NODE: "AFTER THE POST-TRUTH"

From object to process
Interface politics of networked computerization

Jan Distelmeyer
University of Applied Sciences Potsdam
University of Potsdam

Recommended citation

Abstract

One of the most difficult tasks today is trying to grasp the presence of computing. The almost ubiquitous and diverse forms of networked computers (in all their stationary, mobile, embedded, and autonomous modes) create a nearly overwhelming complexity. To speak of what is here evading and present at the same time, the paper proposes to reconsider the concept of interface, its historical roots, and its heuristic advantages for an analysis and critique of the current and especially everyday spread of computerization.

The question of interfaces leads to isolable conditions and processes of conduction, as well as to the complexity of the cooperation formed by them. It opens both an investigative horizon and a mode of analysis, which always asks for further interface levels involved in the phenomenon I am currently investigating. As an example, the paper turns to the displacement of the file with the launch of the iPhone in 2007 and its comeback in 2017 with the "Files" apps.

artnodes

Both developments are profoundly related to the establishment of computers as permanently networked machines, whereby their functionality, depresentations, and ideology come into focus.

Keywords

interface, conduction, network, ideology, depresentation, digital objects

Del objeto al proceso
Interfaz política de informatización en red

Resumen

Actualmente, una de las tareas más difíciles es intentar entender la presencia de la informática. La forma prácticamente ubicua y diversa de los ordenadores en red en todos sus formatos (de sobremesa, portátil, integrado y autónomo) crea una complejidad prácticamente abrumadora. Para hablar de la complejidad de lo que aquí se escapa y está presente a la vez, el artículo propone reconsiderar del concepto de interfaz, sus raíces históricas y sus ventajas heurísticas para el análisis y crítica de la difusión actual y, en especial cotidiana, de la informatización.

La cuestión de las interfaces lleva hasta procesos y estados aislados de conducción, así como hasta la complejidad de la cooperación que las conforma. Asimismo, abre a la vez un horizonte de investigación y un modo de análisis, que siempre exige más niveles de interfaz implicados en el fenómeno que investigo actualmente. Como ejemplo, el artículo habla del desplazamiento del archivo en el lanzamiento del iPhone en 2007 y su recuperación en 2017 con la aplicación "Archivos". Ambos desarrollos están íntimamente relacionados con la creación de ordenadores como máquinas permanentemente interconectadas, donde se centra la atención en su funcionalidad, depresentaciones e ideología.

Palabras clave

interfaz, conducción, red, ideología, depresentación, objetos digitales

Paradoxically, one of the most difficult tasks today is trying to grasp the presence of computing. In particular given their networked condition, the almost ubiquitous and diverse forms of computers (in all their stationary, mobile, embedded, and sensing modes) create a nearly overwhelming complexity. Different concepts and notions try to describe this reality – among them for instance "the stack" (Bratton 2016), the algorithm in "algorithmic governmentality" (Rouvroy and Stiegler 2016), the "technosphere" (Hörl 2017), and the "implication" (Hansen 2015, 580-629) of an allegedly all-encompassing technological ecology. To an important extent this complexity is the result of the fact that it is based both on observable hardware and on electrified and ultimately unobservable processes: on running software and programmatic relations. Since the very beginning of the "'electronic computer' or 'digital computer'" (Turing 1950, 436) as a "really all-purpose automatic digital computing system" (Neumann 1975, 363) it has been necessary to mediate between the machine's calculation processes and the triggers or results of these processes as input or output.

The ever increasing diversity and spread of this coupling has different consequences; exemplified among others by the obvious presence and device handling (visible for example in the distribution of mobile computers such as smartphones and tablets) and at the same time by the implementation of comparatively hidden processes of sensing, calculation and conduction (emphasized for instance in relation to big data analyses, smart cities and machine learning). To speak of the complexity of what is evasive and present here at the same time, I would like to propose to reconsider the concept of interface, its historical roots, and its heuristic advantages for an analysis and critique of the current and in particular everyday spread of computerization.

I.

Interfaces create and allow for connections and transfer processes in different, mutually related forms: Connections and transfer processes between hardware and hardware, software and hardware, software and software, and, finally, between those interconnected hardware-software relations and everything that is not a computer – humans,

other living beings, things, environments and so forth (see Cramer and Fuller 2008). Interfaces constitute the complex of connections and processes that both enable these machines to fulfil their promise of being a "general-purpose electronic computer" (Burks and Burks 1981, 310) and establish the connections we call networks. These different interface layers and processes are not only intertwined, they also share an indispensable basis: the conduction of electricity which enables signals to be transferred.

The history of the term interface started with exactly such processes (see Hookway 2014, 59-119). It was introduced in late 19th century by the physicists James and William Thomson (later Lord Kelvin) to "describe forms of connection found in nature and industry" (Schaefer 2011, 164), to describe the conduction of energy. Driven by the interest in "interfaces between media of different conductivity" (Smith and Wise 1989, 212), William Thomson wrote to George Gabriel Stokes in 1884: "By 'interfacial wave', I mean a wave which runs along the interface, and of which the amplitude diminishes logarithmically according to distance from the interface in each or either medium" (Wilson 1990, 575).

William Thomson's contribution to the research on electricity and thermodynamics led, among other things, to his famous work with the transatlantic telegraph. Today the term interface allows us to describe the computer's 'interior telegraphy' (Winkler 2015, 294) (its inner processuality and conduction of signals), as well as its connections and networks (its exterior telegraphy), its embeddedness (in bodies and things), and its relations to us in the form of dealing with user interfaces, for example. Thus, in contrast to terms that aim at mathematical rules (algorithms) or a deliberately general description of global effects (technosphere, ecology, implication, stack), the concept of interface, with its specific intricacy and history, requires us to keep an eye on different levels as well as their relationships to one another.

With this in mind, I would like to accentuate four types of mutually dependent interface operations:

1. Operations of the various interrelations between hardware and software ensuring that these machines can fulfil their tasks.
2. Operations of the correlation of several computers, leading to further co-action of hardware and software by protocol-driven networks.
3. Operations of the connections (and processes of controlling/sensing) between computers and non-computer forms of interconnected materiality – such as bodies or technical artefacts – that lead to the issues of surveillance and (the internet of) things under programmed control as well as to the benefits of Industry 4.0 and Smart Cities.

4. Operations of humans dealing with computers – understood as technical, physical, and cognitive processes. This ranges from using and programming computers[1] and developing machine-learning systems to questions of the relationship between software and ideology raised by Wendy Chun (2013), Alexander Galloway (2012b), and Cynthia and Richard Selfe (1994). With these operations we can learn through experience what that might be: a computer, its user, a network, 'the digital', and its benefits and flaws.

Where computers are at work, interfaces are also at work – and even more so where they are networked. Against this background Christian-Ulrik Andersen and Søren Pold speak of a metainterface: "Although the interface may seem to evade perception, and become global (everywhere) and generalized (in everything), it still holds a textuality: there still is a metainterface to the displaced interface" (Andersen and Pold 2018, 10). However, in order to emphasize the enduring materiality, processuality, and the different (observable and unobservable) levels of interfaces, which also act when (user) interfaces disappear or become ubiquitous, it is heuristically advantageous to further strengthen the concept of *interface*, especially given that the origin of this concept and its historical proximity to *conduction* – as I would like to emphasize – literally require keeping different modes of conduction in mind: physical, material, as well as political / ideological questions. Interfaces build the technical basis for the implication of computers in support of the invocated new techno-ecology. Interfaces also build the material, aesthetical, as well as ideological basis for understanding what I can actually do with a computer.

My conceptual consequence is: *interfaces perform conduction*. 'To conduct' includes the physical meaning of conduction and transfer like in 'to conduct electricity' (and in the basic function of semiconductors), as well as the social, educational, and political meaning of leadership and guidance like in 'to conduct somebody/groups' and 'conduct politics'. That is why the term interface is so fruitful today: it helps to address a variety of efficacious operations – from the material basis of all sorts of computers and networks up to the educational and epistemological or ideological guidance by user interfaces showing and teaching me what to do.

This special kind of aesthetic conduction is still mainly provided by "operative images" (Distelmeyer 2018, 26-28). The term for this type of imagery in graphical user interfaces refers to a concept coined by Harun Farocki (2004), also discussed as "operational images". They are operative because 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"

---

1. "The difference between users and programmers is an effect of software" (Chun 2004, 38).

(Pantenburg 2015, 210). Concerning computers this operativity is therefore multi-layered: in relation to the operations of a computer (and its network) that I activate, in relation to my physical and cognitive operations in dealing with it, and in relation to effects of material operations and infrastructures (cables, radio masts, server parks, etc.) such as energy consumption, CO2 emissions, electromagnetic radiation, and electronic waste.

This processual intricacy – partly addressed by Frieder Nake's "algorithmic image" (Nake 2009) – unfolds its impact on these different but interconnected levels of operations. Marianne van den Boomen's inspiring term "depresentation" helps to respond to the resulting complexity of this on-going oscillation: The "icons on our desktops do their work by representing an ontologized entity", while hiding "the processual and material complexity involved" (van den Boomen 2014, 36).

Graphical user interfaces and its operative images depresent. They display and conceal at the same time. They show what we can do without showing the procedural complexity and the multitude of requirements and consequences that are only possible, because these clickable or touchable signs are linked electronically to the inner processes of the machine – to its interior telegraphy and its external networking. Hence, the working performance of graphical user interfaces as an 'interface mise-en-scène' (Distelmeyer 2017, 81-92) is relying on and depresenting the very same thing: interface operations.

Starting from this concept of interface, from this heterogeneous ensemble of interconnected aspects and operations, concrete and material questions of technology and (infra)structures are inevitably connected with cultural, political, and epistemological investigations. The question of interfaces leads to certain, isolable conditions and processes of conduction as well as to the complexity of the cooperation formed by them. That is its heuristic advantage: The interface concept opens both an investigative horizon and a mode of analysis, which

Image 1. iPhone advertisement in January 2007 on www.apple.com/iphone/

always asks for further interface levels involved in the phenomenon I am currently investigating. What other interfaces are in play? What else is involved?

Since the still widespread performances of operative images are deeply related to other interface aspects and processes, an analysis of graphical user interfaces must lead to far more questions than those of usability. Instead, it should be a springboard for questions addressing today's computing complexity of, on the one hand, increasingly hidden modes of sensory and networked computers as "autonomous agency" (Ekman 2016, 41) and, on the other hand, the diversification of screens and operative images through mobile computers like smartphones.

II.

As an example, I would like to turn to the displacement of the 'file' with the launch of the iPhone in 2007 and its (kind of) comeback in 2017 with the "Files" app. Both developments are profoundly related to the establishment of computers as permanently networked machines whose special functionality and ideology – traffic, traffic – thus becomes the focus of my questions.

The introduction of the iPhone and its first operating system marked a historic turning point in more than one respect. The interface correlation of screen, operative images, mouse, and keyboard, presented in 1983 by the Apple Lisa (enabled, of course, by the work of Xerox PARC), was replaced in 2007 by a touch-sensitive screen, operative images, and the human body – promoted by Apple as "letting you control everything with just your fingers" in "an era of software power" (Ripley 2008, 91).

Controlling means interfacing by modes of conduction: At certain parts of the capacitive touch screen marked by operative images, my physical contact leads to altered electrical voltage conditions or capacities. The conduction induced by touching is the very start of the commands and program sequences attributed to these operative (conducting) images.

This enables a new performance of an interface mise-en-scène that is presented on the so-called "Home screen, which contains your iPhone applications" (Apple Inc. 2009, 23) in a grid pattern. This shows which apps are available to me 'with just my finger' and furthermore how I handle this computer is primarily how I handle apps. The operative images of this interface mise-en-scène do not depresent files or folders, but rather programs. This, in my opinion, is at least as important as establishing the touchscreen: the change from object-oriented interaction to process-oriented interaction.

Conceptually (for our perception and understanding of a personal computer), the desktop relies on the depresentation of files and folders from which I can start my actions. The Apple Lisa, where

I first had to mark a file and then select an operation/option from the menu, was Apple's prime example of object orientation inspired by Xerox PARC.

Interaction (that is: to deal with an "aesthetics of regulation") was based here on the interface mise-en-scène of 'my' files. This helps to understand a computer as *personal*. Alan Kay – an important figure at Xerox PARC not only in the field of object-oriented programming with the "Smalltalk" language but also in the development of the graphical user interface and its form of visualized object-orientation – describes the connection between the two modes of conceptualizing human-computer relations: "*[O]bject oriented* means that the object knows what it can do. In the abstract symbolic arena, it means we should first write the object's name (or whatever will fetch it) and then follow with a message it can understand that asks it to do something. In the concrete user-interface arena, it suggests that we should select the object first. It can then furnish us with a menu of what it is willing to do. In both cases we have the *object* first and the *desire* second" (Kay 2001, 129-130).

After 2007 this turned into process-oriented interaction. While on the desktop everything is based on the depresentation of what I consider my data, on the home screen of the iPhone and the following smartphones (of Apple and competing companies) everything is based on the depresentation of processes that I encounter as apps. With (and after) the iPhone I have to proceed differently to get to what used to be my data. It is now part of another programmatic order: of an order of programs. Now I have to start first one of the displayed apps in order to then find in it those coveted entities, which Yuk Hui has discussed as "digital objects" – this materialized form of a large amount of "data and metadata, which embody the objects with which we are interacting, and with which machines are simultaneously operating" (Hui 2016, 48). Though these objects have never been only mine, because they depend so much on given working arrangements of data management and hardware processes, I have learned to consider them as my own on my personal computers (see Chun 2013, 67-68). Now, on smartphones and tablets with their home screens of apps, this works differently: In the flow of a program I come to *my* photos, *my* music, or *my* notes.

This interface mise-en-scène thus initiated and conducted a new way of dealing with computers – not to proceed from objects (like a file) but from processes and programmatic structures depresented by operative images of apps. Of course, even in object orientation nothing works without the primacy of programs, because the file manager of the desktop environment, the "Finder", is nothing but a running program.[2] However the gesture is different now. Process / program first: In the beginning, the mass / power of the programs dominates, from which I can choose, but which I do not own, move

and create, as I have learned from my files and folders. A new order is established here (by depresentation). My digital objects only appear under the condition of the program responsible for them. I do not own these programs, which are the goods of the software industry, but rather I acquire the right to their lawful use.

The advertised promise of the iPhone, "it ushers in an era of software power" (Ripley 2008, 91), is echoed and supported by this new performance of process orientation. These far-reaching and influential interface politics are closely related to another paradigm shift: to the always-on and access-everywhere of widespread (and not only mobile) forms of permanently networked computers. A small sign above the grid pattern signals this. The displayed connection to the Internet – and thus to further interface processes of hardware and software, to cables, server parks, and last but not least the "protocol interface" (Galloway 2012a, 243) – displays a new status for computers. The iPhone is not only a model for the triumph of those mobile, sensory, and autonomous active computers called smartphones, it is also a role model for the contemporary computer that is always – or should always be – connected to the Internet.

That seems self-evident today: the propagated always-on of this and similar machines allowed us to outsource computer services more and more. That changes the scope of my touch. It is no longer only starting the computing processes and the energy consumption of my own computer, but more and more (thanks to the interface processes between networked computers) other computing processes and the energy consumption of several machines that altogether provides for performance of internet-based services.[3]

Additionally, the always-on connection of the networked computer allows for a change in the understanding and location of software. Now software could be seen even less as a product to buy and own, but as an (outsourced) service, as Irina Kaldrack and Martina Leeker have argued: "In the past, shrink-wrapped software, as it was called, had to be purchased, installed on a personal computer (PC), configured, and updated regularly. Today, however, it suffices to log on to a single platform and install a service to easily access Dropbox, Facebook, Google, etc. In parallel to the development of clouds, web services, and mobile apps on the consumer market, 'classic' software providers are moving to subscription models in ever greater numbers: Adobe Creative Suite becomes Adobe Creative Cloud and Microsoft Word becomes Office 365. Software is no longer purchased, but rather can be rented. […] Ownership of software is thus becoming obsolete, replacing goods as property through service use" (Kaldrack and Leeker 2015, 9-10).

---

2. "The Finder" is considered in Apple's user guides as "an app that's always open […] to open, organize, and locate your files" (Apple Inc. 2016, 12).
3. Joana Moll's works react to this techno-ecological set of problems (see http://www.janavirgin.com/).

III.

Against this backdrop, I would like to conclude by highlighting connections between interface operations that are difficult or impossible to observe – networks, autonomous agencies, the "becoming environmental of computation" (Gabrys 2016, 4) – on the one hand and the dissemination of operative images on the other hand. To be more precise: I would like to make suggestions on how these connections can be addressed and questioned. My approach is to start with the most popular, the most obvious, and the most tangible – the front-end and its interface politics of depresentation. *Nearer, my computer, to thee*.

I would like to suggest that since 2007 the programmatic and (infra-)structural changes towards predominantly unobservable, networked, and permanently active computers have also been and are still supported by partly observable interface politics: by putting depresentations of programs first rather than files or folders. Since access to my data is now only possible through an obvious entry into a running program (and software as a service), this shift from object-to-process-orientation may lead us to accept new basic conditions and new relations to computers and their status.

The movement from the file to the programmatic flow gradually resolves the difference between computer use and Internet use. It supports the idea and practice that functioning computers are 'naturally' networked computers; and that –consequently – my data is increasingly not stored on and belonging to my computer, but to the network, which on the one hand is more than my computer and on the other hand seems to become one with it. This results in new questions of ownership: If I own neither the network nor the programs, how can I claim ownership of my data?

Following this logic, my computer seems rather to be a tool to participate in the bigger computing power of the network. It is thus no coincidence that the historic iPhone presentation in January 2007 ended with the announcement that the company will change its name from "Apple Computer Inc." to "Apple Inc". The computer disappears, literally (see Kaerlein 2018, 97).

Hence, the shift from object-to-process orientation could be understood as one important and no less ideological part of the change in the status of computers that Steve Jobs explicitly announced in his last presentation of iCloud in 2011: "We're going to move the digital hub, the center of your digital life into the cloud. Because all these new devices have communications built into them, they can all talk to the cloud whenever they want. […] And now everything's in sync with me not even having to think about it. I don't even have to take the devices out of my pocket. […] And so everything happens automatically and there's nothing new to learn" (Apple Inc. 2011).

Now the center of my 'digital life' lies outside of me. Neither myself, nor my (paid or rented) device in my hand seems to be this center. Instead it is made of network conditions and material as well as programmatic operations. That traffic – the production and circulation of data via multi-layered interface operations – generates the new values of what is discussed as "capture capitalism" (Heilmann 2015), "platform capitalism" (Srnicek 2017), and "platform imperialism" (Jin 2015) and what is, of course, still based on older industrial forms of hardware production, scrapping, and recycling.[4]

Getting used to these conditions is made easier for me in this new grid system of apps; if I am not constantly creating, labelling, and moving folders and files and therefore may wonder, where I have my data and what I can do with it. Now data seems only 'haveable' when running programs do something with it; *money must work*. Perhaps this will also help to get used to the idea that it is less about my relationship with the data than about the relationship that the new 'center of my digital life' – permanently active network computer systems, also known as the cloud – is building with it. This idea would at least fit perfectly into the current strategy of those platforms and companies that make the commodification of personal data of their 'users' their business model (see Heilmann 2015, 43).

Forward into the past: In 2017 the new iOS 11 operating system for iPhones and iPads provided a kind of comeback of the object with the new app named "Files", which in 2010 was preceded by the "My Files" app on Android systems. As a program, "Files" gives access to an overview of all files and digital objects that are otherwise part of separated and also outsourced programs: "The Files app brings all of your files together in iOS 11 or later. You can easily browse, search, and organize all your files in one place. Not just the ones on the device you're using, but also those in apps, on your other iOS devices, in iCloud Drive, and across other cloud services" (Apple Inc. 2019).

Object orientation returns here not as default (as with the desktop), instead as a program similar to and next to many others. This helps to keep the important basis and commonality between these forms of object and process orientation in view. By offering object-oriented interaction as a program and as part of process-oriented interaction, this software update may serve as a reminder that any file (and

---

4. Till A. Heilmann has pointed to the "real misery of people, whose work is outside the virtual worlds of Facebook and Co. and at the same time forms the real framework of these worlds: the workers in the Congolese Kivu region enslaved by force of arms who mine the coltan ore needed to make mobile phones, the Foxconn employees who assemble our smartphones and tablets in Shenzhen for starvation wages, or the inhabitants of Agbogbloshie who ruin their health at the world's largest electrical waste dump in Accra in order to extract a little copper from our disposed devices" (Heilmann 2015, 46). Dal Yong Jin's concept of platform imperialism is referring to "an asymmetrical relationship of interdependence between the West, primarily the U.S., and many developing countries. This includes the two great powers of nation states and transnational corporations. But platform imperialism is not only about the forms of technological disparities but also the forms of intellectual property, symbolic hegemony, and user commodity" (Jin 2015, 67).

interaction) manager is, of course, nothing more than a program, that digital objects always depend on programs, and that any kind of interface mise-en-scène is a deliberate and momentous decision, which makes a concept like man-machine interaction still, as Frieder Nake put it in 1984, "a helpless formula for a profoundly social process" (Nake 1984, 117).

Hence, the difference introduced in 2007 consisted especially of the gesture to replace a central and binding file management system by dividing its management structure – with a growing variety and processes of diverse, sandboxed, and potentially outsourced programs (see Hagen 2018, 75-79). These altered interface politics, which have been adopted and strengthened by the computer industry worldwide, could therefore also be understood as another connection with or hint at the new 'center of my digital life'. In this additional sense, the demonstrative diversification and division of distributed services in the form of depresented apps work as an aesthetic approximation to the bigger diversification and distribution: Maybe one should consider the displayed grid system of apps on the home screen of smartphones and tablets as a just as odd as it is operative depresentation of the distributed and (company-) conducted computer network that shapes the new status of (mobile) computers. Accordingly, the software power and the power of the network would become one.

References

Andersen, Christian Ulrik, and Søren Pold. 2018. *The Metainterface. The Art of Platforms, Cities and Clouds*. Cambridge: MIT. https://doi.org/10.7551/mitpress/11041.001.0001

Apple Inc. 2009. *iPhone User Guide. For iPhone OS 3.1 Software*. Cupertino: Apple Inc.

Apple Inc. 2011. "Apple WWDC 2011 – iCloud Introduction". Filmed June 6, 2011 at Apple Worldwide Developers Conference. Video, 38:16. https://www.youtube.com/watch?v=KTrO2wUxh0Q.

Apple Inc. 2016. *MacBook Pro Essentials*. Cupertino: Apple Inc.

Apple Inc. 2019. "Use the Files app on your iPhone, iPad, and iPod touch". Apple Support. Last modified February 06, 2019. https://support.apple.com/en-us/HT206481.

Bratton, Benjamin H. 2016. *The Stack: On Software and Sovereignty*. Cambridge: MIT. https://doi.org/10.7551/mitpress/9780262029575.001.0001

Burks, Arthur W., and Alice R. Burks. 1981. "The ENIAC: First General-Purpose Electronic Computer". *Annals of the History of Computing*, no. 4: 310-399. https://doi.org/10.1109/MAHC.1981.10043

Chun, Wendy Hui Kyong. 2004. "On Software, or the Persistence of Visual Knowledge". *Grey Room*, no. 18: 26-51. https://doi.org/10.1162/1526381043320741

Chun, Wendy Hui Kyong. 2013. *Programmed Visions. Software and Memory*. Cambridge: MIT.

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

Distelmeyer, Jan. 2018. "Drawing Connections. How Interfaces Matter". *Interface Critique Journal*, no. 1: 22-32.

Cramer, Florian, and Matthew Fuller. 2008. "Interface". In: *Software Studies: A Lexicon*, edited by Matthew Fuller, 149-152. Cambridge: MIT. https://doi.org/10.7551/mitpress/9780262062749.003.0020

Ekman, Ulrik. 2016. "Introduction: Complex Ubiquity-Effects". *Ubiquitous Computing, Complexity, and Culture*, edited by Ulrik Ekman *et al*.: 39-75. New York: Routledge.

Farocki, Harun. 2004. "Phantom Images". *Public. Art, Culture, Ideas*, no. 29: 12-22.

Gabrys, Jennifer. 2016. *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*. Minneapolis: University of Minnesota. https://doi.org/10.5749/minnesota/9780816693122.001.0001

Galloway, Alexander. 2012a. "Black Box, Black Bloc". *Communization and Its Discontents: Contestation, Critique, and Contemporary Struggles*, edited by Benjamin Noys, 237-252. New York: Autonomedia.

Galloway, Alexander. 2012b. *The Interface Effect*. Cambridge: Polity.

Hagen, Wolfgang. 2018. "Anästhetische Ästhetiken. Über Smartphone-Bilder und ihre Ökologie". *Smartphone-Ästhetik. Zur Philosophie und Gestaltung mobiler Medien*, edited by Oliver Ruf, 75-104. Bielefeld: transcript.

Hansen, Mark B. N. 2015. *Feed Forward. On the Future of Twenty-First-Century-Media*. Chicago: University of Chicago, 580-629. https://doi.org/10.7208/chicago/9780226199863.001.0001

Heilmann, Till A. 2015. "Datenarbeit im 'Capture'-Kapitalismus. Zur Ausweitung der Verwertungszone im Zeitalter informatischer Überwachung". *ZfM – Zeitschrift für Medienwissenschaft*, no. 13: 35-47.

Hörl, Erich. 2017. "Introduction to general ecology: The ecologization of thinking". In *General Ecology: The New Ecological Paradigm*, edited by Erich Hörl, 1-73. London: Bloomsbury.

Hookway, Branden. 2014. *Interfaces*. Cambridge: MIT. https://doi.org/10.7551/mitpress/9919.001.0001

Hui, Yuk. 2016. *On the Existence of Digital Objects*. Minneapolis: University of Minnesota. https://doi.org/10.5749/minnesota/9780816698905.001.0001

Jin, Dal Yong. 2015. *Digital Platforms, Imperialism, and Political Culture*. New York: Routledge.

Kaerlein, Timo. 2018. *Smartphones als digitale Nahkörpertechnologien. Zur Kybernetisierung des Alltags*. Bielefeld: transcript. https://doi.org/10.14361/9783839442722

Kaldrack, Irina, and Martina Leeker. 2015. "There is no Software, there are just Services: Introduction". *There is no Software, there are just Services*, edited by Irina Kaldrack and Martina Leeker, 9-20. Lüneburg: Meson.

Kay, Alan C. 2001. "User Interface – A Personal View (1989)". *Multimedia. From Wagner to Virtual Reality*, edited by Randall Packer and Ken Jordan, 121-131, New York: Norton.

Nake, Frieder. 1984. "Schnittstelle Mensch-Maschine". *Kursbuch 75: Computerkultur*, edited by Karl Markus Michel and Tilman Spengler, 109-118. Berlin: Rotbuch.

Nake, Frieder. 2009. "The Semiotics Engine. Notes on the History of Algorithmic Images in Europe". *Art Journal* 68, no. 1: 76-89. https://doi.org/10.1080/00043249.2009.10791337

Pantenburg, Volker. 2015. *Farocki/Godard. Film as Theory*. Amsterdam: Amsterdam University. https://doi.org/10.1515/9789048527557

Ripley, M. Louise. 2008. "Trickster Fiddles with Informatics: The Social Impact of Technological Marketing Schemes". *Journal of Systemics, Cybernetics, and Informatics* 6, no. 1: 91-96.

Rouvroy, Antoinette, and Bernard Stiegler. 2016. "The Digital Regime of Truth. From the Algorithmic Governmentality to a New Rule of Law". *La Deleuziana. Online Journal of Philosophy*, no. 3: 6-27. http://www.ladeleuziana.org/wp-content/uploads/2016/12/Rouvroy-Stiegler_eng.pdf.

Schaefer, Peter. 2011. "Interface: History of a Concept, 1868-1888". In *The Long History of New Media: Technology, Historiography, and Contextualizing Newness*, edited by David W. Park *et al.*, 163-175. New York: Peter Lang.

Selfe, Cynthia L., and Richard J. Selfe. 1994. "The Politics of the Interface: Power and Its Exercise in Electronic Contact Zones". *National Council of Teachers of English* 45, no. 4: 480-504. https://doi.org/10.2307/358761

Smith, Crosbie, and M. Norton Wise. 1989. *Energy and Empire: A Biographical Study of Lord Kelvin*. Cambridge: MIT.

Srnicek, Nick. 2017. *Platform Capitalism*. Cambridge: Polity.

Turing, Alan. 1950. "Computing Machinery and Intelligence". *Mind*, New Series 59, no. 236: 433-460. https://doi.org/10.1093/mind/LIX.236.433

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

von Neumann, John. 1975. "First draft of a report on the EDVAC (1945)". In *The Origins of Digital Computers: Selected Papers*, edited by Brian Randell, 355-364. Berlin/Heidelberg/New York: Springer. https://doi.org/10.5479/sil.538961.39088011475779

Wilson, David. B. ed. 1990. *The Correspondence Between Sir George Gabriel Stokes and Sir William Thomson Baron Kelvin of Largs* (Volume 2, 1870-1901). Cambridge: Cambridge University.

Winkler, Hartmut. 2015. *Prozessieren. Die dritte, vernachlässigte Medienfunktion*. Paderborn: Fink. https://doi.org/10.30965/9783846758410

CV

Jan Distelmeyer
University of Applied Sciences Potsdam
University of Potsdam
distelm@uni-potsdam.de

European Media Studies
University of Applied Sciences Potsdam
Kiepenheuerallee 5
D-14469 Potsdam

Professor of Media History and Media Theory in the European Media Studies program of the University of Applied Sciences Potsdam and the University of Potsdam.