Transmitting Location

Digital cartographical interfaces as transformative material practices

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In this paper I will look at digital maps and how the spatial relations they endorse can be understood through focussing on a new conception of them as material interfaces. Using a Latourian view of techno-scientific artefacts, it will be asserted that the practice of digital mapping always takes place *via* interfaces that act as loci of spatial transformation. As the term already indicates, interfaces facilitate interaction between map source and user. However, in line with the ideas Latour, this paper does not view them as empty vessels that let this interaction 'come to pass' – a prevailing ideal in both new media studies and engineering and computer science (Pold 2005) - but as material signs that are inscribed with socio-spatial 'programs of action' (Latour 2005;1999;1993). Similar to for example a door-hinge, they proscribe and invite certain spatial actions (e.g. 'turn left', 'touch me') and transformative processes. They thus act as Latourian intermediaries through which a navigator can create particular spatial relations. This paper will focus on how mapping interfaces as immutable mobiles act as such mediators, creating and proscribing links between users, things and spaces.

Keywords: Digital cartography, material transmissions, interfaces, material signs, immutable mobiles.

Transmitting location

In this paper I will discuss how digital mapping interfaces can be understood as new loci of spatial mediation. I will approach them as material signs via which new spatial formations are being created. Digital mapping interfaces are mediators: they do not so much collect, but rather create spatial transformations for the user of the interface, thus instigating new moves on his or her part that are fed into the interface again. Arguing that it would therefore be shortsighted to view digital mapping interfaces as mere points of passage, I will argue that they are better understood as mediators that create spatial meanings by translating between and inviting movements of users, vehicles, programs, etc. With this theoretical starting point I take distance

from certain voices in the field of new media studies that perceive interfaces as vessels for information that are immaterial and transparent. Instead I will call for a theoretical conception of interfaces as Latourian material signs, quasi-things inscribed with programs of action.

So instead of just storing spatial information, interfaces also take part in the creation of spatial relations. In this process map images are highly dynamic and become hybrids of multi-dimensional input that is merged in ever-changing ways. This makes it highly problematic to speak of digital mapping interfaces as *re*presenting spatial relations: they co-produce them. The title of this paper indeed suggests that they have become transmitters of locations instead. They are mediators via which altering images are produced, combined and merged in ever changing shifting spatial associations.

While analogue maps are representations of space that 'mirror' a certain fixed –and often ideological - view of and on the world that can only be altered 'on the surface', digital maps should be perceived as more profound and flexible interfaces. Deep and high in the sense that what goes on underneath (programming) is always coming to the surface in new ways when new input from 'above' (from the user, a gps) is given. Flexible in the sense that as a simulative processes the input and output always shift and merge in new ways according to where one is headed. As Nanna Verhoeff argued in her paper, they should indeed be situated within the realm of 4D cartography.

To ascertain what has come instead of representations I will probe their status as immutable mobiles. By using the Latourian concept of immutable mobile, I will show that although digital mapping interfaces are certainly immutable and mobile in the sense that they don't loose their shape as things when moved about, a subtle yet crucial shift has occurred in where their immutability should be located. Different from 'paper maps' or many other analogue scientific representations, images have gained a degree of mutability. While the interface mediates and creates translations between different planes of spatial knowledge, such as users input, satellite signals and computer program, maps constantly change their appearances in more than one way.

Cartography is not what it used to be

Navigating through space has taken on radical new meanings since the emergence of digital mapping practices. Analogue maps are abstract and fixed representations. They are designed

with a fixed and predetermined layout of borders, centre, periphery and so forth. Their Euclidian account of height and distances often results in two-dimensional or one-dimensional representations. One can read such maps, one can turn some of them around, one can even make annotations on such maps, but for the rest their visual appearance and meaning remains preset and abstract. Certain irrevocable choices are made by cartographers, censors etc. about what will be shown and how and the map-reader is given a representation of spatial relation and users can only marginally change such decision. Indeed, as has been convincingly argued before, after the Renaissance maps have become seemingly objective and static spatial representations that all too often served particular ideological needs (Anderson 1999, De Certeau 1984, Crampton 2001, Harley 1988, Mukerji 1989, Wood 1992).

Nowadays, digital cartographical interfaces no longer entail such static representations of space. Digital map users are not just reading maps, but constantly influence the shape and look of the map itself. At home, at work and while travelling: maps have become more personal, transforming while we navigate with and through them. Digital maps allow a greater degree of interaction between users and mapping interfaces than analogue maps do. Instead of just reading maps, users have far more influence on how maps look. Whether a navigation device that adjusts its route-display according to where the driver chooses to go, or a map in a computer-game that is partly created by players, maps have become more interactive and are now co-produced by their users.

What has changed considerably since the emergence of digital cartography, is that users are able a to manipulate the appearance of maps in multiple ways. This marks an important cultural shift in the meaning of cartography, which can no longer be solely comprehended in terms of 'objectified' and static representations of space. Digital maps enable more dynamic spatial interactions between user and map (Cartwright et al. 2002). Related to this spatial interaction, digital maps provide a new range of possibilities for agency (and creativity) on the part of the navigator or user. The offered possibilities are nevertheless by no means boundless but determined by parameters: program sources that are mediated through interfaces dictate to what extent trajectories, dimensions, markers, and appearances are modifiable.

As I have argued elsewhere (Lammes 2008), digital cartographical interfaces actually upset the distinction between maps as abstract and objectified, and often ideological constructed representation of space and the practice of going places as a personal and subjective experience of space. De Certeau's (1984) distinction of map and tour as no longer applies since maps are

points of contact that change appearances according to where we wish to move. Indeed, map and tour can no longer be distinguished as categories, as was the case in pre-renaissance western cultures and is still the case in certain non-western culture (e.g. the aboriginal song lines). Users of digital maps are no longer mere readers of maps but have become cartographers on tour.

Mapping interfaces

In this paper I wish to ascertain what has changed in the relation between user and map with the advent of contemporary digital cartographical practices. I will do so by concentrating on the concept of the interface. Both digital maps and analogue maps can be viewed as interfaces – points of contact- that are consulted as go-betweens and through which spatial relations are understood and produced. It is precisely the status of the interface that has considerably changed now.

Mapping interfaces are defined here as the technological means through which one can interact with a particular map, such as the screen, a keyboard or a joystick. Or in the case of analogue maps, printed foldable maps, a road atlas, a display along the road ("immobile moorings that provide the condition for mobility", Bissell 2009, 101), or a map of the underground (cf. Vertesi 2008). Interfaces are thus points of contact and permit interaction with digital maps (Best 2004, Cartwright et al. 2002, Morse 1999) and spaces through which one navigates. Although the use of interfaces is widespread, the kind of interaction they allow varies greatly. The sensory input they permit can differ (e.g. voice, touch, or gesture via camera-input) as well as their level of mobility (stationary or mobile). Also, interfaces can both involve the user in more serious or playful interactive conduct. Finally, and most importantly, the degree of interaction they allow can differ considerably. So, although interfaces for engagement with are ubiquitous their qualities can be rather diverse: they connect, produce and merge different spaces in different ways.

Material interfaces: ideals and ideas

In both new media studies as in the area of engineering and computer sciences a persistent idea can be discerned that perceives interfaces as being transparent and invisible. Obviously computer sciences holds on to this ideal from a conviction that interfaces should be oiled means of communication that invisibly and effortlessly merge with daily practices. To conceive them as

having agency does not agree with an effort to close 'black boxes' with the purpose of weaving them seamlessly into daily practices. Or, as Søren Pold (2005) states in his article *Interface Realisms: The Interface as Aesthetic Form*:

> Making the interface, its expression, and materiality more functional and transparent has been key to interface design and the accompanying academic discipline, HCI. In the broader cultural and social understanding of the computer, the tendency has been to understand the interface as transparent, preferably invisible, in order to produce a mimetic model of the task one is working on. Interfaces should be intuitive and user friendly, should not "get in the way" or otherwise be evident or disturbing. This has led to development of the ideals of direct manipulation and the WYSIWYG (What You See Is What You Get) slogan for the GUI, which became a leading sales argument for the Apple Macintosh from the mid-1980s. Perhaps the apotheosis of the transparent, invisible interface was Virtual Reality (VR), which was widely believed to be the next interface paradigm from the mid-1980s to about the mid-1990s, when it gradually lost steam. (n.p.)

As Pold convincingly argues, this ideal of transparency may have some value for designing interfaces, but has limitation because of its presumption that interfaces are mimetic representations of reality that are non-intrusive. Such an ideal is inadequate because it does not acknowledge "that the interface changes what and how we see, how we experience and interact with reality, and how this reality is reconfigured through the computer" (2005, n.p). If both designers and HCI would recognize the agency of interfaces in the world, it may well lead to more rich and interesting practices of interface design.

The inclination in new media studies to view interfaces as translucent, imperceptible and empty vessels, has a parallel yet slightly different background. Since new media studies started to emerge as a new field of studies in the 90s, a tendency can be discerned to view new media and digital cultures in utopian and dystopian terms. Spellbound by an idealism that often is triggered when media are new, hopes and fears often reach proportions that have little to do with how new media are rooted in every day life. Ideals of communication often play up when technologies are new and (De Vries 2005, 2008, Marvin 1988) and indeed give little space for considering them as material technologies. It is for this reason that discussions frequently focus on how new media, such as the Internet, generate new virtual experiences of space that are supposed to be distant from everyday material realities (Fuller 2005). In relation to space, scholars even argue that new media deprive us of a sense of place. Through their global and ubiquitous use and representations they would create "geographies of nowhere" instead (Augé 1988, Eberle 2004, Kunstler 1994, Kupfer 2007, Meyrowitz 1985).

Theorizations of interfaces follow this tendency. Interface and interface culture were already much-heard buzzwords in the 90s, but until lately definitions remained rather immaterial and

conveyed a utopian or dystopian perspective. Steven Johnson speaks in his book *Interface culture: How new technology transforms the way we create and communicate* (1997) the qualities of interfaces for example as follows:

> (C)yberspace remains, for all practical purposes, invisible, outside our perceptual grasp. Our only access to this parallel universe of zeros and ones runs through the conduit of the computer interface, which means that the most dynamic and innovative region of the modern world reveals itself to us only through the anonymous middlemen of interface design. (p.19)

What is interesting about Johnson's view is that he approaches cyberspace (in itself a rather problematic term) as a realm that exists outside our physical 'universe'. As if digital media belong to a dimension that is intangible and 'out there'. Surely the "zeros and ones" of which Johnson speaks are difficult to grasp, but the same goes for so many black boxed technologies that are nevertheless totally embedded in our daily practices. Secondly, it is intriguing that he describes computer interfaces as "anonymous middlemen", as if they are unrecognizable entrances to ungraspable realms beyond us. Johnson seems to suggest that interfaces are some kinds of portals that cannot be named, but still give us access to the digital as an otherwise intangible universe.

Manovich work on the screen as interface follows a somewhat similar track. In *An Archeology of a Computer Screen* (1995) he argues that the computer screens are part of a historical discourse of the screen that also includes cinema. So far, so good. Yet he also defines the screen, and particularly computer screens, in a highly transparent and immaterial manner. In this much-quoted article, Manovich uses the metaphor of the window to describe how screen interfaces function. Again the ideal of the screen as transparent and indiscernible is put forward. Furthermore it is once more a window to a kind of otherworld, database or source of images and information, that has no function in producing images, text or information:

> What are the properties of a classical screen? It is a flat, rectangular surface. It is intended for frontal viewing (as opposed to, for instance, a panorama). It exists in our normal space, the space of our body, and acts as a window into another space. Today, coupled with a computer, the screen is rapidly becoming the main means of accessing any kind of information, be it still images, moving images or text.(p.124)

In *Body and Screen* (1999) Margareth Morse actually does seem to take some distance from the ideal of the interface as translucent frame, by administering agency to screens when describing contemporary screen cultures:

> (T)he shift in late twentieth century media that changed a stable, mirror relation between a spectator and the screen into a dynamic one between a mobile spectator and a screen that is released, free to seduce or endeavour gaze. (p.65)

So Morse talks about contemporary screens as quasi-objects that can lure and attract. Yet the relation between screen and user remains rather fixed and separated in her explanation. Not only does she speak of spectator instead of user and of 'gazing' as the main activity (clearly indebted to apparatus theory), she also defines the screen itself as "a *threshold* that divides the ordinary and the everyday from other realms that seem truer or larger than life. The interface between this world and the other world." (p. 63, italics added, S.L.). Morse's argument thus still fits in a dominant strand of thinking which the interface is theorized as an immaterial 'membrane', situated outside physical daily life.

This immaterial take on new media has been governing the field for a long time. Actually only lately, a 'material turn' can be discerned in which the conception of new media as immaterial, global and placeless is contested. In this current debate it is asserted that digital media re-mediate existing spaces (Bolter & Grusin 1999), that they are site-specific (McCarthy 2001), local as well as global (Appuradai 1996, Bakardjieva 2005, Lammes et al. 2009, Poster 2004, Schwartz 2006) and that virtuality is not opposed to material or physical practices (Fuller 2005, Hayles 2002, Kalaga 2003, Lievrouw & Livingstone 2006, Poster 2004, Shield 2003).

My approach of mapping interfaces as Latourian sign-things that are inscribed with socio-spatial 'programs of action' (Latour 2005;1999;1993) fits in this recent way of thinking. I approach digital mapping interfaces as material mediators in transformative practices. Similar to for example a door-hinge or a key, mapping interfaces proscribe certain spatial actions (e.g. 'turn left', 'touch me', 'take me out of here'). Mapping interfaces thus invite certain interactions between map source and user and other humans or things and are the material means through which the navigator can create particular spatial relations. To view interfaces as technological artefacts that act as such mediators - creating and prescribing links between users and spaces – allows us to acknowledge their materiality and move away from a (occularcentric) preoccupation in which the transparent and non-intrusive mirror or window is conceived as "the archetypical interface" (Cypher and Richardson 2006, 2). Considering interfaces as more than just "windows" (Manovich 1995), "broken mirrors" (Morse 1999, 65) or "anonymous middlemen" (Johnson 1997, 19) that lead to other worlds, allows us conceive the materiality of the interface and approach them as human made and used things, as "sticky" (Cypher and Richardson 2006, Chesher 2004) and tactile creators of spatial relations. Thus we can avoid to

view them as empty vessels that let interaction 'come to pass' – a prevailing idea and ideal in both new media studies and engineering and computer science (Pold 2005).

Immutable mobiles: From storing images to transmitting images

Clicking on a mouse, touching a screen, pushing buttons, speaking to an interface: users of digital mapping interfaces are invited to undertake all kinds of actions that reciprocally affect the appearance of the map. Here lies a clear difference between old and new mapping interfaces. Older mapping interfaces consist predominantly of a one-dimensional surface that 'holds' the image of the map. This surface invites users to read, touch, look, flick through, fold etc. but such activities don't have a great reciprocal effect on how the image of the map looks. Digital mapping interfaces, on the other hand, involve far more than a flat image of the map and are therefore also far more multi-dimensional than analogue maps: the casing behind the screen with hardware, electricity cables and many other things make up a network that the user can connect with via several kinds of interfaces. Through this network images are transmitted, which are constantly transformed by collaborative input of humans and other things (e.g. roads, satellites, radio signals of traffic jams, other computers). All this extra stuff surrounding the image actually serves only one purpose, and that is to make the map image transformable.

Because of this transformability digital maps are no longer classical *immutable mobiles*. In "Visualisation and Cognition: Drawing Things Together" (1990) Latour describes what he means by an immutable mobile by taking the example of La Pérouse who travels to the Pacific to bring back a better map to the king of France. When he tries to ascertain whether a part of China is insular or peninsular, a local draws him a map of the area:

> An older man stands up and draws a map of his island on the sand with the scale and the details needed by La Pérouse. Another, who is younger, sees that the rising tide will soon erase the map and picks up one of La Pérouse's notebooks to draw the map again with a pencil . . . (p.24)

Latour argues that the difference between the project of La Pérouse and what the locals are doing, lies not so much in that the Frenchman has more knowledge of how to draw maps, but in that he wants to be able to bring a map back to France, so that others can use his knowledge. The locals have no need for that and can draw maps anytime they want. For them it doesn't matter if they are being wiped out by the sea. To be able to bring a map back La Pérouse has to make an inscription, a map as an object that does not change shape when transported. The map has both to become immutable and mobile to achieve this. Thus it turns into a representation of

that particular area of China that can be transported.

Latour states that particular traits ensure that a thing becomes an immutable mobile: it has to be a *flat inscription* that can vary in *scale*, can be *reproduced*, is *re-combinable* and is *super-imposable* with other inscriptions (37-38). When we look at digital map images, we can indeed agree that they are pre-dominantly flat, re-combinable and that their scale may be adjusted. It should however be added that it is now the user as cartographer that has a certain say in how scales vary (zooming in) and in which images are combined and superimposed (mash-ups). Yet the two features of inscription and reproduction need reconsideration.

First of all, digital mapping images cannot always be viewed as straightforward inscriptions. Surely, some digital maps still depend heavily on the practice of inscription. This is most notably the case in Google Earth. It is actually a 3D digital globe on which a multitude of inscriptions are superimposed. Perfectly in line with Latour's definition the globe itself and its basic cartographical features are immutable, yet super-imposable and re-combinable. The views and degree of zooming and moving has spectacularly increased in the case of Google Earth, but as a tool and toy it actually still heavily depend on reproducible inscriptions. It is a perfect example of Latour's claim (1997) that since the digital turn the term immutable mobile has not been made redundant, although velocity may have increased tremendously and other connections may be privileged:

> (I)n the long history of immutible mobiles, the byte conversion is adding a little speed, which favours certain connections more than others, than this seems a reasonable statement. To say that we are living in a cyberworld, on the other hand, is a complete absurdity. (n.p)

Indeed one could state that in Google Earth the practice of hybridization, which has always existed according to Latour, is sped up and augmented to a far greater extent. The connections that can be made have altered (e.g. webcams, photographs) and the rate in which images can be added and re-combined has accelerated. Yet in essence the images that are re-combined via Google Earth as an interface are still inscriptions that are re-producible.

Yet, even in the case of Google Earth, which hinges on a multitude of visible and re-combinable inscriptions, something has changed about the status of the image. The position of the user of Google Earth actually somewhat evokes that of the young Chinese men that makes a drawing of the island in La Perouse's notebook, a mediator or translator in Latour's story. Similar to him, users that are not necessarily map experts are encouraged to make their own personal

inscriptions on a surface by adding photographs, icons, films and games. In the simulative environment of Google Earth user can draw extensively on the cartographical layout of the world as a surface. Since these alterations on the surface are partly made by users as cartographers and designers (another new connection), cartographical images become less asymmetrical inscriptions and regain at least a taste of mutability.

Yet some other digital mapping practices upset the immutability of the image as inscription to a far greater extent. They remind us of the story of the older man that draws the map in the sand. In these practices images are not stored but are wiped out continually only to make place for new ones. A strong example of this is of course a satellite navigation device, via which the navigator sees and (tactically) interacts with shifting pictures of the road visible as an image on the screen when moving about. The user also continually sees himself or herself in new positions within that transforming image. Evidently the image changes constantly and has become *mutable* and almost irreproducible. You cannot easily show what route you have taken by using the sat nav, because images are wiped out continually and cannot be easily retrieved or stored.

What is crucial here is that the scientific status of the map does not suffer from this mutability of the image. This can be so because the immutability of inscriptions is stored elsewhere: in the program, on the satellite and in the casing of the thing (the hardware) that frames the cartographical image and makes it (to a greater and lesser extent) transportable (cf. Akrich 1993). So inscription still plays an important role in digital mapping interfaces, but *has shifted location*. Surely the image itself is no longer an inscription in the way that Latour meant this, but the digital mapping interface as a whole remains an immutable mobile by employing different kinds of inscriptions that together ensure what Janet Vertesi called the "image's indexicality, which changes in an appropriated (but still expert) context of use" (2008, 25).

To paraphrase Latour's statement about the Chinese map: because digital mapping interfaces are programs of actions that connect and translate inscriptions of computer code etc., it doesn't matter that the image of the map gets constantly wiped out by the traveler. New connections and translation can always be made between satellites, users and program source to retrieve new coordinates and images. This makes digital mapping interfaces highly immutable and highly mobile, although the digital image in itself has become more mutable and less reproducible. Storage is situated elsewhere and under the hands of the user the image of the map has become a transformative surface for transmitting locations.

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