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Maps as geomedial action spaces: considering the shift from logocentric to egocentric engagements

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Abstract This paper considers some significant questions in geography and cognate fields about the roles of maps in the information age. Most maps are now digital products, offering immersive environments for user involvement. The increasingly networked digital distribution of geographic information in consumer-orientated cartographic representations leads to substantial changes how people individually and collaboratively experience and produce space and place. This article focuses on the ongoing metamorphosis arising through geobrowsing, the media-based flexible production of geographic knowledge through interactive maps. Drawing on work in media studies influenced by the so-called spatial turn—the rediscovering of geography-related questions in the social sciences and humanities, after modernism's claimed prioritization of time and history (Soja in Postmodern Geographies. The reassertion of space in critical social theory, London, 1989; Jameson in Postmodernism, or, the cultural logic of late capitalism, Duke University Press, Durham, 1991)—this paper develops a theoretical framework built on the dynamic networked geomedial action spaces concept to understand the changing roles of information age maps as imagined materialist spaces for the experience and production of space—ultimately a medial turn. Following this concept, maps change from offering static and non-interactive frames of geographic reference for the production of space and place and as geomedia support a veritable infinity of interactive and map-based activities. Geobrowsing facilitates some new modes of geographic interactions that move from logocentric engagements with static maps to egocentric dynamic interactions with code-based elements of geomedial action spaces. Google Earth and similar geomedia facilitate maps that become intrinsic to a growing number of social action spaces and alter the experience and production of space and place.

Keywords Online maps · Neogeography · Media studies · User interaction · Geobrowsing · Geomedia · Spatial turn

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Introduction: From Julian's interactive geobrowsing session using the geomedia Google Earth

> Surrounded by the blackness of the screen, the earth in the geobrowser window seems to float in space, a few stars can be made out in the background. At an indicated altitude of 11,000 kilometers Europe is now visible in the center of the interface. With a press of a mouse

> button, suddenly a nosedive starts at a rapid pace towards a German town centered in the browser window, stopping abruptly at the altitude of 7.4 kilometers. A blur of features comes into focus. Centered in the window is the small town of Dietz, near Koblenz, where the Rhine and the Lahn rivers meet, Julian speaks now and tells us, what we see and describes the surrounding forests and fields. Following brief scrolling movements to the right and the left, the on-screen slider bar is used to zoom in. At an altitude of only 650 meters, Julian identifies his parents' house that he is searching for and zooms in yet further. Along the course of two parallel roads the navigation continues in the direction north-west. Next, a quick zoom out follows until the castle of Dietz comes into view. Following a closer inspection of the castle, the journey continues northwards, along the bends of a river until another castle, castle Schaumburg, becomes visible from the blur on the screen as the imagery downloads in high resolution. Julian zooms into 500 meters altitude. Abruptly he zooms out while scrolling southwards. The cursor moves to the search box. His hands go to the keyboard and he types another destination. His next geobrowser stop is Mojácar, Spain….
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> (Geobrowsing Activity (male, 27), January 11th 2010, Sequence: 0:00 Min–2:15 Min.; Total duration: 11:27 Min.)

Even though initially geomedia, such as the now re-conceived Google Earth, represents the earth on a global scale that can be rotated analogous to the physical globe still found in many libraries, most users do not initially navigate to faraway places they have never been to. Instead of following a certain sense of exoticism in their navigation, inscribed in the figure of the explorer (Cartwright 2010a), users tend to appropriate the geomedia through geobrowsing by first searching for already familiar places. The town Dietz in the geobrowsing vignette above is the place where this young man spent his childhood, and is the current residence of his parents and grandparents. In the concept of the map as an action space, the map-supported appropriation means transforming the abstract logocentric space shown in a geobrowser into a personal egocentric space through interactive adjustments to the position and perspective of the viewer's visual focus. This process is primarily an aesthetic one since new modes of interaction allow the individual to guide the virtual navigation, and during the encounter with the software, views of the planet are transformed into individual topographies and relationships to experiences. But Julian's zooming into his hometown Dietz was not just a trip down his memory lane, but also a trigger for connecting historic facts about the area and its surroundings to experiences. During the geobrowsing, Julian informs us that the count's castle dates back to the eleventh century, and that it used to be an official residence of the Nassau dynasty. Later on in the session, we learn about his youth spent near the inner-German border. Nevertheless these choices of particular historical topics are linked to subjective experiences and preferences based on individual connections to the territory depicted through the geomedia. In the course of his geobrowsing encounter, after entering the action space of the map, the abstract space rendered in a geobrowser changed into a place with individual layers of meaning, constructed and related with the help of the navigational devices offered by the interface. Julian used Google Earth as an autobiographic medium without a focus on events or experiences, but with an emphasis that connects personal places of remembrance with visually rendered elements of the depicted territory. In distinct contrast to the traditional paper map's logocentric modes of interaction, an online geobrowser map representation becomes an action space that supports a personal egocentric access and the individual adaption of the geobrowser's abstract spatial representations.

In recent years media scholars, scholars of geography and GIS experts alike point to distinct changes in the modes of cartographic production (e.g. Pickles 1995; McHaffie 1995; Gartner 2009; Caquard 2011, 2014). Commercial and non-profit mapping applications have become aesthetically enticing open platforms transforming previously abstract, logocentric, and disembodied cartographic maps into egocentric and embodied action spaces by combining or overlaying it with photographic and sensorial images and 3D computer graphics. In addition, a gradual move from capital-intensive authoritarian modes of production lowers the bar for cartographic amateurs to get involved in map design and diffusion. Participatory, and collaborative forms of cartographic cultures emerge online (Turner 2006a; Goodchild 2007; Caquard 2014), and as a result, digital maps with personal content have become available privately and publicly. Due to socio-

technological developments in the course of the digital upheaval, new cultural objects, and with them new ways of depicting and dealing with space and place emerged. At the same time the so-called Spatial Turn brings space and place back into the humanities and the social sciences (Döring and Thielmann 2008; Warf and Arias 2009). This re-localization of theory happens first and goes hand-in-hand with the location-awareness of artifacts and objects involving further inquiry. Media scholars also begin to recognize the sudden location-awareness of their objects of study (e.g. Thielmann 2010; Farman 2011; Wilken and Goggin 2012; Verhoeff 2012). Complementing this spatial turn in the sciences, cartographic production confronts a medialization of mapping phenomena, a 'medial turn' characterized by the intermingling of physical and digital space and by new means of presenting space and place through new media. Location aware media, like online communities structured by the geographic location of their members, mix reality with digital art installations, and augmented reality smartphone applications became their own field of study, cutting across formerly individual media ontologies such as film-, tele-, or cybergeography. Geographers have called these new convergence phenomena DigiPlace, mapping 2.0 or the geospatial web (Zook and Graham 2007; Gartner 2009; Scharl and Tochtermann 2007). The term suggested by media scholars is geomedia (Döring and Thielmann 2009; Thielmann 2010; Felgenhauer and Quade 2012). Geomedia are global communication media whose usage is tied to specific places. This includes localizing hardware like GPS trackers, augmented-reality applications, and localizing practices like geotagging. Of particular note are devices with automatic positioning of the user and geographic information systems that afford interactions with geographic presentations. The latter have been popularized by commercial macro actors like Google and Microsoft. Consequently geomedia are technological assemblages which afford the positioning of users and digital data, visualize these entities on a map-like representation and support the interaction between the user and the environment. Therefore geomedia have the potential to socio-technologically reorganize our encounter with space and place (Döring and Thielmann 2009: 13).

The key development involves the change in the viewer's relation to cartographic media objects in geomedia, their abilities to include variable contents, and the support of many possibilities for interactions. The visualization and interface navigation techniques used in geomedia afford perspectives which demand conscious positioning and repositioning of the spectator to the mapped object in relation to the inscription. It makes a difference, for example, if the subject feels external to the depicted space, or manages to imagine being within it somehow (Klatzky 1998) when using a digital 3D globe for example. The latter points to the concept of immersion which describes all those properties of a media artifacts that account for the evocation of a feeling of being present in the media world (e.g. Slater and Wilbur 1997) or of being fully absorbed by it (Brown and Cairns 2004). Presence, on the other hand, signifies the subject's response to the media world until a feeling of being there is achieved (total immersion) as the state when the mediated world becomes a subject's primary frame of reference (e.g. Lombard and Ditton 1997; Wirth and Hofer 2008). Both concepts are highly problematic in their use but serve as heuristic concepts to distinguish different forms of user involvement (Calleja 2011). For example can the properties of contemporary maps and locative media applications be compared with terms and concepts of traditional immersive media usually distinguished from traditional cartographic media, but related, for example to eighteenth century panoramas. They also borrow New Media's immersive design principles and capabilities found in 3D-computer games, e.g. the progression of zooming in from a digital globe into a navigable environment illustrates (Pickles 2004; Kingsbury and Jones III 2009). In the immersive engagement of geomedia, traditional training and cartographic-based operations of wayfinding and navigation are transformed. The ability to handle software functionality becomes more important than the complexity of gestalt shifts (Polanyi and Prosch 1975), feature integration (Treisman and Gelade 1980) or mental rotation (Vandenberg and Kuse 1978), since the networked medium itself can take over a lot of cognitive tasks when using paper maps, including positioning, way finding and aligning the map. But, on the other hand, active exploration and the manipulation of the depicted space and its contents becomes possible through the development of different tactile skills compared to engagement with static and non-immersive inscriptions.

From a logocentric cartographic perspective, the geomedial roles of maps as immersive action spaces alters maps from static frames of reference of activities to supporting interactions. The map becomes an action

space for the actor who can alter the construction of relationships and replace them through interactions and interpretations that dynamically move from the logocentric to the egocentric. While cartographic researchers emphasize the emergent properties of practices related to map reading in geobrowsers (Peuquet and Kraak 2002), the growth of geomedia also involves a shift from pre-fixed representations to relational modes of visualization accompanied by open means of exploring geographic virtual spaces, freeing up space for interpretation, individual adjustment and, one might say, constructing individual ontologies of place. The use of geomedia is therefore not reducible to dynamic and interactive acts of navigation and wayfinding but involves more affective forms of media consumption. Instead of the traditional logocentric emphasis of the map as a repository and representation of geographic information for communication, the egocentric action space map becomes a medium that we actively engage and interact with. Geomedia changes how we negotiate the division between virtual representations and communication and physical representations and communication. The immersion and interactivity of its map-like representations lead to an interpretative openness that raises both theoretical as well as methodological questions the action space concept engages.

The aim of this paper is not to review recent shifts in geographic information production and distribution including the development of spatial data infrastructures theoretically (Morrison 1997; Harvey 2012; Azocar Fernandez and Buchroithner 2014), but to have a closer look at fundamental changes to the roles and uses of maps arising in geobrowsing. In the following we outline how the rapid growth of geomedia involves a wide-ranging shift in map use, exemplified by geobrowsing (Abend 2013). This development is reviewed, drawing on media studies, Science and Technology Studies, and the distinction between an Apollonian and a Dionysian use of geomedia made by Kingsbury and Jones III (2009), to develop further insights in the changing roles of maps in the information age as action spaces.

The online map as a medial space of action (immersion and playfulness)

A variety of new user practices have emerged as a direct consequence of the technological convergence of cartographic rendering with New Media (Manovich 2001) following the transformation of static and discrete cartographic representation into dynamic networked geomedia applications. Geobrowsers, digital globes for example, and mobile geographic applications, increasingly enriched with 3D-models and panoramic images together with navigational devices, are thus being transformed into media platforms that go beyond static cartographic visualizations. These platforms can be described as media hybrids, or conglomerates, combining additional textual information, audio-visual content and even time-critical mappings of communication activity with various means to interact with the presentation. The handling of these platforms can be thought of as remediation (Bolter and Grusin 2000) producing shared aesthetics that emerge from technologically enabled means of combination, recombination, and hybridization of different media. Data and services become intermingled in cartographic mashups. Novel features and functionalities are not only added to existing visualization, but means of interactivity are introduced that enhance the overall user experience. The transformation of maps into navigational media environments is most significant for understanding maps as spaces of action. For example, the available navigational means of the Earth View in Google Maps can be described through the notion of the virtual camera that is operated by on-screen joysticks which makes it possible to navigate through the geographic content in user-chosen and infinitely flexible ways. Here, the medial turn leads to the uptake of practices formerly exclusively associated with non-geographic (but not necessary non-spatial) digital media like computer games.

Through these aesthetic transformations maps and globes become a type of media Espen Aarseth has termed ergodic (Aarseth 1997). Ergodic media afford a user centered angle on the world presented that assumes some kind of representation of the user viewpoint. In geomedia this is achieved by a virtual camera which allows for subjective viewpoints, and in Augmented-Reality applications it is the actual smart phone camera that serves as a device for a subject-centered browsing through geographic contents which overlay the mediated camera view. The map transforms into a cybernetic sign that is able to react to user input. The map becomes an action space and map usage is not a passive activity but a performative act

since user inputs influence the presentation of geographic space while navigating the interface, for example by voluntarily or involuntarily triggering specific actions within a location and map based game. This accounts for a degree of spatial involvement commonly associated with digital gaming environments (Calleja 2011). But the incorporation of game-like perspectives and mechanisms also goes beyond the geospatial. For example digital maps afford kinesthetic involvement that emerges from the means to control and move the presentation, spatial involvement is supported in geobrowsers like *Google Earth* which afford the exploration of 3D geographic environments, community-based navigation systems like *Waze* and location-based social networks like *Foursquare* lead to a shared involvement when maps and mappings are produced collectively (Caquard 2014), and location-based and mixed-reality games such as *Parallel Kingdom* (2008, PerBlue) or *The Target!* (2015, La Mosca) support ludic and affective involvement. Some applications such as the location based augmented reality MMOG *Ingress* (Niantic Labs/Google 2013) thrive for a combination of all of these components by overlaying the geographic interface with game mechanics and social media functions.

These emerging practices of map use can be summarized under the term geobrowsing (Abend et al. 2012). Understood as a way of using visual geomedia, and derived from word 'to browse' for the use of the internet, this neologism reveals itself as an ambiguous term in the open-endedness of geobrowsing. Yet, the concept itself is readily grasped. The *geo-* prefix points to the horizon of the practice: geographical space or, to be specific, its presentation on a geomedial platform. The root word of 'to browse' can either mean 'to look something up in a database' or a less targeted notion of flipping through contents. The concept develops in close connection with traditional cartographic concepts, well known academics Donna Peuquet and Jan-Menno Kraak describe the mechanics of then nascent geobrowsing as follows:

> We pan the map, zoom in and zoom out, and change colors. All of these involve 'playing' with the map to allow latent relationships to emerge. There are other ways of manipulating maps for this purpose that we may not ordinarily do—turning the map upside down and sideways, for example (Peuquet and Kraak 2002: 82).

In geobrowsing a playful cartography is acted out that is closer to a navigational form of cartography than to a mimetic paradigm (November et al. 2010). The map-supported appropriation means transforming the abstract logocentric space shown in map into a personal egocentric space through interactive adjustments to the position and perspective of the viewer's visual focus. The movement involved here is a form of knowledge generation since it allows for 'latent relationships to emerge', while the ever changing surface of the geobrowser bears the possibility to show that "all spaces are, at least a little, accidental, and all have an element of heterotopia" (Massey 2005: 116). Geobrowsing allows for emergence in an otherwise pre-modelled environment, and emergence is only possible by linking perception to movement and as such by integrating time critical user inputs. In the media environment of emergent geobrowsing, maps become spaces of action and inseparable from interactive possibilities and choices. In addition, researchers in this field face contemplative and immersive modes of action that cannot be explained within a functional framework to map reading that treats maps as fixed representations with certain consistent rules of presentation. If the map doesn't have the 'gestalt' of a flat inscription any more, but serves as a stage for 3D interactive immersion or becomes an overlay in a mobile mapping application it steps out of its role as a transparent and canonical mediator and develops into a space of action on its own right (Winter et al. 2009). Therefore, contemporary concepts of map use accent the act of looking and the affective qualities of maps and other geomedia (Aitken and Crane 2009; Cartwright 2010b). This shift in the descriptions is not superficial, instead should be understood in theoretical and methodological terms, which place emphasis on aesthetic transformations and newly emerging practices alike. On a phenomenological level, it becomes visible that historical dichotomies between the map as a scientific inscription, on the one hand, and artistic presentations of space, on the other, increasingly vanish in geomedia. The term maps as action spaces also reflects the disciplinary change from representing physical space as a central task in map production towards visualizing or presenting geographical data and with it the recent controversy of representationalists versus non-representationlists (Thrift 2008). Thus, the contributions of critical cartographers since the 1960s (Harley 1988, 1989; Wood and Fels 1992;

Pickles 2004) initiated reflections on the changing roles of information age maps to promote robust theoretical engagements with an emphasis on the changing relationships between map designers, researchers and users of maps. The concept of maps as action spaces theoretically mediates between the structural power of maps and everyday user activities by integrating both within one framework. This framework focuses on the activities of users as the starting point as they encounter the structural power of the design and technology of digital maps with their inscribed scenarios (Akrich 1992) generating the affordances (Gibson 1950; Turner 2006b) of geomedial action spaces.

Geobrowsing in everyday flows of action

Investigations in the study of technologies reveal that new technologies have to prove themselves useful through user-involvement, and, as such, their development phase usually extends well into the actual use (Rammert et al. 1991; Rammert 1993). Interactions between users and technology confront humans with contingent and complex systems that cannot be apprehended and used in one single manner, and, therefore, have the tendency to stay underdetermined (Luhmann 1995)—their potential exceeds the users' uses. It is obvious that this holds for complex technologies such as nuclear power plants with a high degree of complexity and safety mechanism, yet also holds for technologies we regularly use and rely on, the well-known smart phone for example, with lots of possibilities for modification and personalization including interactive media. This indeterminancy also characterizes many geomedia applications. The cartographical representation is a key element supporting many functionalities that can be applied for diverse uses in wide-ranging contexts. This mixture leads to uncertainty that demands decisions and a stronger agenda setting on the side of the users. Leaning towards strengthening possibilities for interaction, in geomedia often times the burden of choosing the right visualization and the appropriate content in a given situation is increasingly handed over from producer to the user. It was traditionally only the map maker's turn to decide what to depict on a maps surface, now it is up to the user to find a way of arranging the contents offered for a display.

As a result, many usage scenarios are emerging long after the product had been released and some of them emerge in quite unexpected contexts. For example one could find Google Earth users in TV and film production companies, where the software is used and adjusted for virtual location scouting. And geobrowsing also found its way into science. At a PhD oral exam at the University of Duisburg-Essen, the zoologist and researcher of animal magnetism, Hynek Burda, came up with the idea to use Google Earth for the study of the alignment of large mammals on pastures all over the world. After finding 8150 cows, on 308 randomly selected pastures on the satellite images, Burda's associate Sabine Begall and her team empirically validated and statistically verified that cattle align while grazing with the magnetic field of the earth. Nature.com published the story and a widely recognized article in the Proceedings of the National Academy of Sciences followed (Begall et al. 2008). A second paper served as proof for the first, again using Google Earth to investigate into the orientation of cows underneath power lines that generate a magnetic field of their own, successfully contrasting the different findings (Burda et al. 2009).

The map as a user-construction is just one side of changing map usage that influence expectations on geomedia. Already, digital maps and globes, and especially locative media applications help revitalize the notion of map use as a form of distraction, contemplation and pleasure, as opposed to a usage solely for analytical purposes, embodied by the historical figure of the flâneur, or armchair traveler (Kehlmann 2005). There are plenty of contexts including artists' engagements with maps, location-based gaming, or social geomedia that pose completely different questions for studies in map usage (Perkins 2006). Traditional methods of map use research that rely on individual, cognitive approaches (Montello 2002) will find it hard to contextualise these varied forms of map usages. New options for the armchair travelers of the digital age still remain an uncharted territory for research in map use and geomedia (Goodchild 2008).

Drawing on Nietzsche's relevant distinction for map use between the Apollonian and the Dionysian, Kingsbury and Jones III (2009) seize on the dichotomous division of the map into an analytical and purposeful tool contrasted to a concept of the map as an affective medium emphasizing the playful side that

characterizes the practice of geobrowsing. They charge the dominant attitudes towards Geospatial Technologies like Google Earth or Google Maps, at that time, with implicitly and exclusively relying on Apollonian standpoints, either criticizing the technology for fostering panoramic surveillance, rationalized worldviews, dystopic control and a transparent world order or highlighting the potentials for participation, civic engagement and empowerment. And it is easy to find usage scenarios which illustrate what is meant by an Apollonian use of a commercial geomedia. There is, for example, Melvin Curtis, researcher at the US-Korea Institute at Johns Hopkins University, Baltimore, who painstakingly collects data on North Korea and covers the country with placemarks, mapping infrastructures, the mansions of Kim Jong-un and his family, and economic regions.[1] What started out as a private mapping project developed in a large-scale spy project whose KML-layer was downloaded over 250,000 times since its launch in 2007.

In Kingsbury's and Jones III's view, a key aspect of the capabilities and exuberant engagement with commercial geomedia is widely neglected, and that is the Dionysian use that manifests itself in the appropriation of the common users. While critics stress the Apollonian understanding of the medium pointing out either anxiety or hope, the Dionysian offers an alternative interpretation, a mode of use that follows a flâneur-like and affective form of interaction while emphasizing "the indeterminancy of technology" (Kingsbury and Jones III 2009: 503). This draws on Walter Benjamin's thoughts on the artwork freed from cult uses on account of mass reproduction and circulation (Benjamin 1969). Both poles construct diametrically opposed but complementary horizons to the question if Digital Earth in its current form resembles a media space of freedom or control. The type of media used in geographic communication and the resulting overall mediality of the geomedial assemblage seems to play the crucial role for the appraisal and the many questions posed hint to the changes introduced by the map as an action space.

Thus, the Apollonian gaze is closely tied to a power/knowledge complex Michel Foucault identified at work: hegemonic discourse. Mapping as a political act is put in duty of the authorities, and they use maps within the exercise of control over national space, or, in the case of Digital Earth, commercial vendors inscribe their view in the alleged objective presentation. According to Kingsbury and Jones III this general resistance and rejection is the only tried and tested reaction which they do not see as a productive form of criticism. By contrast they argue in recourse to Walter Benjamin's fascination with the figure of the flâneur that Dionysian forms of usage are supported by the new means of navigating within the interface of contemporary mapping applications. Using the example of Google Earth, the authors identify spontaneous, chaotic, even avant-garde forms of spatial disclosure. Can Google Earth, in others words, be a variant of "third space" (Soja 1996) that spurs individual viewpoints and frees the individual from notions of absolute space? This is a space that can be explored and reconfigured following individual perspectives transcending the borders of nation states and the ethnic territoriality. In contrast to an approach stressing Apollonian aspects, the appropriation of a Dionysian dimension suggests the emergence of this new space that fosters collaborative production and individual experiences of space and place. Means of action become visible which they describe with the metaphor of the "digital-peep box":

> Like the peep-box and the phantasmagoria machine studied by Benjamin, Google Earth invites an intoxicating array of responses to its zooming, tilting, and rotating imagery. While users can navigate with an Apollonian eye on Google Earth's features such as its 'Pointer' to coordinate latitude and longitude, its 'Eye Alt' to check altitude, and the 'Fly To' and 'Search Panel' in order to specify destination, they can also indulge in the thrill of unchecked aleatory journeys (Kingsbury and Jones III 2009: 505–506)

The authors keenly focus on the discussions and image collections in blogs and forums where users share technical errors, defocused or blurred images and extraordinary discoveries: Screenshots of giant insects, profanity written on the earth's surface, along with countless image collections of nude people. These contributions of users are supposed to count for the Dionysian moments of Google Earth, because they are to be found by rambling around in the map's action space and are non-intended by-products of the

[1] http://www.nkeconwatch.com/.

geographic visualization (Kingsbury and Jones III 2009: 509).

While many of the examples can seem trivial, of interest in considering geobrowsers is the explicit inclusion of different forms of user interactions, along with the renunciation of strict ontological assumptions of the geomedial form in question. But we suggest it is doubtful if a dichotomy like the one introduced by Kingsbury and Jones III is helpful for the research into the actual everyday usage of geomedia. This distinction serves an analytical purpose only, while the examples above show that online and interactive digital geomedia are no longer fully and satisfactorily describable as self-contained indexical sign systems, but take on a semantic openness arising in their underdeterminacy that has to be taken into account: the map as a space for action. Actions are enabled by design and interface, but there is no longer an implicit user that can be fully modeled in advance. Instead the style of geobrowsing can be modified in every virtual step of the flâneur.

Situating geomedia as action spaces (maps as processes)

Characteristic for interactive New Media, potentials for user appropriation exceed the notion of different interpretations as a result of complementary readings because the technological capabilities of many applications allow for many further adaptations and changes by the users. Examples are the user-generated artifacts of the so called web 2.0 (O'Reilly 2005), the emergence of content remixing (Manovich 2013) as a dominant form of participatory practices (Jenkins 2006), or the co-creative practices in computer game modding and videogame production (Banks 2013). The latter specifically applies to computer games that afford building a game world rather than playing within one, like in the popular open world title *Minecraft* (2011). The concept of maps as action spaces not only tries to integrate these different new media usages, but also the complementary adoptions of maps to these possibilities. It takes into account the changing and re-formatting prescribed usage scenarios by the users themselves which turn maps into geomedia. This refers to a fundamental change from the use of maps primarily for functional purposes (e.g. the navigation from A to B) towards the potent use of maps as media. Cartwright and Hunter, well known in the field of multimedia cartography, implicitly point to this dimension of the artifact's altered impact, when they speak of the "intrinsic merit of the content" (Cartwright and Hunter 2001: 302). But the transformations of maps into action spaces suggest a shift of focus away from the contents and towards the overall mediality of different maps. Marshall McLuhan's often cited dictum "the medium is the message" (McLuhan 1964: 13) applies here reminding us to also consider and reflect on the affordances of New Media rather than only its contents. It is the altered mediality of maps (e.g. the immersion, playfulness and the shift from logocentric to egocentric perspectives) that resists the reduction to tool-like and Apollonian use since it is a quality that has to be first discovered. In other words, there is no specific scenario inscribed into the artifact by design, but rather it is the action space that becomes visible that leaves room for the users' expectations. This missing structure and path dependency is a characteristics feature of the map as an action space and as a result, when faced with networked geomedia, map reading and interpretation can have many facets some of them exceeding the representational character of map, or even result in a refusal to interact. For instance, logocentric presentations of geographic space can get transformed into individual and egocentric places of remembrance. With the help of the navigational interfaces, the default Apollonian view of maps alters through Dionysian engagements to link different individually meaningful places in order to produce 'autobiographic topographies' (Abend 2013).

A certain interpretative openness and the focus on the interactive construction of an action space, as well as the specifics of the media involved, geomedia applications also seem to be open to very diverse processes of appropriation that far exceed the appropriations of traditional maps. Implications for map design and map usage arise as well. Distinct from hiking maps, road maps, or thematic maps on paper media, often in geomedia no single implicit user can be deduced from the aesthetics and scripts of the map. This result of the transformation from logocentric to egocentric involvement adds to a critique, which questions the status of the map as a static representation of a territory. The map as an action space by contrast emphasizes the performative character. It is more concerned with the act of mapping as an open

process which involves the user in various ways and degrees than with maps as ideal cultural objects. Thus Geobrowsing is not a mere interpretation of the map as an ideal object but an act of mapping. This conception signifies a focus shift of the analysis into map use from the end product to the ephemeral qualities of the map as an action space. Thus the concept is able to challenge static and linear models of cartographic communication that are based on unified and standardized ontologies. Eventually this impetus to remodel cartographic communication with dynamic, performative, and mobile parameters points to a general critique on the scientific self-conception and on the claim to truth of scientific facts (Turnbull 2007: 141).

Thus, researchers, and users alike, are confronted with uncertainties and contingencies that lead to unpredictable outcomes once digital maps are diffused into different social contexts. Methodologically, these transformation processes are situated actions (Suchman 1999) that demand a departure from reductionist studies of map reading towards in situ observation of map use in action. To follow all the actors involved in map use—the human users as well as the involved cultural objects—is the basic, often cited claim made in this context (Latour 2005). Heeding this advice, there is an impetus for the application of qualitative methods to investigate into the use of maps as action spaces.

With the development of networked cartography and production of immersive and interactive geomedia, in times of multimedia maps and three dimensional visualizations, there are many claims stating to not exclusively focus on laboratory research anymore and to try to capture more 'natural' forms of map usage. One reason is that maps are not produced and distributed exclusively by cartographic experts any more, another lays in the artifacts which become ever more complex, flexible and open for individualization. The mediality becomes more important. Formerly passively modeled end-users are self-empowered, insofar as they now have access to the techniques, and rules of visualization, as well as to the distribution channels. Moreover, maps are distributed cross-platform on different devices including mobile phones and tablets. Empirical research into map use has to deal with these challenges since standardized procedures of data gathering and analysis can only illuminate a small portion of emerging instances of map use. With the entry of cartographic visualizations into the sphere of networked media, and the associated practices of neogeography (Goodchild 2007; Turner 2006a), there must be an orientation towards the individual user.

> The need to capture how maps emerge into the world to do their work necessitates more nuanced means of evaluation than has typically been employed in academic cartographic research to date. Studying mapping needs to progress *outside controlled laboratory environments* and seek deeper ethnographic understanding of *mapping in the 'wild'*, so to speak. Here the focus moves from measured responses to tests towards situated observations and participation in the mapping process (Dodge et al. 2009: 231, emphasis added).

With this appeal to leave behind the spaces of the laboratories there is an underlying claim to turn away from stimulus–response testing and establish methods that involve situated and participatory observations instead. Because in a praxis, or user-centered view it is not clear at all what is ultimately meant with the concept of 'mapping' (ibid.). Also the critique is targeted at the modeling used in cartographic communication, despite all attempts to modify existing models of cartographic communication. Above all a reductionism in the models of cartographic communication fails to adequately capture the contexts of map usage. Instead we propose a methodological shift, at least for inquiries into the culture of map use where the emphasis has shifted from maps as fixed representations to mapping as a processual and situated praxis.

> So a focus for cultural research into map use might shift towards participation and observation of real uses, as well as interviews, focus groups and read aloud protocols. A rich diversity of textual and visual methods needs to be deployed (Perkins 2008: 152).

Perkins sees an alternative in the application of ethnographic informed methods that he summarizes under the term 'cultural approaches'. Moreover, he states that the functional approaches of laboratory research designs face the problem of oversimplification within complex systems. This hits the wall when map use is to be described as embedded in a

superordinate cultural context. Here it becomes clear that there is no antagonistic situation between a somehow old-fashioned research methodology, and the new and somehow better cultural approaches, but simply that both serve different needs and research interests.

> The argument is not that a cultural and contextual approach is any better per se than a cognitive or semiotic approach to map use. Rather that a cultural approach can allow us to answer different questions about mapping and to explore different aspects to the ways in which our society deploys the map (Perkins 2008: 150).

In this sense, qualitative approaches can bring the researcher closer to the productive users and engage them as active agents co-crafting action spaces. They take into account the context of digital map use, lead to further insights into how geomedia are interwoven with everyday activities, reveal new usage scenarios and let us reconstruct how the software's affordances are brought into action.

The many dimensions of digital maps

The maps as action spaces approach holds several implications for studies of geobrowser and other types of geomedia usage. First of all, it must be stated that the skills required to use digital maps are not limited to cognitive tasks of map reading and interpretation any more. The usage of maps also demands additional skills such as the handling of interactive controls like on-screen joysticks and hyperlinked information. Besides, the overall egocentric status of the virtual camera leads to a very personal affiliation with the depicted material and reduces the distance between user and cartographic presentation. It proves true that when the space in geomedia is read by the subject, it becomes the subject's own space and this appropriation can lead to various forms of involvement including spatial storytelling and the translation of the map into topologically re-organised biographies.

In the information age it may seem self-evident that maps are on the way to become immersive action spaces integrated into daily life; media hybrids consistent of immersive environments combining cartographic aesthetics with variable perspectives and means of playful navigation typically associated with other media forms such as digital games. This development shows, that references are not limited to an indexical relationship between space and its depiction, but increasingly tending towards semantic openness, as iconic signs and embodied perspectives intermingle with cartosemiotics, potentially overriding the latter. It even might seem that in the future of the fusion cartographic and non-cartographic media indexicality becomes yet another layer—an additional option—among others for the users of geomedia.

These characteristics are not alone design-implications but also pose other issues regarding the origin and status of geographic software in a time when the centers of cartographic knowledge production are increasingly moving from state institutions to the private sector. Commercial geomedia such as Google Earth paved the way for many new usage scenarios because they successfully combined web 2.0 functionalities with cartographic interfaces, they are much easier to use than expert systems and, like many other geomedia as services, are free of charge and prepackaged, without any further data gathering needed. But this comes at the expense that geomedia can serve as extensions of the organizations providing it, translating commercial interests into the material agency (Sutton 2008) of the devices and mingle with user interactivity. The most obvious way is the integration of commercial content within the geographic data displayed. With this mixing of editorial, user-generated, and commercial content in the presented search results, the translated interests are naturalized and tagged as equally important to other inquiries, particularly since geomedia put users in the center of the world depicted. With the egocentric view point, that is not limited to the aesthetics of the presentation itself but extends also to the data layered on top of it, platform operators can create a space Eli Pariser calls the filter bubble (Pariser 2011). It is a data space that works as a media channel for the users to choose from but the contents originate out of their own individual desires obtained from data-mining. In the context of geomedia this preserves the discovery of new grounds and spatial connections and counteracts the emergent qualities of geobrowsing (Zook and Graham 2007). By this means, many geomedia strengthen a world view in which the interests and intensions of commercial, private-sector companies are inscribed into the software. Seen this way, geomedia becomes part of a much larger attempt to

steer and control how people are "[d]welling in the Web" (Thielmann et al. 2012). Therefore maps as action spaces can be characterized as contested territories where various and opposite intensions meet.

Summary and conclusion

In summary, this contribution to ongoing considerations about the changing roles and uses of maps offers theoretical and methodological perspectives to help understand how cartographic digital media mediate human creation of space and places and power in the information age, and how researchers can deal with changing practices surrounding geographical media. A comparison with previous studies of previous generations of geobrowsing software and activities may offer some important insights into its evolution. Another possibility for additional research involves evaluating whether the convenience and wide usage of free commercial solution outweighs the downsides. Besides the evocation of a rather critical view on the medial shift in geography, there are also far reaching changes concerning the aesthetics and use of geomedia related to the flexibility arising in changing perspectives and playful encounters that lead the way to the individual subjectivization of space. We want to emphasize that this implies a further shift away from maps as fixed presentations of a certain territory towards maps as action spaces which are used for their own sake, or in new, unexpected ways. Situating research within a network approach to map use while taking the intrinsic properties of geomedia—the Dionysian, playful and immersive qualities of the media, the Apollonian 'observational' value as well as the polysemantic qualities of the contents—into account can give further insights into these novel and developing constellations of maps as action spaces.

In the information age it may seem self-evident that maps are on the way to become action spaces integrated into daily life; media hybrids consistent of immersive environments combining cartographic aesthetics with variable perspectives and means of playful navigation typically associated with other media forms such as digital gaming. On the other hand, non-cartographic media like open-world computer games, or simulation computer games e.g. the *Grand Theft Auto*-Series (1993–2013), or the *SIM-City*-Series (1989–2013), are cartographic in the sense as they resemble and simulate presentations of the geographical space, from urban environments to world scale territories; generating map-like action spaces on their own. The examples used in this paper also show, that the context and framing of images and activities matter, and also how a referential cartographic indexicality is replaced in immersive use by the polysemantic values of geographic images that allow alternative interpretations without relying on a full correspondence to the depicted scenery, building or landscape, thus transforming correspondence and diminished indexicality into what Bruno Latour called a 'circulating reference' (Latour 1999) enabling varying degrees of resemblance of the signifier with the signified in an action space. Thus, interactive digital geomedia are no longer fully and satisfactorily describable as self-contained indexical sign systems, but take on a semantic openness arising in their underdeterminacy that has to be taken into account: the map as a space for action. Actions are enabled by design and interface, but there is no longer an implicit user that can be fully modeled in advance. Instead geobrowser interactions can be modified in every virtual step of a flâneur.

Compliance with ethics requirements

Conflict of interest Dr. Pablo Abend declares that he has no conflict of interest. Prof. Dr. Francis Harvey declares that he has no conflict of interest.

Ethical standards All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 (5).

Informed consent Informed consent was obtained from all patients for being included in the study.

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