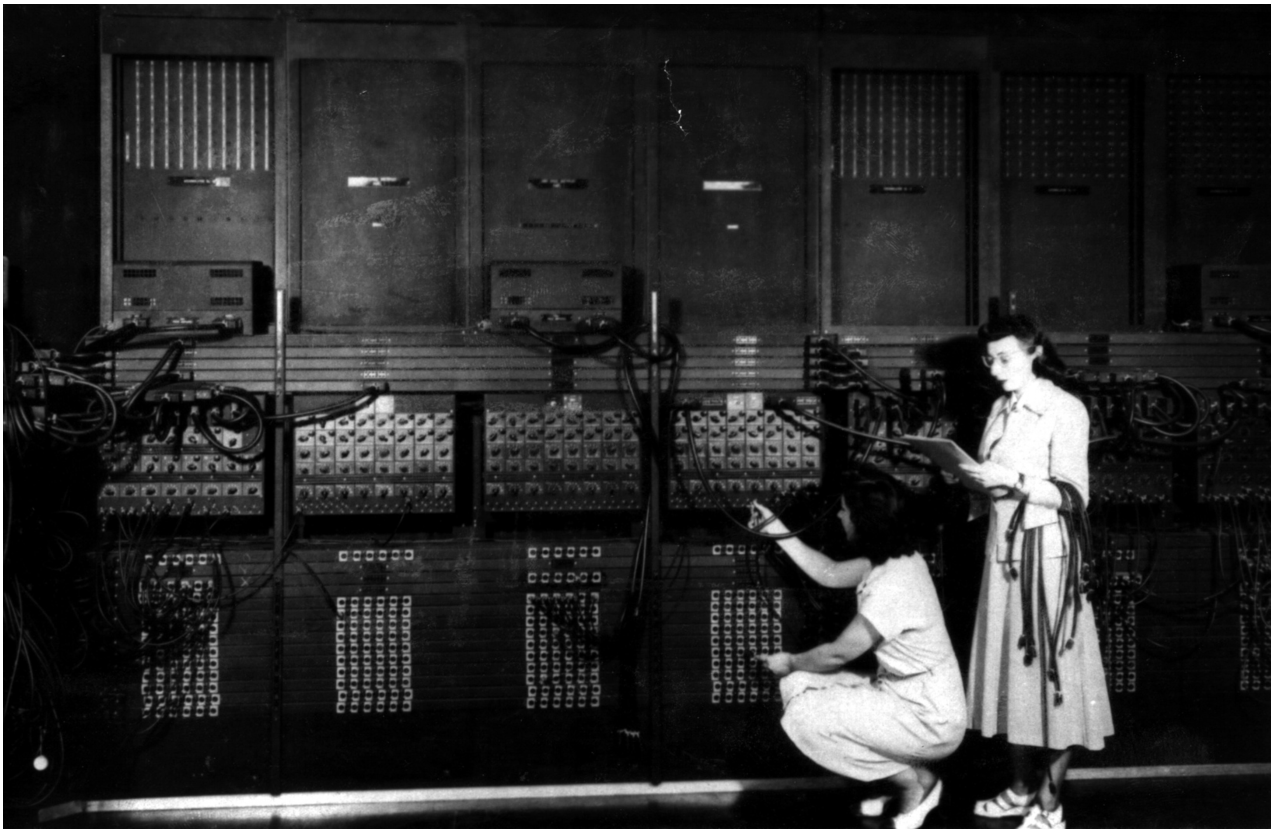
In August 2013, The Guardian received an order to destroy the computer on which Snowden's files were stored. In mass media we saw explicit pictures of damaged computer parts and images of journalists executing drives and chips and heard Guardian's Editor in Chief saying: "It's harder to smash up a computer than you think." And it is even harder to accept it as a reality.
For government agencies, the destruction of hardware is a routine procedure. From their perspective, the case of deletion is thoroughly dealt with when the media holding the data is physically gone. They are smart enough to not trust the "empty trash" function.

Of course the destruction made no sense in this case, since copies of the files in question were located elsewhere, but it is a great symbol for what is left for users to do, what is the last power users have over their systems: They can only access them on the hardware level, destroy them. Since there is less and less certainty of what you are doing with your computer on the level of software, you'll tend to destroy your hard drive voluntarily every time you want to really delete something.

Classic images of the first ever computer ENIAC from 1945 show a system maintained by many people who rewire or rebuild it for every new task. ENIAC was operated on the level of hardware, because there was no software. Can it be that this is the future again?

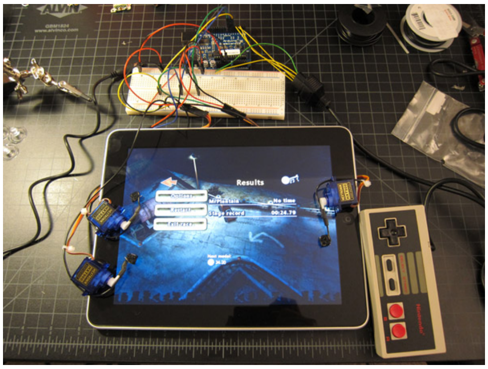
19 See Olia Lialina, "Users Imagined," appendix to: "Turing Complete User", October 2012, http://contemporary-home-computing.org/turing-complete-user/.

20 Lance A. Miller and John C. Thomas Jr., "Behavioral issues in the use of interactive systems," in *Interactive Systems. IBM 1976. Lecture Notes in Computer Science, vol 49*, eds. A. Blaser and C. Hackl (Berlin, Heidelberg: Springer 1977), 193–216.



Source: Frank da Cruz: Programming the ENIAC, 2003
http://www.columbia.edu/cu/computinghistory/eniac.html

In 2011, 66 years after ENIAC, ProtoDojo showcased a widely celebrated "hack" to control an iPad with a vintage NES video game controller. The way to achieve this was to build artificial fingers, controlled by the NES joypad, to touch the iPads surface; modifying the hardware from the outside, because everything else, especially the iPad's software, is totally inaccessible.



Source: Protodojo: RoboTouch iPad Controller, 2011-08-21.

Every victory of experience design: a new product "telling the story," or an interface meeting the "exact needs of the customer, without fuss or bother" widens the gap in between a person and a personal computer.
The morning after "experience design:" interface-less, deposible hardware, personal hard disc shredders, primitive customization via mechanical means, rewiring, reassembling, making holes into hard disks, in order to to delete, to logout, to "view offline."

* * *

Having said that, I'd like to add that HCI designers have huge power, and seem unaware about it often. Many of those who design interfaces never studied interface design, many of those who did didn't study its history, never read Alan Kay's words about creating the "user illusion," didn't question this paradigm and didn't reflect on their own decisions in this context. And not only interface designers should be educated about their role, but it should be discussed and questioned which tasks can be delegated to them in general. Where are the borders of their responsibilities?

COMBAT STRESS AND THE DESKTOPIZATION OF WAR

In 2013, Dr. Scott Fitzsimmons and MA graduate Karina Sangha published the paper Killing in High Definition. They rose the issue of combat stress among operators of armed drones (Remote Piloted Aircrafts) and suggested ways to reduce it. One of them is to Mask Traumatic Imagery.
To reduce RPA operator
s' exposure to the stress-inducing traumatic imagery associated with conducting airstrikes against human targets, the USAF should integrate graphical overlays into the visual sensor displays in the operators' virtual cockpits.

These overlays would, in real-time, mask the on-screen human victims of RPA airstrikes from the operators who carry them out with sprites or other simple graphics designed to dehumanize the victims' appearance and, therefore, prevent the operators from seeing and developing haunting visual memories of the effects of their weapons.

I had students of my interface design class read this paper. I asked them to imagine what this masking could be. After hesitation to even think in this direction, their first draft were alluding to the game SIMS:

Of course the authors of this paper are not ignorant or evil. A paragraph below the quoted one they state that they're aware that their ideas could be read as advocacy for a "play station mentality," and note that RPA operators don't need artificial motivation to kill, they know what they are doing. To sum it up, there is no need for a gamification of war, it is not about killing more but about feeling fine after the job is done.

I think that this paper, its attitude, this call to solve immense psychiatric task on the level of the interface made me see HCI in a new light.

Since the advent of the Web, new media theoreticians were excited about convergence: you have the same interface to shop, to chat, to watch a film … and to launch weapons, I could continue now. It wouldn't be really true, drone operators use other interfaces and specialized input devices. Still, as on the image above, they are equipped with the same operating systems running on the same monitors that we use at home and the office.

But this is not the issue, the convergence we can find here is even more scary: the same interface to navigate, kill and to cure post traumatic stress.

Remember Weizenbaum reacting furiously to Colby's plans of implementing the Eliza chatbot in actual psychiatric treatments? He wrote: "What must a psychiatrist think he is doing while treating a patient that he can view the simplest mechanical parody of a single interviewing technique as having captured anything of the essence of a human encounter."[21] Weizenbaum was not asking for better software to help curing patients, he was rejecting the core idea to use algorithms for this task.

21 Josef Weizenbaum, "From Judgement to Calculation [1976]," in *The New Media Reader*, eds. Noah Wardrip-Fruin and Nick Montfort (Cambridge, MA: MIT Press, 2003), 370.

Michael Shoemaker: MQ-9 Reaper training mission from a ground control station on Holloman Air Force Base, N.M., 2012

It is an ethical rather than a technical or design question, just like the masking of traumatic imagery is now.

If we think about the current state of the art in related fields, we see on the technological level everything is already in place for the computer display acting as a gun sight and at the same time as a psychotherapist coach.

- There are tests to cure PTSD in virtual reality, and studies that report about successes. So there is believe in VR's healing abilities.[22]

- There are a lot of examples around in gaming and mobile apps proving that the real world can be augmented with generated worlds in real time.[23]

- There is experience in simplification of the real—or rather too real—images, like in the case of airport body scanners.[24]

- And last but not least there is a tradition of roughly seven years of masking objects, information and people on Google Maps: This raises the issue of banalization of masking as a process. For example, to hide military bases, Google's designers use the "crystallization" filter, known and available to everyone, because it is a default filter in every image processing software. So the act of masking doesn't appear as an act that could rise political and ethical questions, but as one click in Photoshop.[25]

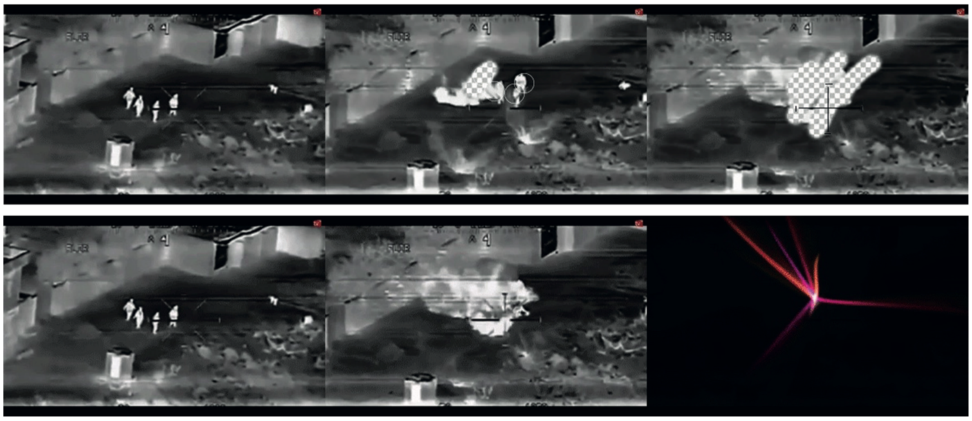
Those preconditions, especially the last one, made me think that something more dangerous than the gamification of war can happen, namely the desktopization of war. (It has already arrived on the level of commodity computing hardware and familiar consumer operating systems.) It can happen when experience designers will deliver interfaces to pilots that would

22 PBS' "Frontline" series covered a few projects: Interview with Albert Rizzo, leader of Virtual Reality Exposure Therapy at the USC Institute for Creative Technologies since 2005, Frontline, last modified February 2, 2010, http://www.pbs.org/wgbh/pages/frontline/digitalnation/waging-war/immersion-training/stress-inoculation.html?play. Interview with P.W. Singer, Frontline, last modified February 2, 2010, http://www.pbs.org/wgbh/pages/frontline/digitalnation/waging-war/immersion-training/virtual-training.html?play. Report on a Sargeant going through VR assiset PTSD therapy, Frontline, last modified February 2, 2010, http://www.pbs.org/wgbh/pages/frontline/digitalnation/virtual-worlds/health-healing/a-soldiers-therapy-session.html?play.

23 Since 2011, Nintendo's handheld video game systems series 3DS features a built-in game called "Face Raiders" that mixes live camera, user photos and 3D graphics.

24 See: Tom McGhie, "Boffins design 'modest' naked airport scan," Time is Money, last modified November 21, 2010, http://www.thisismoney.co.uk/money/news/article-1708293/Boffins-design-modest-naked-airport-scan.html. Manchester Airport press release on body scanners, Manchester Airport, unknown date, http://www.manchesterairport.co.uk/guides-to-travelling/security/body-scanners/.

25 Crystallized NATO Airbase Geilenkirchen on Google Maps, https://www.google.com/maps/@50.9600013,6.028254,1213m/data=!3m1!1e3.



Eraser Tool by Madeleine Sterr.
Screen Saver by Monique Baier.

complete the narrative of getting things done on your personal computer; to deliver the feeling that they are users of a personal computer and not soldiers, by merging classics of direct manipulation with real time traumatic imagery, by substituting the gun sight with a marquee selection tool, by “erasing” and “scrolling” people, by “crystallizing” corpses or replacing them with “broken image” symbols, by turning on the screen saver when the mission is complete.

We created these drafts in the hope of preventing others from thinking into this direction.
Augmented Reality shouldn’t become Virtual Reality. On a technical and conceptual level, interaction designers usually follow this rule, but when it comes to gun sights it must become an ethical issue instead.
Experience designers should not provide experiences for gun sights. There should be no user illusion and no illusion of being a user created for military operations. The desktopization of war shouldn’t happen. Let’s use clear words to describe the roles we take and the systems we bring to action:

War	**UX**	**HCI**
Gun	Technology	Computer
Gun Sight	Experience	Interface
Soldiers	People	Users

* * *

I look through a lot of old (pre RUE) homepages every day, and see quite some that are made to release stress, to share with cyberspace what the authors can't share with anybody else, sometimes it is noted that they were created after direct advice of a psychoterapist. Pages made by people with all kinds of different backgrounds, veterans among them. I don't have any statistics about if making a home page ever helped anybody to get rid of combat stress, but I can't stop thinking of drone operators coming back home in the evening, looking for peeman.gif in collections of free graphics, and making a homepage.

They of course should find more actual icons to pee on. And by any means tell their story, share their experiences and link to pages of other soldiers.

REFERENCES

A. Miller, Lance and John C. Thomas Jr. “Behavioral issues in the use of interactive systems.” In: *Interactive Systems. IBM 1976. Lecture Notes in Computer Science*, vol 49, edited by A. Blaser and C. Hackl, 193–216. Berlin, Heidelberg: Springer 1977.

Allaire, Jeremy. “Macromedia Flash MX—A next-generation rich client.” Macromedia whitepaper. San Francisco: Macromedia, 2002.

Anderson, Chris and Michael Wolff. “The Web Is Dead. Long Live the Internet.” In: *Wired*. Last modified August 17, 2010. https://www.wired.com/2010/08/ff_webrip/all/1/.

Bolter, Gromala. *Windows and Mirrors* Cambridge, MA: MIT Press, 2003.

Kay, Alan. “User Interface: A Personal View.” In: *The Art of Human-Computer Interface Design*, edited by Brenda Laurel and S. Joy Mountford, 191–207. Reading, MA: Addison Wesley 1990.

Lampson, Butler and Ed Taft. *Alto User’s Handbook*. Palo Alto: Xerox Corporation, 1979.

Lialina, Olia. “Geocities as Style and Marketing Gimmick @divshot.” *One Terabyte of Kilobyte Age*. Last modified April 4, 2013. http://blog.geocities.institute/archives/3844.

Lialina, Olia. “Turing Complete User.” Last modified October 2012. http://contemporary-home-computing.org/turing-complete-user/.

Lialina, Olia. “Users Imagined,” appendix to: “Turing Complete User.” Last modified October 2012. http://contemporary-home-computing.org/turing-complete-user/.

Manchester Airport. Press release on body scanners. Unknown date. http://www.manchesterairport.co.uk/guides-to-travelling/security/body-scanners/.

McGhie, Tom. “Boffins design ‘modest’ naked airport scan.” Time is Money. Last modified November 21, 2010. http://www.thisismoney.co.uk/money/news/article-1708293/Boffins-design-modest-naked-airport-scan.html.

Merholz, Peter. “Peter in Conversation with Don Norman About UX & Innovation.” Adaptive Path. Last modified December 13, 2007. http://adaptivepath.org/ideas/e000862/.

Murray, Janet. *Hamlet on the Holodeck*. New York: The Free Press, 1997.

Nielsen Norman Group. Definition of User Experience (December 1998), http://web.archive.org/web/19981201051931/http://www.nngroup.com/about/userexperience.html.

Norman, Donald A. “Commentary on: Hassenzahl, Marc (2014): User Experience and Experience Design.” In: *The Encyclopedia of Human-Computer Interaction*, 2nd edition, edited by Mads Soegaard and Rikke Friis Dam. Aarhus: The Interaction Design Foundation, 2014. https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/user-experience-and-experience-design.

O’Reilly, Tim. “What is Web 2.0.” O’Reilly. Last modified 2005. http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html?page=5.

Turkle, Sherry. *Alone Together. Why We Expect More from Technology and Less from Each Other*. New York: Basic Books, 2011.

Walter, Aarron. *Designing for Emotion*. New York: A Book Apart, 2011.

Weebly, Inc. “Introducing Weebly for iPad.” Weebly newsletter, received by author on November 16, 2014.

Weizenbaum, Josef. “From Judgement to Calculation [1976].” In: *The New Media Reader*, edited by Noah Wardrip-Fruin and Nick Montfort. Cambridge, MA: MIT Press, 2003.

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Jany, Susanne. "Operative Räume. Prozessarchitekturen im späten 19. Jahrhundert." *Zeitschrift für Medienwissenschaft: Medien/Architekturen* 12, no. 1 (2015), 33–43.

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Andersen, Christian Ulrik and Søren Pold. *The Metainterface – The Art of Platforms, Cities and Clouds*. Cambridge, MA and London, England: MIT Press, 2018.

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Selected Publications:
Shapiro, Alan N. "Towards a Software of the Concealing World." In *Tracelation*, edited by Tyyne Claudia Pollmann. Berlin: Archive Books, 2017.
Shapiro, Alan N. "Light-Writing in Las Vegas." (photo-essay) In *Nevertheless. 17 Manifestos,* edited by Andrea Sick. Hamburg: Textem Verlag, 2018.

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Mangold, Michael, Peter Weibel, Julie Woletz, eds. *Vom Betrachter zum Gestalter. Neue Medien in Museen – Strategien, Beispiele und Perspektiven für die Bildung.* Baden-Baden: Nomos, 2007. (2nd revised edition forthcoming in 2018)

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Selected Publications:
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Hadler, Florian; Haupt, Joachim, eds. *Interface Critique*. Berlin: Kulturverlag Kadmos, 2016.
Hadler, Florian. *G-Geheimnis,* Kleiner Stimmungsatlas in Einzelbänden. Hamburg: Textem, 2014.

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Selected Publications:
Irrgang, Daniel. *Vom Umkehren der Bedeutungsvektoren. Prototypen des technischen Bildes bei Vilém Flusser*. International Flusser Lectures. Cologne: Verlag der Buchhandlung Walther König, 2017.
Irrgang, Daniel, and Florian Hadler, eds. *Zur Genealogie des MedienDenkens.* Berlin: Kulturverlag Kadmos, 2017.

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ISBN 978-3-946653-91-2