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The Time-Space Dimensions and Geometrical Spaces of Electronic Media Technologies

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Abstract : This paper reviews how electronic media technologies involve and produce time-space dimensions in geometrical spaces, focusing on four theoretical perspectives: van Dijk's dual structure of networks as scale extension and reduction; Latour's actor-networks as fluid and hybrid networks; Virilio's dromospherical time as global media vectors; and Castells' timeless time as non-sequential flows. In these four theoretical perspectives, we can see that electronic media technologies involve different and multiple time-space dimensions in geometrical media spaces: from the two-dimensional spaces (surfaces) of concentric circles, through the one-dimensional spaces (lines) of actor-networks to the zero-dimensional spaces (points) of dromospherical time and finally to the multi-dimensional spaces (hypertexts) of timeless time. The paper concludes by suggesting that we need to explain electronic media spaces not only in terms of geometrical media spaces but also in terms of geographical media spaces in order to understand the ways in which electronic media spaces are dis/embedded in geographical spaces.
Key Words : electronic media, geometrical spaces, dual structure of networks, actor-networks, dromospherical time, timeless time.

요약 : 이 글은 전자 미디어 기술이 기하 공간에서 시공간 차원을 어떻게 수반하고 생산하는지를 네 가지 이론적 관점에 초점을 두면서 고찰한다: 반 딕의 규모의 확장과 수축으로서 네트워크의 이중구조; 라투어의 유동적이고 혼종적 네트워크로서 행위자-네트워크; 비릴리오의 지구적 미디어 벡터로서 속도권 시간; 그리고 카스텔의 비순차적 흐름으로서 초월적 시간. 이들 네 가지 이론적 관점에서, 우리는 전자 미디어 기술이 기하 미디어 공간에서 상이하고 다중적인 시공간 차원을 수반한다는 것을 알 수 있다: 동심원의 이차원 공간 (면), 행위자-네트워크의 일차원 공간 (선), 속도권 시간의 영차원 공간 (점), 그리고 초월적 시간의 다중차원 공간 (하이퍼텍스트). 전자 미디어 공간이 지리적 공간에서 탈/토착화되는 방식을 이해하기 위해서는 우리는 전자 미디어 공간을 기하 미디어 공간뿐만 아니라 지리 미디어 공간에서 설명할 필요가 있음을 제시하면서 이 글은 끝맺는다.
주요어 : 전자 미디어, 기하 공간, 네트워크의 이중구조, 행위자-네트워크, 속도권 시간, 초월적 시간.

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"The making of objects has spatial implications and spaces are not self-evident and singular, but there are multiple forms of spatiality" (Law, 2002, 92).

1. Introduction

Transportation and communication technologies, so-called 'space-adjusting technologies' (Abler, 1975) which have been developed through two critical moments of so-called 'communications revolutions', have changed the time-space structures of social systems and interactions, facilitating more 'time-space convergence' (Janelle, 1991), 'time-space distanciation' (Giddens, 1990) and 'time-space compression' (Harvey, 1989). According to van Dijk (1999), the first communications revolution occurred with a tremendous advance in analogue and mechanical technologies in the late ninetieth and early twentieth centuries (see also Beniger, 1986), and the second communications revolution has occurred with the drastic development of digital and electronic technologies since the late twentieth century (see also Williams, 1982).

Digital and electronic technologies, which have been developed with the second communications revolution since the late twentieth century, have changed time-space structures in much more radical ways than analogue and mechanical technologies in the first communications revolution. On the one hand, new technologies accelerate the homogenisation, integration and synchronisation of time-spaces. On the other hand, they produce more complex and multiple time-spaces at a local, national or global level. The city is no longer more dependent on an integrated and unitary time-space, but rather it comes to have fragmented and multiple time-spaces. For while some parts are accelerated and synchronised by real-time global electronic networks, others still remain locked in and restricted at a local level by the tyranny of time and space barriers. After all, "as a unity of place without any unity of time, the city has disappeared into the heterogeneity of that regime comprised of the temporality of advanced technologies" (Virilio, 1997b, 383).

New kinds of 'technological times' ('real-time vectors' and 'non-sequential-time flows') began to shatter the temporal concept of 'linear time', supported by clock time and based on 'temporal duration' and 'spatial extension', breaking down the sequential and successive order of things (Adam, 1995; Virilio, 1997a; Bauman, 2000). "Innovations in communication changed the relationship between time and movement across space: succession and duration were replaced by seeming simultaneity and instantaneity. The present was extended spatially to encircle the globe; it became a 'global present'" (Adam, 2003, 68). Virilio (1997a, 51) sees this process as the demise of geographical space (extension) and historical time (duration) by the real-time light (interface) of telecommunication technologies, underlining the coming of the 'third interval of light' – "an interval of the light type (neutral sign), the third and ultimate interval (interface), for instantaneous control of the microphysical environment thanks to the new tools of telecommunications" – after the 'interval of space' – "an interval of the space type (negative sign) for the geometrical development and control of the geophysical environment" – and the 'interval of time' – "an interval of the time type (positive sign) for control of the physical

environment and the invention of communication tools". As a result, "duration was compressed to zero" (Adam, 2003, 68), and "linear, irreversible, measurable, predictable time is being shattered in the network society" (Castells, 1996, 433).

As such, the second communications revolution has changed the time-space dimensions of everyday, which can be seen in terms of geometrical spaces. In this context, this paper reviews how electronic media technologies involve and produce 'time-space dimensions' in 'geometrical spaces', focusing on four theoretical perspectives: van Dijk's dual structure of networks as scale extension and reduction, Latour's actor-networks as fluid and hybrid networks, Virilio's dromospherical time as global media vectors and Castells' timeless time as non-sequential flows.

2. Jan van Dijk's Dual Structure of Networks: Scale Extension and Reduction

Electronic media spaces can be perceived as different kinds of 'electronic media territories'. As Adams (1996, 422) notes, "the rise of mechanical printing in the 16th century, the development of the telegraph in the 19th century and the diffusion of radio and television in the 20th century have strengthened certain territorial processes". Recently, electronic media technologies have been rapidly refiguring existing territorial boundaries. Of course, not all electronic media technologies contribute to global electronic media territories. Some are extending electronic media territories towards a global level, other are shrinking them towards a local level. In this sense, some media researchers have explained how electronic media territories entail their distinctive, but interrelated, territorial scales, producing complex and multiple global-local networks. Here, I suggest three typical models: van Dijk's social network model, Keane's political network model and Lull's cultural network model.

van Dijk (1999) suggests the 'dual structure of networks': the 'scale extension' of networks towards macro-scales for on-line communications bridging time and space and the 'scale reduction' of networks towards micro-scales for off-line communications fixed in time and space. For example, van Dijk (1999, 24-26) argues that the network society is composed of 'organic communities' based face-to-face communications and 'virtual communities' based on on-line mediated communications. Here, the organic community is defined as a community "tied to a particular time, place and physical reality" and the virtual community is defined as a community "not tied to a particular place and time and not directly to physical reality" (van Dijk, 1999, 249-250). This means the coexistence of 'social networks' and 'media networks' in the network society (van Dijk, 1999, 24). Here, the social networks can be understood as the 'space of places', and the media networks can be seen as the 'space of flows' in Castells' terms (Castells, 1996). In this sense, van Dijk argues that electronic media technologies result in dual media landscapes: centralization and decentralization, central control and local autonomy, unity and fragmentation, socialization and individualization and so on (van Dijk, 1999, 221). It is through the dual structure of networks that van Dijk's 'network society' in which social networks and media networks coexist with each other can be differentiated from Castells' 'network society'

in which the space of places (or social networks) comes to be substituted with the space of flows (or media networks).

Although the dual structure of networks can be understood in the sense of the simultaneous process of scale extension through (on-line) media networks and scale reduction through (off-line) social networks, we do not need to confine the scale reduction only to (off-line) social networks. Rather, we can find the dual structure or process of networks in (on-line) media networks. In this sense, electronic media territories can be differentiated into three basic scalar levels through scale-up and scale-down processes: local, national and global levels. For example, Keane (2000) suggests a model of 'political networks' (public spheres) based on local, national and global spatial scales. That is, Keane (2000, 78-80) divides the public sphere into three kinds according to spatial scales. (a) 'Micro-public spheres': for instance, local social movements "utilize a variety of means of communication (telephone, faxes, photocopiers, camcorders, videos, personal computers) to question and transform the dominant codes of everyday life". (b) 'Meso-public spheres': meso-public sphere are "mainly co-extensive with the national state", and "mediated by large circulation newspapers such as the New York Times" and by "electronic media such as BBC radio and television". Finally, (c) 'macro-public spheres': macro-public spheres, made possible by satellite networks or the Internet at a global level, are "the (unintended) consequence of the international concentration of mass media forms previously owned and operated at the national state level".

Although Keane's triple model of political networks is useful in explaining the spatial territories of public spheres, it is too static and simple to be applied to other kinds of networks which involve the more complex and multiple structures of media territories. For example, Lull (2000) suggests a model of 'cultural networks' composed of six multiple fundamental spheres: (a) everyday life; (b) regional cultures; (c) national cultures; (d) civilization; (e) international sources; and (f) universal value. Lull (2000, 268) calls this mode of cultural networks the 'superculture' which "transcends traditional categories to reflect two principle current cultural trends: globalization and personalization". One of the most important characteristics of the superculture is that fixed cultural boundaries are blurred through multiple cultural networks. That is, "the superculture necessarily is a janus-faced, transient space between here and there, between society and self, and the material and the symbolic because culture today floats tentatively between the local and the global, between the collective and the individual, and between unmediated and mediated forms of experience" (Lull, 2000, 268). In this process, people's personal cultural experiences come to be increasingly non-local and hybrid. "As persons expand their range of cultural operation, their experiences become less local and less strictly communal. They construct their supercultures when they assemble cultural syntheses by drawing from resources emanating from the various culture spheres" (Lull, 2000, 268).

These kinds of models (van Dijk's social network model, Keane's political network model and Lull's cultural network model) can be called 'concentric circle models' in that they explain electronic media spaces as overlapped and nested 'two-dimensional spaces' (surfaces) with different scales. These models can provide

insights into how different electronic media spaces construct their own boundaries, territories and identities in horizontal (between same-scale units) and vertical (between different-scale unites) dimensions. There are relativities or differences between the media territories of micro-scale and those of macro-scale in that while the media territories of micro-scale involve specific or local mediascapes, the media territories of macro-scale entail general or global mediascapes. Furthermore, the models can explain how different media territories are connected to each other through global-local networks or 'glocalisation' involving "the contested restructuring of the institutional level from the national scale both upward to supranational and/or global scales and downward to the scale of the individual body, the local, the urban, or regional configurations" (Swyngedouw, 1997, 157).

3. Bruno Latour's Actor-networks: Fluid and Hybrid Networks

We need to recognise that seeing 'electronic media spaces' as 'electronic media territories' in terms of a concentric circle model has some problems. Above all, such concentric circle models tend to see each layer of electronic media territories as an almost homogeneous, always fixed and already given space, as the term 'structure' (the 'dual structure of networks' or the 'superstructure') suggests. However, as Latour (1991, 119) puts it, "the socio-technical world does not have a fixed, unchanging scale. ... Trying to endow actors with a fixed dimension as well as a fixed form is not only dangerous, but simply unnecessary". In addition, such concentric circle models premise the binary, linear and hierarchical spatial relations of different electronic media territories in terms of micro-macro, global-local and inside-outside spaces. However, we can observe that electronic media technologies are now relentlessly and ceaselessly breaking down such spatial relations, producing disordered, multiple and multiscalar time-spaces (see Graham and Marvin, 2001; Graham, 2002; Sassen, 2001; Virilio, 1997a; Luke 1995). Thus, we need to see 'electronic media spaces' as 'electronic media networks' – instead of 'electronic media territories' – in the perspective of Latour's actor-network theory (ANT). As "an expanded view of networks that starts to capture the distanciation of relations and the abstraction of communication through technological intermediaries in conditions of time-space compression" (Bridge, 1997, 620), actor-networks theory "helps to capture the complex and multiple relational worlds supported by information technologies" (Graham, 1998, 180). That is, while concentric circle models see electronic media spaces as electronic media territories with two-dimensional, linear, fixed and homogenous spaces (surfaces), actor-network theory views them as electronic media networks with one-dimensional, non-linear, changeable and heterogeneous spaces (lines). We can see some characteristics of electronic media spaces in the perspective of actor-network theory.[1)]

First, electronic media spaces are 'one-dimensional spaces' (lines). "Technological networks, as the name suggests, are networks thrown over spaces, and they retain only a few scattered elements of those spaces. They are connected lines, not surfaces" (Latour, 1993, 118). In these one-dimensional media networks, it is reasonable to say that "rather than one network

being 'bigger' than another it is simply longer or more intensely connected" (Graham and Marvin, 2001, 189). This epistemological change is a kind of paradigm shift in the way we perceive not only media networks but also all kinds of networks. As Latour (1999, 19) states, "to have transformed the social from what was a surface, a territory, a province of reality, into a circulation, is what I think has been the most useful contribution of ANT". In a sense, to see electronic media spaces not as two-dimensional spaces (surfaces) but as one-dimensional spaces (lines) implies that electronic media networks can be regarded as electronic media 'vectors' with lengths and directions. As Wark (1994, 11) puts it, "any particular media technology can be thought of as a vector. Media vectors have fixed properties, like the length of a line in the geometric concepts of vector".

Thus, and second, electronic media spaces are 'non-dualist' or 'non-linear' spaces. Actor-network theory refuses the binary, linear and hierarchical spatial relations between the macro/global/outside and the micro/local/inside (Latour, 1999; Law, 1992; Murdoch 1997a, 1997b). For example, "the Net is neither local nor global. It is local at all points since you always find terminals and modems. And yet it is global since it connects Sheffield and Sydney" (Bingham, 1999, 255). Thus, "the words global and local offer points of view on networks that are by nature neither local nor global, but are more or less long or more or less connected (Latour, 1987, 122). It seems to be more reasonable to say that "the global is already included in the local" (Law and Mol, 2001, 619), for "even a longer network remains local at all points" (Latour, 1993, 117). That is, "a network must always remain continuously local, as it inevitably touches down in particular places" (Graham and Marvin, 2001, 189). To speak more extremely, electronic media networks involve not 'global-local' but rather 'local-local' networks. If there are the boundaries of networks, which draw a distinction between outside and inside, they are based on not (far/near) physical distances but (connected/disconnected) relational networks.

Third, electronic media spaces are 'fluid spaces'. Actor-networks are assembled materials or circulations or so-called 'immutable mobiles'[2] (Latour, 1987; see also Bingham, 1996) as objects both with 'immutability' in 'network space' and with 'mobility' in 'Euclidean space' (Law and Mol, 2001, 612; Law, 2002, 96). For them to move and exercise their power across Euclidean space, especially through 'long distance control' or 'remote control' (Law, 1986; Bingham, 1996; Murdoch, 1998), their networks must not be broken up in network space. That is, "their power might act-at-a-distance in geographical terms, but its efficacy is a function of the coherence of the network and of its intermediaries which enable representations and calculations to be carried from distant places (and different time scales) to a local context" (Bridge, 1997, 620). However, it does not mean that actor-networks are absolutely fixed or immutable. They tend to not only maintain, but also change their configurations through the 'translation' of networks. That is, "these networks are rarely stable for long and are continually bringing in new elements and changing the relationships between actors" (Wise, 1997, 32). As Thrift (1999, 40) states, "these actor-networks, whose purpose is to generate and transmit knowledge, have translated the metaphors of complexity to their purposes, and then circulated them in these mutated forms". In this sense, van

Loon (2000) poses Latour's actor-networks between Castells' networks and Deleuze's assemblages.[3)]

> "Somewhere between the political-economic notion of 'network' and the differentialist notion of 'assemblage', we can find 'actor networks'. Actor networks are more dynamic than network structures, but less elusive than assemblages. They are ensembles of humans, animals, technologies and gods, aimed at the stabilization of particular environments, through the fixation of specific objects as 'immutable mobiles' which enable particular frameworks of encoding and decoding to be kept at specific 'nodes'. The main motivation of these actors is survival, if not expansion, and on this count, ANT is closer to political economy than differentialism (for which the main driving forces are becoming and disappearance). However, actor networks are (temporary) accomplishments that remain vulnerable to disintegration, dysfunctionality and disorder; they exist on the basis of arbitrary closures. In this sense, they are more like assemblages, as the strategies deployed by its various members are not controlled by some invisible structural force (such as capitalism)" (van Loon, 2000, 110).

As such, actor-networks are not absolute, static and fixed, but rather contingent, dynamic and fluid, changing constantly their configurations through alternative networks or strategic translations through which they make themselves more sustainable, survivable or powerful. That is, actor-networks tend to be open-ended. Latour (1999, 19) describes space in between networks as 'empty space' open for change. Law calls such a replaceable and changeable network space 'fluid space' in which "objects hold themselves constant in a process in which new relations come into being because they are reconfigurations of existing elements, or because they include new elements" (Law, 2000, 99; see also Law and Mol, 2001; Mol and Law, 1994). In this fluid network space, time-spaces are not fixed frames, but dynamic according to changing networks. "Spaces and times are outcomes of the combination and recombination of a full world"(Bingham and Thrift, 2000, 289). In this sense, new electronic networks produce different time-spaces in the world.

Finally, electronic media spaces are 'hybrid spaces'. As Bingham and Thrift (2000, 299) put it, "it (actor-network theory) has produced a sense of a world of partial connection in which all kinds of constantly shifting spaces can co-exist, overlap and hybridise, move together, move apart". It entails the geographies of 'material semiotics' in which "humans, other organisms, artefacts, and technologies are all players" (Haraway, 2003, 77) and which "is con-cerned with how all sorts of bits and pieces – bodies, machines, and buildings, as well as texts – are associated together in attempts to build order" (Bingham, 1996, 643). In this sense, Latour's (1991) concept of actor-networks is similar to the concepts of Deleuze and Guattari's (1983, 1987) 'rhizome' or 'assemblage' or Haraway's (1991, 1992) 'cyborg' or 'articulation'. They all deny modernist binary boundaries and call for becomings, dis/appearances or dis-equilibrium. "One of the most attractive feature of ANT is that there are implicit but unmistakable traces of Deleuzoguattarian inspiration, particularly in the writings of Bruno Latour" (van Loon, 2000, 110), and in this sense, actor-network theory is often described by Latour, with a nod to Deleuze, as

'actant-rhizome theory' (May and Thrift, 2001, 27). In addition, drawing on Haraway's (1992) 'articulation' as a means of "thinking about bringing things together without reducing those 'things' to speechless objects or docile constituencies", Hinchliffe (1996, 677) says that "these articulations are the stuff of geography, linking together without presupposing too much about the characteristics of those actors and actants (and without romanticising them)". After all, actor-network theory can help us to understand how electronic media networks produce 'hybrid geographies' or 'cyborg geographies'.

4. Paul Virilio' Dromospherical Time: Global Media Vectors

Electronic media technologies have produced new kinds of times, called 'technological times'. We can think of two kinds of technological times: Virilio's 'dromospherical time' and Castells' 'timeless time'. Dromospherical time can be seen as global 'real-time vectors', and timeless time can be viewed as global 'non-sequential-time flows'. The modern temporal conception of linear time based on temporal duration and spatial extension comes to be shattered by both real-time vectors and non-sequential-time flows. For Virilio and Castells, such technological times have destructive and disrupting effects on historical and lived places through the relentless and indifferent bombardment of global real-time vectors and the a-historical and anarchic domination of global timeless time flows. Although these explanations have been exaggerated (see Thrift, 1995, 1997; Graham, 1997a, 1997b), they are important in understanding how electronic media technologies have transformed the time-space dimensions of our lives and societies. Recently, many thinkers have begun to pay more attention to Virilio's brilliant and distinctive work of speed, vision, war and architecture machines, especially concerned with the transformation of time-space by such machines (Wark, 1998; Der Derian, 1998; Armitage, 2000; Luke and O'Tuathail, 2000; Baldwin, 2002; Cooper, 2002; Cook, 2003; Adam, 2003; Bartram, 2004). Deleuze's nomodology was also affected by Virilio's dromology. "Time is the crucial category for Virilio. One of Virilio's central concerns is how time is reconstituted, through technology, into what he calls 'speed'" (Cooper, 2002, 120). That is, Virilio' concern is with how existing concrete time-space modes are reconstructed into new abstract time-space modes, especially towards a zero-dimensional time-space mode, through real-time networks, and how our bodies, cities and societies are deconstructed by the politics of speed or 'the politics of real time' (Cook, 2003).

Here, I explain how time-space dimensions disappear into 'zero-dimensional spaces' (points) through Virilio's technological time, real time. "The word real-time implies that the response comes back very quickly – usually within two seconds or so if the response is to a man, and sometimes in a fraction of a second if it is to a machine" (Martin and Norman, 1970, 4). For Virilio, real-time networks move at the speed of light at a global level, and the globe itself is tightly wired with the global real-time networks. Virilio (1997a) calls global real time 'dromospherical time'.

> "The cyclical time of the world's origins and the linear time (the sagittal time of time's arrow) of a

> chronological history world then be superseded by a spherical time, the 'dromospherical' time of light overtaking in the near future the old circle of bygone centuries. Only, what this cleverly skirts round, thereby promoting some 'global' time, is quite simply the 'local' time of a history acted out on the surface of a planet within the very particular alternation of terrestrial night and day, under the influence of the specific gravity of one star among many" (Virilio, 1997a, 124).

"For Virilio, technological time ... empties out the ontological category of space. ..... While space still exists, the meaning of space as a category that can frame our mode of engagement with the world, 'disappears'" (Cooper, 2002, 122). That is, global real-time networks result in 'zero-dimensional spaces' (points) into which both geography and history disappear. "Not only inside and outside disappear, the expanse of the political territory, but also the before and after of its duration, of its history; all that remains is a real instant over which, in the end, no one has any control" (Virilio, 1997a, 18). Bauman also argues this point: 'no time-distance separating the end from the beginning' and 'only moments: points without dimensions' (Bauman, 2000, 178) and calls this process the 'devaluation of space' (Bauman and May, 2001, 111). After all, global real-time networks desert bodies, cities and societies into homogeneous points without temporal and spatial dimensions and any qualitative differences.

Global real-time networks alter the meaning of the city. "The urban no longer has a form with the exception ... of this 'form-image' without dimension, this point, the punctum that is everywhere such that the measurable expanse is nowhere" (Virilio, 1998, 59-60). That is, "once a centre of social and mercantile exchange, the city as a meaningful site has been undermined by technologies that allow subjective actions to be carried out of their specific location" (Cooper, 2002, 122). While pre-modern cities are dependent on natural-cyclical time or mechanical-linear time, global cities are operated through global real-time networks penetrating urban boundaries and accelerating urban temporalities. In this sense, the global city can be called an 'overexposed city' (Virilio, 1997b) or 'real-time city' (Graham, 1997b; Townsend, 2000) in which "new communications technologies finally overcame what are now thought of as 'time constraints' and 'temporal barriers'" (Robins and Webster, 1999, 257). Wark (1994, vii) represents such global real-time networks as global 'media vectors' of which flows are managed, interpreted, mediated and radiated in global real-time cities and then are transmitted to all local terminals across global space, producing 'virtual geography' which "doubles, troubles, and gradually permeates our experience of the space we experience firsthand". Wark (1994, 11) explains such global media vectors as giving us lives and cities without terrestrial and territorial roots: "vector has no necessary position: it can link almost any points together". Thus, "we no longer have roots, we have aerials" and "we no longer have origins, we have terminals" (Wark, 1994, x and xiv). This landscape is similar to Virilio's (1998c, 118) 'polar inertia': the "polar inertia ... is less original than terminal". Wark's media vectors and Virilio's polar inertia can be seen as the geometric elements of Castells' space of flows. As Castells (1996) claims the substitution of the space of places with space of flows, so Virilio (1997a) argues the replacement of present local time-space (or here and now) with absent global time-space:

> "Meeting at a distance, in other words, being telepresent, here and elsewhere, at the same time, in this so-called 'real time' which is, however, nothing but a kind of real space-time, since the different events do indeed take place, even if that place is in the end the no-place of teletopical techniques (the man-machine interface, the nodes or packet-switching exchanges of teletransmission). ..... What then becomes critical is not so much as the three dimensions of space, but the fourth dimension of time - more precisely, the dimension of the present since ... 'real time' is not the opposite of 'delayed time', as electronics engineers claim, but only of the 'present'" (Virilio, 1997a, 10).

Bauman (2001, 38) calls this deterritorialisation the 'devaluation of place'. Such 'real-time spaces' undermine a sense of place and authenticity, based on Heideggerian phenomenological existentialism (being-in-the-world), through a shift from dwelling and being in 'actual time-spaces' to leaving and becoming into 'virtual time-spaces' (see Lévy, 1998, 28-29). An ironical point is that this process makes human bodies immobile and frozen at/as the ground zero of real-time vectors through 'polar inertia': "the global village, Marshall McLuhan hoped for does not exist; there is only a center of inertia that freezes that present world within each of its inhabitants" (Virilio, 2000, 51). In addition, 'real-time spaces' circulating around such polar inertia can be thought of as not 'real time-spaces' but 'virtual time-spaces'. In other words, global real-time spaces are 'virtual' in that "deterritorialization, the escape from the 'here' and 'now' and 'that,' would be encountered as one of the royal roads to virtualization" (Lévy, 1998, 30), and 'hyperreal' in that "the virtual is more, not less, (real) than the real" (Doel and Clarke, 1999, 270). However, we need to be aware of different images of virtual time-spaces. That is, Lévy's 'virtual time-spaces' as 'deterritorialised time-spaces' can be seen as creative and desirable, and Baudrillard's 'virtual time-spaces' as 'simulated time-spaces' are generally seen as nihilistic and deceitful, and Virilio's 'virtual time-spaces' as 'real-time spaces' seem to be more or less apocalyptic and destructive.

5. Manuel Castells' Timeless Time: Non-Sequential Flows

At the heart of Castells' academic ambition are the 'network society' and 'informational city' in the 'information age'. While being concerned with the structural transformation of social space and time by technologies in the networks society, Castells (1996, 1997, 2000) suggests the 'space of flows' as a social form of space and 'timeless time' as a social form of time. In order to understand the relation between timeless time and the space of flows, we need to briefly see the space of flows before explaining timeless time. "The space of flows refers to the technological and organizational possibility of organizing the simultaneity of social practices without geographical contiguity" (Castells, 2000, 14). The space of flows is opposed to the space of places. "The meaning and function of the space of flows depend on the flows processed within the networks, by contrast with the space of places, in which meaning, function, and locality are closely interrelated" (Castells, 2000, 14). Between the space of flows and the space of places are tensional relations, and "we increasingly observe a space of flows substituting

a space of places" (Castells, 1985, 14). However, this does not mean that the space of flows is purely a-territorial. "Electronic networks link up the specific places, and it is this hybrid space that is the space of flows" (Castells, 2002, 554). Global cities are one of the examples. According to Castells (1996, 412-5), such spaces provide at least three layers of material supports that constitute the space of flows. "The first layer, the first material support of the space of flows, is actually constituted by a circuit of electronic impulses". "The second layer of the space of flows is constituted by its nodes and hubs". "The third important layer of the spaces of flows refers to the spatial organization of the dominant, managerial elites".

For Castells, "the new informational mode of development and its culture of real virtuality have radical implications for the social organization of time" (Bromley, 1999, 11). At the centre of Castells' thesis of time in the network society is 'timeless time' as a new kind of 'technological time' or 'virtual time'. "Timeless time is defined by the use of new information/communication technologies in a relentless effort to annihilate time" (Castells, 2000, 13). Timeless time has two kinds of forms. On the one hand, "time is compressed (as in split second global financial transactions, or in the attempt to fight 'instant war')", and on the other hand, "time is de-sequenced, including past, present, and future occurring in a random sequence (as in the electronic hypertext or in the blurring of life-cycle patterns, both in work and parenting)" (Castells, 2000, 13-14). The first form refers to synchronous 'real time', and the second one means asynchronous 'non-sequential time'. "In contrast to the rhythm of biological time of most of human existence, and to the clock time characterizing the industrial age, a new form of time characterizes the dominant logic of the network society: timeless time" (Castells, 1997, 12). This means that technological timeless time frustrates both biological cyclical time and mechanical linear time. 'Timeless time' results from the 'space of flows': "flows induce timeless time, places are time-bounded" (Castells, 1996, 465). Timeless time is to cyclical or linear time as the space of flows is to the space of places. As the space of flows has destructive effects on the space of places, so timeless time has disrupting effects on natural, biological, historical and mechanical time.

When we think of 'timeless-time' flows in the network society, we need to pay more attention to 'non-sequential-time' flows than 'real-time' flows in order to make sense of Castells'particular insight into the transformation of time-space dimensions in the network society, distinctive from others. In fact, Castells also tends to focus more on non-sequential time than real time when he explains timeless times in the network society. Non-sequential-time flows are called 'temporal collages' (Castells, 1996, 462) in that time comes to be far from the sequential and successive order of things, constructing the incoherent and structureless temporality of things and creating fragmented and disordered images of things. That is, "the distinction between live events and arbitrarily time-shifted replays becomes difficult or impossible to draw (as it often is now on the television news); anything can happen at any moment" (Mitchell, 1995, 16). Castells explain that non-sequential time entails at the same time 'eternal' and 'ephemeral' cultures. "It is eternal because it reaches back and forth to the whole sequence of cultural expressions. It is ephemeral because each

arrangement, each specific sequencing, depends on the context and purpose under which any given cultural construct is solicited". Non-sequential-time flows can also be called 'hypertextual-time' flows in that hypertext in the Internet can be seen as a typical example of eternal and ephemeral temporal collages.

Such non-sequential-time flows are complex, multiple, discontinuous, dislocated, undirected and undetermined, denying chronological timetables such as television/radio, bus/train, or class/work timetables based on 'spatialised time' in Bergson's perspective which is actual, spatial, static, quantitative, divisible and extensive (Deleuze, 1988; see also Crang, 2005). "Time is a constant melding of past, present and future, a 'mode of stretching' which produces a kind of simultaneity in difference" (May and Thrift, 2001, 23). For example, we can select certain programmes at any time without strict time schedules, and watch certain programmes time and time again on the Internet or satellite TV whenever we want. "This supports the shift from the highly structured time patterns of the modernist city – with its standard business, leisure, sleep and commuting periods – towards more fluid, asynchronous urban lifestyles" (Graham and Marvin, 1996, 67). Furthermore, Castells' non-sequential-time flows can be seen to produce technologically-induced 'virtual time-spaces' in a different way from Virilio's real-time vectors. As Lévy (1998, 33) claims, "with respect to this mediation on the escape from 'there,' we should bear in mind that virtualization does not simply accelerate already known process or suspend, or even annihilate, time and space, as Paul Virilio has claimed. Based on expenditure and risk, it creates qualitatively new velocities, mutant space-time systems". As de Landa (1998) states, "differences in intensity are what gives rise to forms and their boundaries in extensity". Electronic media technologies make time-spaces not only accelerated and compressed towards 'non-dimensional' points, but also produce 'multi-dimensional' spaces in the points, for the technologies make multiple 'virtual time-spaces' folded and unfolded in the points.

6. Coda

Until now, I have explained how electronic media technologies produce time-space dimensions in geometrical media spaces, which cannot be depicted as singular spatiality or temporality. As Law (2002, 92) argues, "the making of objects has spatial implications and spaces are not self-evident and singular, but there are multiple forms of spatiality". We need to extend Law's idea of space into the realm of time in order to consider the time-space dimensions of electronic media technologies in geometrical media spaces. In the four theoretical perspectives explained above, we can see that electronic media technologies involve different and multiple time-space dimensions in geometrical media spaces: from the two-dimensional spaces (surfaces) of concentric circles, through the one-dimensional spaces (lines) of actor-networks to the zero-dimensional spaces (points) of dromospherical time and finally to the multi-dimensional spaces (hypertexts) of timeless time. What I want to argue here is not which model is adequate or not, but that geometrically different and multiple time-space dimensions coexist and overlap with each other in electronic media spaces, like Kandinsky's abstract paintings composed of various geometrical elements such

as surfaces, lines, points and so on. As Simonsen (2004, 1336) states, "the kind of geometry put forward in the new metaphorization is very different from the one known from spatial analysis. It is much more unstable, messy, nonlinear, and open-ended in the way in which it is researching for the potential for emergent order in complex and unpredictable systems".

However, we need to explain electronic media spaces not only in terms of 'geometrical media spaces' but also in terms of 'geographical media spaces' in order to understand the ways in which electronic media spaces are dis/embedded in geographical spaces. Adams (1996, 421) distinguishes between "the ways people construct ideas and ideologies (content) about scale" and "the ways people construct politically significant communication links (contexts) over great and small distances". Then, Adams (1996, 421) says that the latter ways have two spatial aspects: 'geography' (a mappable arrangement of connected locations) and 'geometry' (a functional arrangement embodying hierarchies and directionalities of connection). In a similar way, we need to look at how electronic media technologies produce different and multiple time-space contours in geographical media spaces in order to understand new media spaces such as spatial digital divides.

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Note

1) We need to recognise some weaknesses of ANT (Actor-Network Theory) approach. Above all, actor-network theory tends to see geographical actors and spaces as indifferent and homogeneous (Simonsen, 2004, 1335; Passi, 2004, 541). In addition, we cannot neglect its 'inherent elitism' in that "its methodological roots lie in the analysis of scientific endeavour to which most people are marginal" (Bridge, 1997, 622) and in that "there are certain relational or network configurations which become standardised, and agents who do not happen to fit the pattern are disadvantaged – and their 'voices' are marginalised" (Hetherington and Law, 2000, 128).
2) "The immutable mobile is a network of elements that holds its shape as it moves. Indeed like a ship. Or, one might add, in cybernetic mode, like the electronic symbols, the bits and bytes of contemporary communication. So in this kind of account the vessel or the electronic symbol is a network that holds its shape and moves through Euclidean space. But we could add, so too is navigator-chart-instrument-table network (or the electronic network)" (Law and Hetherington, 2000).
3) Actor-networks (theory) can also be contrasted with social systems (theory). Drawing Deleuze and Guattari's (1987) concepts of 'smooth space' and 'striated space', Lee and Brown (1994) contrast 'actor -networks' and 'social systems'. The former could be compared to smooth space in that they "deviate from delimiting arborial structures in a Euclidean or striated space", and the latter could be compared to striated space in that they are "measured, hierarchical, and calculated" (in Hinchliffe, 1996, 675).

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