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Aporias of the touchscreen

On the promises and perils of a ubiquitous technology

Timo Kaerlein

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We may debate whether our society is a society of spectacle or of simulation, but, undoubtedly, it is a society of the screen.

– Lev Manovich¹

Screens attached to computers have always been tangible insofar as they feature a solid glass surface that lends itself to touch, while other parts like the processor, memory, and integrated circuits are separated from the user by a secretive casing. Alas, it was not until recent interface advances made it interactive that the screen responded in any meaningful way to tactile stimuli. In this respect, the undiscerning user has so far been in a dissatisfactory position comparable to that of the apprentice sorcerer of former times, as mocked by Shakespeare:

Glendower – I can call spirits from the vasty deep.

Hotspur – Why, so can I; or so can any man:

But will they come when you do call for them?²

The touchscreen interface eventually offers the promise of reciprocity. Since its early inception in the 1960s by the British Royal Radar Establishment where it served as a novel interface for flight control purposes, it has quickly conquered many public spaces. Kiosk displays, ticket vending machines, point of sale systems, interactive whiteboards, and electronic exhibition guides have all featured touchscreens. Undoubtedly though, the present allure and ubiquity of the touchscreen is due in large part to the advent

and diffusion of personal mobile media devices like PDAs, mobile (smart) phones, and tablet computers. In fact, it is plausible to connect the success of Apple's first iPhone to its pioneering utilisation of a touchscreen interface able to interpret multiple input signals at the same time, thereby opening up a range of novel interaction variants.

The widely distributed video of a TED conference presentation by Jeff Han showcasing the possibilities and affordability of the technology preceded the iPhone launch by almost one year.³ This talk whetted the appetites of both the market and future users and is retrospectively addressed as a birth myth that set the touchscreen craze in motion. Han is in the remarkable position of emphasising the qualities of an interface that from its inception is conceived of as being 'invisible', 'natural', and 'intuitive'.

[T]here's no reason in this day and age that we should be conforming to a physical device. That leads to bad things, like RSI [Repetitive Strain Injury]. We have so much technology nowadays that these interfaces should start conforming to us.⁴

Any attempt at outlining the benefits of such a technology must deal with the paradox of exposing that which is supposed to fade from view in the interaction. 'The interface just disappears.'⁵ An unsuspecting observer might well ask: so what actually remains to be demonstrated? In a world of cloud computing, big data, constant algorithmic interpretation of behavior, and hardware that operates on the nano scale, the touchscreen suggests tangibility where there is little to none – simultaneously doing so on a physical level by providing a reactive surface that is palpable in a literal sense, and in the metaphorical way of purporting cognitive tangibility, i.e., comprehensibility.

This essay attempts to connect the history of fascination with the touchscreen to the recurring topoi in media theory and practice revolving around ideas of immediacy and the prospect of the 'interfaceless' interface. More refined as a term, it attempts to outline a state of emergency, a system pressure, an 'urgence' in the Foucaultian sense,⁶ that can serve to explain the success of the touchscreen technology in being a reaction to an exigent problem. Simultaneously, an attempt will be undertaken to deconstruct the '[h]yperbolic [v]ision' of immediacy and contrast it with '[f]actual [d]evelopments', as Ulrik Ekman has recently asked for with regard to cultures of ubiquitous computing, noting that 'mobile devices and co-developing cultural practices might be one of the best foci' for this undertaking.⁷ To this purpose, the essay will:

1. provide a short profile of touchscreen technology as well as its history of ideas and current prospects;
2. differentiate several layers of the promise of immediacy that is an integral part of designers' and reviewers' vocabulary, but also influences the theoretical discourse profoundly;
3. identify empirical instances of failure and disappointment where the technology does not live up to its promise and instead reveals a perpetually dysfunctional state of mediation;
4. in an attempt of explanation, resort to the ideas of German philosopher of technology Günther Anders that outline a fundamental discrepancy structuring any interface between human and computer, and the efforts undertaken to cover it;
5. as a sort of non-conclusion, outline the central aporia of the touchscreen as an interface that reveals its own limitations through its specific quality of performance.

The touchscreen: Technology and history of ideas

Different kinds of touchscreen technology have been devised and implemented.⁸ *Resistive* touchscreens consist of several layers, including two that are electrically-resistive and separated by a thin gap. When a finger, stylus pen, or other object touches the top layer, this gap is closed and a point of contact is established which can then be calculated and transformed into machine-readable parameters. Due to their robustness, longevity, and low cost, resistive touchscreens are widely used in public spaces – however, they suffer from inaccuracies more than other solutions. Essentially, resistive touchscreens function according to a simple mechanical principle and correspondingly require some degree of force to react to an input.

Surface acoustic wave touchscreens rely on a setup of ultrasonic waves that are created by two transducers placed along the x and y axes of the panel. If the waves are disturbed by an object touching the screen, the according attenuation can be located by interpreting the time delay from the transmitted pulse to the attenuation center. Wave technologies are usually most expensive, but also feature top clarity.

Capacitive touchscreens operate with an electrostatic field that underlies an insulator surface such as glass (coated with a transparent conductor). Because the human body is also a conductor, when a finger touches the surface the field is distorted and electric particles with opposing charges

interact with those on the screen. The resulting change in capacitance can then be interpreted, either by circuits located in the four corners of the screen (so-called *surface capacitance* technology) or – in the case of *projected capacitance* screens – directly at the impact point by an underlying matrix of conductive wires.

The latter projected capacitive touchscreens are most widely installed in portable media devices like smartphones and tablet computers, as they are very accurate in tracking the motion of a finger over the display in real time. Other technologies exist, e.g. optical technologies that utilise sensors to detect the position of a touch impulse, including such advanced methods as ‘Frustrated Total Internal Reflection’, which to the uninitiated mind conjures up images of a serious mental condition. In what follows, only the projected capacitive touch (PCT) screens will be scrutinised more closely, as they are arguably the most successful of commercially-produced touchscreens. In addition, this essay shall also demonstrate that PCT screens are the most interesting ones from a theoretical viewpoint.

As mentioned in the introduction, the first capacitive touchscreens were developed and put to use in the late 1960s by the British Royal Radar Establishment as an easier way to handle the task of air-traffic control.⁹

A novel input/output device for computer systems has wires, sensitive to the touch of a finger, on the face of a cathode-ray tube on which information can be written by the computer. This device, the ‘touch display’, provides a very efficient coupling between man and machine.¹⁰

Today, touchscreens are widely employed in miscellaneous contexts – they are even proposed for office use in the upcoming Windows 8 operating system. More experimental applications are being tested in various prototype stages, e.g. Pranav Mistry’s SixthSense technology at MIT Media Lab,¹¹ also Microsoft’s OmniTouch technology¹² – both attempts to transfer the touchscreen principle to any available surface by using cameras and other sensors.

A recent edited collection by Bernard Robben and Heidi Schelhowe¹³ lists touchscreens as one major component in a design paradigm of tangible interaction, which most of the contributing authors agree to be a descendant and enhancement of Mark Weiser’s vision of ubiquitous computing, first formulated in 1988.

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.¹⁴

The editors proclaim that Weiser's anticipation of a world of embedded and invisible computing is gradually shifting from the realm of engineering fantasy – the 'technomythscape'¹⁵ – into the hands of systems and interface designers.

While the touchscreen might be the most visible (and tangible) element in this new media ecology, recent developments in embedded networking technologies and interfaces like 'things that think' (e.g. RFID), pervasive and context-aware computing, and ambient intelligence complete the picture. Haptic human-computer interfaces play an important role in this setting, as they are supposed to be able to activate users' tacit knowledge and everyday habits (such as spatial orientation) while presenting the user with a surface cleansed from the computational complexity enabling them.¹⁶ True to Weiser's spirit, 'tangible computing is exploring how to get the computer "out of the way" and provide people with a much more direct – tangible – interaction experience'.¹⁷

Robben and Schelhowe advocate the concept of tangibility in the German double meaning of the term *Be-greifbarkeit*, as both palpability and comprehensibility. 'Tangibility denotes [...] manifold relations between meaning and comprehension, feeling and experiencing, thinking and perceiving, which intertwine in medial space.'¹⁸ As computing technologies and everyday life are increasingly interwoven, the former are set to become invisible in a process of normalisation and habitualisation – to the point 'that they and their algorithmic basis evade attention'.¹⁹ It is often repeated by designers and engineers that technology should not interfere with but rather improve users' lives.²⁰ The most auspicious way towards this goal on the level of interfaces seems to be the cognitive dissolution of the means in favor of an immediate link between action, purpose, and result. This promise of immediacy shall be investigated next, as it is central to the allure of the touchscreen.

Grasping the world: The promise of immediacy

In the introduction to his book *Production of Presence: What Meaning Cannot Convey*, when Hans Gumbrecht declares that one can safely assume the existence of a 'desire for [...] immediacy'²¹ (notwithstanding the principal

impossibility to perceive any object of this world in an immediate manner), he touches on a subject that has taken a prominent place in philosophical ontology as well as in poststructuralist discourse.²² He makes his point by indulging with relish in an adulation of lived experience (*Erleben*) as opposed to hermeneutics, which made him the target of some mocking criticism.²³

In Gumbrecht's understanding, [s]omething that is "present" is supposed to be tangible for human hands, which implies that, conversely, it can have an immediate impact on human bodies.²⁴ What is interesting in this context is the fact that Gumbrecht connects his argument to the process of mediatisation, i.e., the saturation of society with forms of mediated communication and experience.

While modern (including contemporary) Western culture can be described as a process of progressive abandonment and forgetting of presence, some of the 'special effects' produced today by the most advanced communication technologies may turn out to be instrumental in reawakening a desire for presence.²⁵

Jay Bolter and Richard Grusin have constructed their remediation theory around the terms of 'immediacy' and 'hypermediacy'.²⁶ However, they do not explain in any degree of detail what motivates the drive for immediacy that they postulate as the central mechanism of media history. Notwithstanding the irrefutable 'non-transparency of the code',²⁷ screens have often invited the observer to suspend disbelief and identify with the image. The computer screen has challenged this traditional logic by introducing overlapping windows and control elements that inhibit full immersion.²⁸ It can be argued that the touchscreen attempts to compensate for this loss of experiential immediacy by reintroducing it on several alternative layers, organised by the central immediacy of cutaneous contact. Now I will attempt to provide some evidence for the assumption that immediacy is indeed the focal point of the history of fascination with the touchscreen.

The promise of immediacy, as it is incessantly invoked in statements by designers and reviewers,²⁹ operates on several layers that constantly intertwine and sometimes lead to confusing overlaps. First, on the level of practical interface design, the touchscreen offers 'immediate' access to items on the screen. This is called 'Direct Touch', as it creates a shortcut between screen content and user; this can be compared to the rather indirect mouse and keyboard input solutions predominantly utilised in graphical user interfaces (GUI).³⁰ One step of abstraction and translation of

user action to computer reaction is omitted. Additionally, input and output spaces are no longer separated but rather converge, allowing for a more seamless interaction.³¹ Appropriately, great hopes are raised that revolve around the touchscreen as a more egalitarian interface that anyone can use, regardless of proficiency.³²

Second, the idea of universal direct access is extended into the network infrastructure when devices are used that are connected to the 'cloud', i.e., wirelessly communicating with remote providers of data storage and processing. The 'always-on' rhetoric is no less than the most recent expression of the notion of immediacy pursued by Bolter and Grusin. 'Immediacy after 9/11 materializes itself as an unconstrained connectivity so that one can access with no restrictions one's socially networked mediated life at any time or anywhere through any of one's media devices.'³³ As the touchscreen represents the gateway to the network, it is associated with the instantaneous availability of information about friends' activities, information streams, events, etc., via the touch of a fingertip.

Third, some (noticeably affected) reviewers of touchscreen technology report a sensation of intimacy that runs counter to the more familiar topos of cold technicity vs. warm human relations. Here is just one of many examples following the launch of the iPad in 2010:

It's no wonder we love our printed books – we physically cradle them close to our heart. Unlike computer screens, the experience of reading on a Kindle or iPhone [...] mimics this familiar maternal embrace. The text is closer to us, the orientation more comfortable. And the seemingly insignificant fact that we touch the text actually plays a very key role in furthering the intimacy of the experience.³⁴

Affective experiences such as this one (if one abstracts them from the considerable accompanying marketing hype) imply a proximity on the level of psychological object relationships that is aligned with the possibility to engage with the screen in a physical manner. The rhetoric mirrors that of the haptic human-computer interface research community at large, who proclaim that the early promises of the virtual reality industry were flawed and that only 'the combined senses of vision, force and touch' will lead to 'the evolution of the truly intuitive interface'.³⁵

These different layers of perceptual and emotional immediacy are connected by the central interaction modality of touch. In a dominant branch of Western philosophical thought extending from Aristotle to Heidegger and the phenomenologists Husserl and Merleau-Ponty, touch has figured as

the epitome of immediacy. ‘Touching something, somebody else, or myself with the fingers of my hand is the essential model of immediate experience, of immediacy, of the presence of the present.’³⁶ Although deemed highly significant by early researchers conducting psychophysical experiments,³⁷ the ‘senses of touch’³⁸ have long resisted systematisation – let alone application in technical interfaces.

Hartmut Böhme has pointed out that ‘our contemporary culture which has been formed under the double primacy of writing and the visual sense, has distanced itself from the experiences of touch.’³⁹ He assumes that there is something like a hidden cultural history of touch permeating the regimes of the visual.

In language, memory of a *different perception* has been conserved through the millennia of dominant theories of optical geometry. In this we know ourselves in close relationship to the things, in perpetual involvement with them, in a medial flowing through, in a blending that doesn’t know the sharp division of subject and object.⁴⁰

While academic discourse – particularly that of the media – usually lags behind the rapidly changing phenomena, positions such as Böhme’s (and of course, McLuhan’s bold characterisation of electricity as a *tactile* medium⁴¹) clearly precede the invention of the PCT screen. The latter now shifts the theoretical speculations to the status of a technical necessity.

As the PCT screen relies on the interaction of human body and device in their capacity as conductors, it demands the intimacy of the bare finger as a working principle. A gloved hand does not achieve the desired effect. In fact, with the touching of the screen by a finger, the charge transferred to the user’s body establishes a closed cycle of interaction. Human and machine merge into one as far as the electrical engineer is concerned. Far from being an excessive engineering fantasy of ‘man-computer symbiosis’⁴² or (even more fitting in its allusion to a process of merging or flowing together) ‘human-computer confluence’,⁴³ the touchscreen prosaically utilises the interflow of electrical currents to overcome the subject-object division on the plain level of technical operation.⁴⁴

Tangibility and its discontents

Following Paul Dourish’s and Genevieve Bell’s contrasting of the ‘mess and mythology in ubiquitous computing’,⁴⁵ this section critically scrutinises the

idealisation of the touchscreen interface; its supposed immediacy, instinctiveness, and ease of use are sometimes thwarted by subtle and irritating deficiencies in everyday use. Many users complain about the imperfect legibility of text on the reflective display, particularly in bright daylight. Additionally, touchscreens are prone to scratches when carried around in a pocket or handbag, which then necessitates the use of unattractive protective sheets. Grease spots left on the display after heavy use – despite the absorptive layer designed to prevent them – interfere with an enjoyable interaction and can be quite embarrassing in a public setting when the problematic encounter between wetware and (formerly new and shiny) hardware cannot be denied.

At the end of the 20th century we see this thinking bio-pump being slung back and forth, panting and spluttering, between wet and dry, loose and fixed, fleeting and firm, intoxication and reason, static and signal, suddenly functional in the electronic environment. The watery and steamy human factor has shocking effects on the machinery.⁴⁶

And not only that – in recent years, news reports about the spreading of germs via touchscreens shared by several users have initiated debate.⁴⁷ The basic argument is related to the debates about reading mania in the 18th century and the harmful effects of cinephilia in the 20th. It seems that not only the machines are at risk, but also the users' health.

Such minor defects can be interpreted as the inevitable plight of any disruptive technology that will eventually be diminished by its maturity. But it can be argued that there is more to the blemishes of the touchscreen than a collective discomfort. The last given example (grease spots) already illustrated that the specific promise of performance (often articulated in terms of immediacy) automatically involves frustrating side effects. As was pointed out above, the PCT screen reacts to input by the bare finger and utilises its electric charge. The human user is obviously not adaptable enough for the screen to utilise only its desired properties (charge) and prevent others (oiliness).

Other problem areas are of a similar character. The occlusion problem occurs because input and output device converge in the touchscreen. This is seen simultaneously as one of the main advantages of the technology because it cognitively relieves the user – but it impedes immersion because the user's hand is constantly crossing their field of vision. Lev Manovich has framed this conflict in terms of the fundamental difference between the purposes of representation and control that afflicts interfaces in general,

such that ‘the computer screen becomes a battlefield for a number of incompatible definitions – depth and surface, opaqueness and transparency, image as illusionary space and image as instrument for action’.⁴⁸ Again and curiously, it is the user’s body that he finds himself reduced to and it obviously gets in the way of a satisfying interaction.

Finally, the central promise of the touchscreen – it being an interface eventually addressing the long-neglected sense of touch, thereby including the whole person rather than just one isolated sense, if we follow McLuhan’s dictum⁴⁹ – is disappointed by the inevitable insight that all touchscreens feel alike. Even worse: a single touchscreen always feels the same regardless of its current use. Compared to the older generation of cellphones featuring physical keyboards, the poor haptic variability of the touchscreen soon becomes evident. This leads to the paradoxical situation that a touchscreen, despite its suggestive name, cannot be operated blindly like a keyboard by a proficient user – because one necessarily requires visual support to navigate its surface. ‘Interactive surfaces bring with them the dilemma to make virtual objects “touchable” but not really physically tangible.’⁵⁰ Consequentially, the distinguishing quality characteristics of a smartphone lie not so much in the touchscreen itself, but in the chrome casing and weight of the device.

The overall dissatisfactory situation naturally spurns new concupiscence and excessive engineering creativity, for example:

- an electrovibration technology advertised as ‘Feel Screen’ that utilises the Coulomb effect, creating an electrostatic force pulling two objects together, to simulate different surface structures like textures and edges;⁵¹
- a ‘user interface with real physical buttons, guidelines, or shapes that rise out of the surface of a touchscreen on demand’⁵² and recede into the surface, becoming invisible again when they are not required anymore;
- the logical absurdity of a ‘touch-free touchscreen’ that exploits gesture recognition sensors to track a finger’s movement hovering slightly above the display, solving hygienic problems at the least;⁵³
- and even a ‘furry’ display made of optical fibers with no apparent use apart from serving as a sort of robotic pet.⁵⁴

Some of the interfaces being developed seem to follow Viktor Sklovskij’s image that ‘art exists that one may recover the sensation of life; it exists to make one feel things, *to make the stone stony*’.⁵⁵ Evidently though, the engineering quests do not aim for defamiliarisation, but are rather part

of an affirmative discourse of unleashed technological progress. Still, the general impression remains: the strengths of the touchscreen are often just its weaknesses in disguise, and the user's body seems to be the persistent source of most problems – be it in undesirable side effects or unfulfilled sensual entitlements.

On bodily insufficiency: Promethean shame and technology as pharmakon

The German philosopher of technology Günther Anders has developed a construct of ideas around human relations with technology in which the notion of *discrepancy* plays a major role.⁵⁶ By referring to his seminal work from the 1950s, I would like to make an attempt at explaining the emergence of a still-prevailing paradigm of 'soft machines'⁵⁷ and user-friendly interfaces that share as a combining characteristic a strategy of concealment.

While the investigation so far has focused on device materialities and a rather phenomenological reference to certain incidents of failure in human-computer interaction (a method one might refer to as 'digital materialism'⁵⁸), it now activates a seemingly outdated theory following a radically interpretive approach.⁵⁹ I am aware that this procedure might cause some theoretical incommensurabilities, but I expect to gain something from this conscious change of perspective and methodology.

In Anders' understanding, the realm of human capabilities and that of technology are separated by an insurmountable chasm that he calls the 'Promethean gap'.⁶⁰ As humanity is capable of producing much more than an individual mind is able to comprehend, the paradox situation arises in which technology can come to humiliate its human users/observers. Anders narrates a curious incident in a technology museum that he and an acquaintance visited:

T. behaved in a most peculiar way, so peculiar indeed that I eventually observed him instead of the apparatuses. As soon as one of the highly complicated pieces started working, he lowered his gaze and fell silent. – Even more noticeable was that he hid his hands behind his back as if he was ashamed to bring these heavy, plump and obsolete devices in the high society of apparatuses that functioned with such a degree of accuracy and refinement. [...] To have to meet the gaze of the perfect apparatuses in all his carnal loutishness, in his cretural imprecision, he really couldn't bear; he was really ashamed.⁶¹

Anders identifies the outdated nature of the human body as the core problem of human-technology coexistence in a world dominated by produced artifacts to such an extent that he even speaks of a ‘technocracy’ in the most literal sense.⁶² The component of human failure is increasingly occupying a prominent position in interface and systems design; it underlines the presumed obsolescence of human bodies in an environment that is shaped by the demands of technology. Human self-reference in such a world is only possible as shame based on an insight into one’s own deficiency and impotence vis-à-vis the apparatus.⁶³

Anders’ theory of Promethean shame allows a reformulation and adaptation of Gumbrecht’s description of a (mostly unconscious) longing for presence and tangibility inspired by ‘a world [...] saturated with meaning’.⁶⁴ What the world is actually saturated with today, it can be argued, is not only structures of meaning but *technological* structures that shape interactions and everyday routines in varied ways – specifically computing devices gradually fusing with objects of everyday use, often to an extent that is worrying to observers.⁶⁵

These irreducible and inescapable structures might take the place of the sought-after *urgence* in Foucault’s sense, as the historical configuration that is the counterweight and explanatory background to a given *dispositif* – if we, for the time being, consider the emergence of the touchscreen interface in these terms. In fact, the *history of interfaces* (especially in human-computer interaction) can then be read as an ambitious undertaking to let users forget their immersion in a technocratic environment by providing them with colorful, inviting, soft, organic, ‘natural’, and often smart surfaces,⁶⁶ while the actual computers fade into the background of awareness. The notion of immediacy (‘Direct Touch’) acts as a design imperative as it expresses the ideal of an interaction that, although it doubtlessly and even necessarily depends on media technology, presents itself as unmediated with varying degrees of success, as the previous section has shown.

While strategic attempts to overcome Promethean shame by negating the process of mediation can only be successful within limits, the problem is even more perplexing. As the proposed means of solution (in this case: the touchscreen interface) is itself a technological means, it simultaneously occupies the position of antidote and poison in the sense of a *pharmakon*. Bernard Stiegler, in a tone comparable to Anders’, has framed the question of technology in this way: technology is marked by an ‘irreducible ambivalence’,⁶⁷ both enhancing human capabilities and delegating them with detrimental or ‘toxic’ effects.⁶⁸

Both Anders and Stiegler argue that technics cannot be interpreted as being simply in opposition to something that might be called ‘human nature’.⁶⁹ Instead, in Stiegler’s reading, there is a ‘default at origin’ caused by Epimetheus’ failure to distribute a quality to human beings, making them dependent on technology to further their existence.⁷⁰ Anthropogenesis is thus tightly bound up with technogenesis – a fact which, arguably, is so shameful for humankind that it has been systematically expelled from occidental philosophical thought via the separation of *tekhne* from *episteme*.⁷¹

It could be argued, then, that today’s ambient ICT infrastructures extend the project of suppression into the realm of interface design. The expulsion of technics from thought is mirrored in the focus on human-centered design and calm computing,⁷² as well as the desire for *immediate*, tangible interfaces that deny their complicity with the largely invisible computational architectures at large.⁷³ Thus, an ongoing quarrel with technicity, which is often experienced as alienation and loss of insight, is answered with the double-edged blade of media-based compensation, i.e., interfaces promising the limited solace of bodily tangibility – a Pyrrhic victory, at best.

(Non-)conclusion: Aporias of the touchscreen

This investigation has treated the touchscreen interface, focusing on its technical operation and the place it occupies in a changing interaction design paradigm; its promise of immediacy was contrasted with persistent failures in human-computer interaction predominantly caused by discrepancies between human body and device. An attempt was made to connect the history of fascination of the ‘interfaceless’ interface with Günther Anders’ theory of Promethean shame, thereby embedding the problem in a more comprehensive framework of human-technology relationships. It was shown that the touchscreen illustrates the dilemma of a technological fix that is applied to bridge the Promethean gap while simultaneously transferring it into the proximity of the body.

This last section shall demonstrate that the central aporia of the touchscreen might consist in its unsatisfiable offer of tangibility itself. On a strictly technical level, the PCT screen lives up to expectations by short-circuiting user and device electronically, successfully negating the human-technology binary in the process. Touching the screen leads to a temporary indistinction between man and machine – a momentary relief from the tormenting knowledge of their fundamental incompatibility. By using a touch interface, the range of the tactual is widened and marked

simultaneously. As Joseph Vogl has related using the example of Galilei's telescope and its implications for the visual,⁷⁴ the touchscreen likewise opens up an anaesthetic field of the not-yet-graspable – or maybe, in view of the process of digitisation, the not-anymore-graspable, indefinitely perpetuating the desire for tangibility.

Apart from the various empirical deficiencies resulting from a persistent incompatibility between human body and technical interface as mentioned above, the project of mediating touch itself is of an aporetic character, i.e., a puzzle not to be solved, or a 'nonpassage'.⁷⁵ Derrida has retrospectively described a major portion of his work as concerned with such impassable thresholds of thought or undecidabilities, which are the motor of deconstruction. Most relevant to the topic of interest is his *On Touching – Jean-Luc Nancy*, a long comment on and continuation of Nancy's thinking about the problem of touch. Using Aristotle's discussion as a starting point, Derrida recounts 'four obscure aporias'⁷⁶ that are 'haunting a thinking on touch'⁷⁷ to the present day:

1. the undecidability about 'whether touch is a single sense or a group of senses' and what precisely is the organ of touch (the flesh might merely be a medium, 'the real organ being situated farther inward'⁷⁸);
2. the impossibility to identify a single object of touch (analogous to color for vision or sound for hearing);
3. the dubious conjunction of sense organ and medium in the human body, which masks the multiplicity of different sensual qualities;
4. the strange difference between the senses of contact (taste and touch) and those of distance, with the former spurring fantasies of immediacy ('we fancy [...] we can touch objects, nothing coming in between us and them'⁷⁹)

In Derrida's complex treatment (which can only be touched upon gently here), the act of touching and being touched resembles a tangent in geometry.

A tangent touches a line or a surface but without crossing it, without a true intersection, thus in a kind of impertinent pertinence. It touches only one point, but a point is nothing, that is, a limit without depth or surface, untouchable even by way of a figure.⁸⁰

Touch, according to Derrida, revolves around an 'absolute untouchable that is untouchable not because it is of the order of sight or hearing, or any other sense, but untouchable in the order of touching, untouchable touchable, untouchable right at [*à même*] the touchable'.⁸¹ The reason for this aporia

is connected to ‘the originary intrusion, the ageless intrusion of technics’⁸² which always contaminates any conceived immediate relation. Derrida thus asserts once again ‘the absence of any direct immediacy or presence in a ubiquitous detouring technicity that is already present in the unaided hand touching its own other hand or the hand of another’.⁸³ The ‘dominant tradition’ of ‘haptocentric intuitionism’⁸⁴ is potent, but flawed.

In the postscript to his book on Nancy and touch, Derrida turns to yet ‘another challenge, a supplementary one, of the *technical supplement*’.⁸⁵ In haptic technologies, the project of pursuing immediate tangibility is exposed in its precarity. When technics are blatantly involved in creating illusionary effects of tangibility, a *dispositif of tangibility in the media* deconstructs itself. In the technical implementation of tangible interfaces, the long-held correlation between immediacy and touch is permanently irritated and made questionable.⁸⁶

As the sense of touch is further utilised in interface design, it inevitably loses its aura of directness because it has to be mapped to sensors and actuators. The more detailed the knowledge of the haptic sensorium becomes (and accordingly, the more refined the interfaces brought about by this scientific effort), the less convincing appears any rhetoric of immediacy – understood as absence of mediation and technicity in favor of an unfiltered experience of what is present and what impacts the body. The touchscreen can then be interpreted as a cursory (tangential) point of contact between man and machine. It neither ends the frantic search for immediacy nor does it properly address the problem of Promethean shame which has previously been identified as a possible underlying cause for this endeavor. Channeling Anders, the Promethean gap will continue to trouble us despite its asserted dissolution by tangible media. Enduring the aporia and not desperately trying to resolve it might well be to Derrida’s liking.

Notes

1. Manovich 2001, p. 94.
2. Shakespeare 1885, lines 54-56.
3. TED Talks 2006.
4. Ibid. (interactive transcript).
5. Ibid.
6. Foucault 1978, p. 120.
7. Ekman 2011, pp. 1, 7.
8. The summary in this paragraph follows the explanations provided in Broz et al. 2012, Blindmann, and the English Wikipedia article on #Touchscreen at <http://en.wikipedia.org/wiki/Touchscreen> (all accessed on 9 July 2012).

9. Johnson 1965 and 1967. The Danish engineer Bent Stumpe claimed in 2010 to have developed 'the very first prototype of a capacitive touch screen' at CERN's SPS control room in 1973 (Anonymous 2010). As one can easily deduce from the dates of Johnson's publications, this claim is exaggerated.
10. Johnson 1965, p. 219.
11. <http://www.pranavmistry.com/projects/sixthsense/> (accessed on 9 July 2012).
12. Harrison & Benko & Wilson 2011.
13. Robben & Schelhowe 2012.
14. Weiser 1991, p. 94. For a recent summary of the status quo and prospects of the ubiquitous computing research framework cf. Dourish & Bell 2011 and the special issue on 'Ubiquity' of *Fibreculture Journal*, no. 19 (2011).
15. Dourish & Bell 2011, p. 2.
16. The concept of tangible user interfaces has been introduced in Ishii & Ullmer 1997. The authors propose an 'attempt to bridge the gap between cyberspace and the physical environment by making digital information (bits) tangible' (ibid., p. 235). Interactive surfaces like touchscreens were one major component of their vision for the future of computing. For a comprehensive overview of initiatives in haptic HCI, cf. Brewster & Murray-Smith 2001.
17. Dourish 2004, p. 16.
18. Robben & Schelhowe 2012, p. 9 (trans. T.K.).
19. Ibid., p. 8 (trans. T.K.).
20. Cf. Weiser's well-known conclusion: '[m]achines that fit the human environment instead of forcing humans to enter theirs will make using a computer as refreshing as taking a walk in the woods.' (Weiser 1991, p. 104)
21. Gumbrecht 2004, p. xiv.
22. The discursive field encompasses Aristotle's definition of the immediate as a self-evident ultimate justification, Hegel's notion of an always-already mediated immediacy, and Rousseau's longing for a primal immediacy lost in modernity, to name but a few. For a concise summary of philosophical positions on the topos of immediacy see Arndt 2004. In poststructuralism, the theme re-emerged under the discredited label 'presence', most notably in the works of Derrida, who attacks the 'metaphysics of presence' by developing a semiotic theory that forecloses any notion of immediacy in a network of interrelated signs (Derrida 2009).
23. For a compilation of (sometimes entertaining) reviews see <http://www.perlentaucher.de/buch/hans-ulrich-gumbrecht/diesseits-der-hermeneutik.html> (accessed on 9 July 2012).
24. Gumbrecht 2004, p. xiii.
25. Ibid., p. xv.
26. Bolter & Grusin 2000.
27. Manovich 2001, p. 64.
28. Ibid., p. 97.
29. Nakatani & Rohrlich 1983, p. 21: '[t]his mode of direct operation of controls by touch rather than through some intermediary pointing device such as a light pen or mouse gives soft machine users a sense of immediacy they would otherwise not have.'
30. Herrlich & Walther-Franks & Malaka 2012, p. 135.
31. Ibid., p. 136.
32. Holzinger 2003.
33. Grusin 2010, p. 2.
34. Mod 2010.
35. Stone 2001, p. 15.
36. Miller 2009, p. 290.

37. See Weber 1996 for an English translation of two studies originally published in 1846, and Katz 1989.
38. Paterson 2007. Speaking of 'senses of touch' in the plural is reasonable because a range of sensory mechanisms distributed in the skin act together to create haptic impressions, including those of kinaesthesia and proprioception. Paterson also stresses the manifold metaphorical, i.e. non-somatic, meanings of being touched.
39. Böhme 1996, p. 185 (trans. T.K.). Cf. also Kerckhove 1993, pp. 139-142.
40. Ibid., p. 205f (trans. T.K.). The emission theory of vision opined by the Presocratics explicitly coupled visual and tactile sensations. Cf. Bickenbach 2000, pp.16f. More recent adaptations pursuing this connection for the context of cinema include Barker 2009 and Marks 2000.
41. McLuhan 2005, pp. 247f.: '[e]lectricity offers a means of getting in touch with every facet of being at once, like the brain itself. Electricity is only incidentally visual and auditory; it is primarily tactile.'
42. Licklider 1960.
43. Cf. the interdisciplinary research community at <http://hcsquared.eu/home> (accessed on 9 July 2012).
44. The reunification of subject and object worlds 'within the phenomenological experience of touch' has been Merleau-Ponty's project in his books *Phenomenology of Perception* and *The Visible and the Invisible*. Cf. Paterson 2004, p. 169.
45. Dourish & Bell 2011.
46. ADILKNO 1998.
47. Calvin 2010.
48. Manovich 2001, p. 90.
49. McLuhan 2005, pp. 66f.
50. Herrlich & Walther-Franks & Malaka 2012, p. 141 (trans. T.K.).
51. Arthur 2012. Bau et al. 2010 includes an overview of current developments in tactile augmentation based on electrovibration rather than on the widely-used mechanical actuators. One main advantage of these technologies lies in a completely different sensual arena: they are entirely noiseless (ibid., p. 7).
52. Anonymous 2012, p. 3. The accompanying promotional video (<http://www.tactustechology.com/technology.html>) states: '[f]or years people believed that the world was flat. They were wrong. For years people believed that touchscreens were only flat. They were wrong.'
53. Strietelmeier 2012.
54. Kosuke et al. 2010.
55. Sklovskij 1988, p. 20 (emphasis added, T.K.).
56. Anders' main work *The Outdatedness of Human Beings 1: On the Soul in the Era of the Second Industrial Revolution* has never been translated into English.
57. Nakatani & Rohrlich 1983. The authors differentiate between computers and machines by stressing the 'inscrutable form' (ibid., p. 19) and high degree of abstraction of the former, which make it hard to establish a perceptible link between user actions and consequences.
58. Manovich 2001, p. 10.
59. Anders' ambition to get beyond the surface of the phenomena he analyses even encompasses the temporal dimension. In his methodological approach of 'prognostic hermeneutics' he strives for an understanding of the formative power of technology by speculating about its non-obvious future qualities (Anders 2002, pp. 424-426). To put it into a formula: it is necessary '[t]o torture the things until they confess.' (Ibid., p. 428 [trans. T.K.]
60. Anders 2010, pp. 16-18.
61. Ibid., p. 23 (trans. T.K.).
62. Anders 2002, p. 9. In Anders' view technology has replaced human beings as the subject of history.

63. Anders uses the term *apparatus* in the double meaning of denoting individual devices but also the accumulated totality of machines, installations, institutions, etc. Cf. Dries 2009, p. 68. The theory of Promethean shame is developed in Anders 2010, pp. 21-95.
64. Gumbrecht 2004, p. 107.
65. Intriguingly, these structures today often have the form of software, making them even more intangible and evasive. Cf. the growing body of literature on Software Studies, e.g. Fuller 2008.
66. Fortunati 2005, p. 153.
67. Stiegler 2012b.
68. Stiegler's more recent work revolves around a concerned 'pharmacology of attention', investigating, for example, the 'correlation between Attention Deficit Disorder and the hyperconnected mediated milieu' (Stiegler 2012a, p. 8). Cf. Stiegler 2010.
69. Technics, as opposed to technology, is a more fundamental term designating 'the technical domain', while the latter describes the epoch of a functional integration of technics and scientific knowledge. See Stiegler 1998, p. 280f.
70. Cf. *ibid.*, p. 187f. and Camp 2009, p. 126 for a summary of the argument. Anders' position is best summarised in Stern 1936, p. 22 (under his birth name Günther Stern): '[a]rtificiality is the nature of man, and his essence is instability.' (trans. T.K.)
71. Stiegler 1998, p. 1.
72. Weiser & Brown 1996, p. 7: '[w]hen computers are all around, so that we want to compute while doing something else and have more time to be more fully human, we must radically rethink the goals, context and technology of the computer and all the other technology crowding into our lives.'
73. Manovich has objected that the notion of invisible computing (prominently laid out in Norman 1999) is actually displaced by a paradigm of dramatised aesthetic experiences in interaction design. While this 'aesthetization of information tools' also applies to the touchscreen interface (cf. Jeff Han's presentation video mentioned above), one can still argue that the problematic encounter between human and technology is shifted to a different register where, paradoxically, immediacy might be showcased as an exceptional, engaging, and affective event (Manovich 2006). On a similar note, cf. Rogers 2006.
74. Vogl 2001.
75. Derrida 1993, p. 12.
76. Derrida 2005, p. 5
77. *Ibid.*, p. 6.
78. Aristotle 1941, 2.11.422b. Cited after Derrida 2005, p. 5.
79. *Ibid.*, 423a-b.
80. Derrida 2005, p. 131.
81. *Ibid.*, p. 113.
82. *Ibid.*
83. Miller 2009, p. 262.
84. Derrida 2005, p. 300.
85. *Ibid.*
86. Bergermann 2006, p. 316.

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