

# Mapping social networks in time and space

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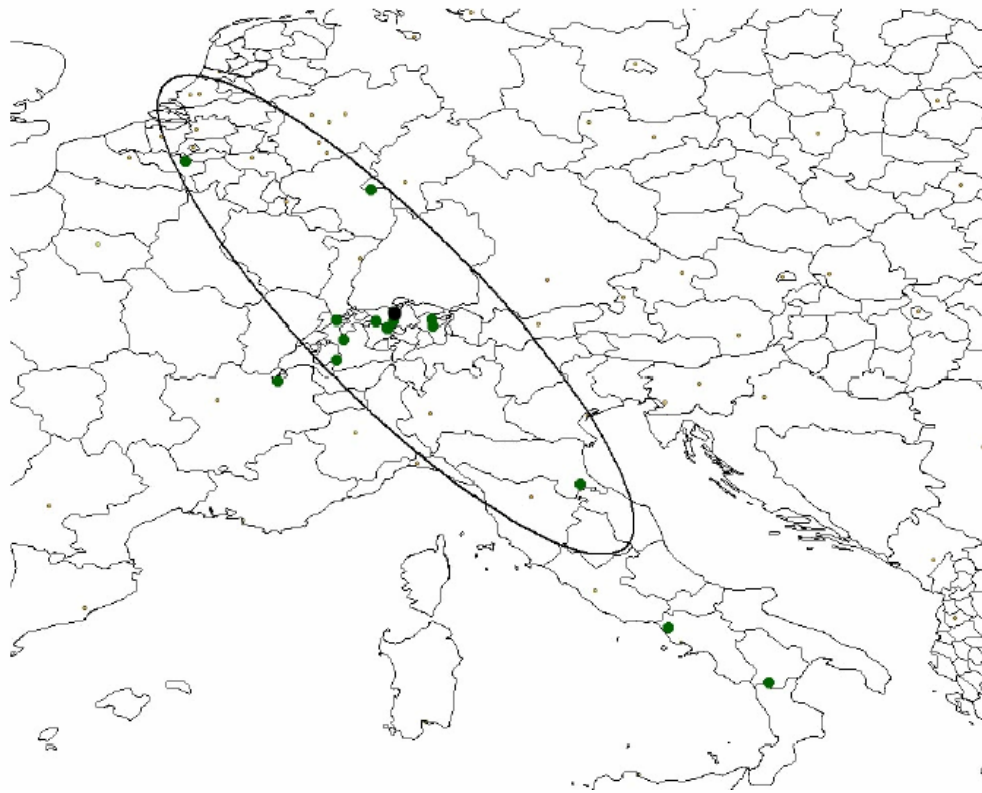
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Ohnmacht Timo

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## Mapping Social Networks in Time and Space

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### Abstract

Over the last few decades, the motives and determinants of individual travel behaviour have been analysed from different perspectives. Whereas the main approach explains personal mobility due to the travellers' sociodemographics and the generalised costs of travel, travel behaviour research has added several more complex analysis directions such as role patterns, household interactions, time budgets, activity planning, life styles, etc.

This working paper addresses a further possible determinant to help us understand travel behaviour, this being the size and structure of social networks. Recognising the ongoing pluralisation and differentiation within society, it seems crucial to investigate *social realities* to understand traveller behaviour in greater detail. This study develops a concept, which allows us to explore the relationship between social networks and (leisure) travel. Several mappings of interviewees' network geographies will be combined with their related transcribed mobility biography interviews, to explain different cases of mobility patterns.

### Keywords

Mobility Biographies, Social Networks, Activity Space, Network Geography, Life course transitions, Triangulation.

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I want to thank in first place the Management Committee of the COST 355 Action. First of all the chair of the action Dr. Christoph Rizet and the science officer Jan Spousta for their guidance and acceptance of the proposal for this STSM and to all the COST people in Belgium who have helped me in any way for this mission, especially Ms Jie Zhu for administration.

Last but not least I thank Professor Kay W. Axhausen who accepted me at the Institute for Transport Planning and Systems (IVT), ETH Zurich and received me with hospitality.

## 1 Towards a Sociology of Mobilities

In spite of the fact that classical writers, such as Simmel, Marx, Sombart (see Rammler 2001), have included aspects of mobility in their theories, generally speaking, there is still a real need for a Sociology of Mobilities (Urry 2000). Nevertheless, considering the past few years, a considerable literature focussing upon the interplay between mobility and modern society has been developed. Recent research focuses on the effects of highly mobile lifestyles on the quality of social networks. The results have shown that in special occupations connections are becoming weaker and more wide-spread (see Pelizäus-Hoffmeister, 2001; Kesselring, 2001a and 2001b; Collmer, 2001; Bonß and Kesselring, 1999, 2001). Likewise there has been an attempt to conceptualize *opportunity space* as *mobility space* (Knie and Canzler, 1998) and the development of the notion *motility* (Kaufmann, 2002).

One special aspect is the subject of tandem projects between transport researchers and sociologists addressing the nature of mobility in modern life in relation to new forms of communication and the structure of social networks (see Larsen, Urry and Axhausen, 2005a; Larsen, Axhausen and Urry, 2005b; Axhausen, 2003; Ohnmacht and Axhausen, 2005). It is indeed plausible to argue that “travel distances between members of social, familial and work-related networks have substantially increased since the 1950s; on average, social networks are more spread out and less coherent (...)” (Cass, Shove and Urry, 2005: 545)

In this context, I ask whether there is a relationship between the spatial increase of social networks in modern times and (travel) `mobilities` (Urry, 2003). The expectation, which will be investigated in this report, is that people explore space to develop their individuality, especially with regards to places of work, of education, and of general interest. Furthermore, the homes of relatives, partners, and friends, are also included as a way of exploring space.

To maintain a personal social network we have to interact in co-presence using mobility tools to meet up, and conversely we have to use face-to-interface-to-face communication by using net-

working tools sometimes over a sizeable geography (Larsen, Urry and Axhausen, 2005). Axhausen points out, that modernisation and industrialisation have decreased the cost of mobility and networking tools the last few decades (Axhausen, 2005). Thus it is cheaper and easier to keep in touch and meet up at-a-distance<sup>1</sup>. Contemporary tendencies establish new forms of exploring space, and one result is the change in the spatial locations of social network members (Beck, 1984; Giddens, 1986). Insights into these new forms of maintaining social relationships are necessary to explain travel behaviour. This paper is concerned with the interplay between the spatial patterns of peoples' social networks and the effect upon recent and future forms of travel.

For this investigation, travel behaviour and mobility has to be researched through a combined framework of qualitative and quantitative methods using a *triangulation*<sup>2</sup> (for triangulation see: Flick, 2000). Quantitatively, in relation to the spatial representation of social networks over time, the 'activity space' - a concept to capture the area of mobility- is used to measure the network geography (Schönfelder, 2004). Qualitatively, consider the social background of the interviewee, transcribed interviews are used to fill the network geography with social content. Mobility biographies were used as the starting point.

A data set will be used, which combines quantitative data measuring the network geography of an interviewee with transcribed guideline interviews (Ohnmacht and Axhausen, 2005). The intention is to test whether Axhausen's quantitative notion of network geography (2003) can be linked to qualitative interview material, and if so, whether a new explanation of mobility in modern life, can be obtained.

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<sup>1</sup> For a discussion about an interplay between social exclusion and access to mobility tools, see Cass, Shove and Urry (2005) or Grieco (1995) and a trial for measuring social exclusion in relation to access to mobility tools, see Schönfelder and Axhausen 2003.

<sup>2</sup> A combination of different methods, both quantitative and qualitative, a weakness in one method could be avoided by using a second method that is strong in the area that the first is weak



The structure of the paper is as follows: the next section introduces the theoretical framing (what we understand to be a social network), the influences of modernity, and how it is linked to mobility; to be followed by a discussion of the methods used to measure the network geography, and how it can be sociologically useful to interpret such spatial representations. The predominant aim of this paper will be to analyse qualitative and quantitative data, using two interviews out of six examples in detail, regarding their quantitative network geography and qualitative interview material. The conclusion addresses the expressiveness of personal travel behaviour in modern day life in terms of the spatial dispersion of the personal network geography.

## 2 A Social Network has a Geography

The qualities of social networks based in the industrialized world are shifting their qualities. The results are as follows: Relationships are weaker, more transient, spatially far-flung, and the different networks one belongs to overlap less (Wellman, 1999).

Much literature discusses trends in social life; mostly it speaks about change, even the end, of social certainties. On a macro scale, Castells describes everything being on the “flow”(Castells, 1996). In his outline of the *Information Age* he shows how organisations, and much of wider society, act on a global scale through ubiquitous communication networks. As a result, the world is shrinking physically, socially and imaginatively. This produces a wide range of opportunities to explore the world. There are social, political, economical and cultural necessities, to be “on the move” as well (Urry, 2000).

On a meso scale, Giddens is speaking in his micro-macro-link sociology about the “embeddedness” of social certainties, as a result network members become more individualized with weaker ties (Giddens, 1984). On a micro scale, in their individualisation thesis, Beck and Giddens are discussing the effects on humans of “reflexive modern societies” (Giddens, Lash and Beck, 1994). The consequence is a tendency among persons to be more flexible in organizing their life and the vanishing of the so-called “normal biography” – this results in spatial diversity and social differentiation (Beck, 1986). Social life becomes more and more fluid and thus disperse and at-a-distance, and therefore modern western societies are said to be characterized by flows and reflexivity (Lash and Urry, 1994). To sum up, globalisation on a macro scale, and individualisation on a micro scale, have direct human consequences, especially on the quality of social networks.

Regarding these changes in terms of social networks, the interplay between mobility and the new network patterns has to be addressed. This raises certain questions and issues for mobility research: What are the impacts upon travel behaviour? Why is it suddenly necessary for many to travel long distances to meet up with friends, relatives and partners? Which “network tools” (Axhausen, 2003) like text messages, mobile phones, letters, chats, e-cards, voice over IP (“skyping”, see [www.skype.com](http://www.skype.com)), and laptops with email, are required to maintain relationships? Which “mobility tools” (ibid., 2003) such as cars, public transport, bicycles and the new age of low-cost airlines, are necessary to meet them in person? What causes social networks to become more far-flung over time and therefore influence our travel behaviour?

For these questions “mobility” has to be defined. In a sociological context, Urry distinguishes five highly “mobilities”:

1. *Corporeal travel* of people for work, leisure, family life, pleasure, migration, and escape;
2. *Physical movement* of objects delivered to producers, consumers, and retailers;
3. *Imaginative travel* through images of places and peoples via television, and other media;
4. *Virtual travel*, often in real time on the Internet, so transcending geographical and social distance;
5. *Communicative travel* through person-to-person messages via letters, telephone, fax, and mobile phone (Urry, 2002: 28; and 2000: 49 – 76)

Urry also points out, how important physical co-presence is to keep social relationships alive (2003). For that reason the paper will address corporeal travel as well as communication and virtual travel in the context of social networks. Wherever social obligations, meetings and gatherings take place, corporeal travel is essential, and physical co-presence requires different mobility tools to be used. In this approach the communicative and virtual travel refers to staying connected when physically separated (Castells, 1996).

### ***Mobility Biography***

The notion “mobility biography” is a very important to discuss the development of a personal network geography. What is a mobility biography then? According to Lanzendorf, the term “mobility biography” refers to the set of an individual’s longitudinal trajectories in the mobility domain. It assumes the existence of events at certain moments in an individual’s life that change their daily travel patterns to an important degree, for example car ownership or other mobility characteristics (Lanzendorf, 2003). Within an interview material, it is possible to localize such events both in qualitative and quantitative data, which have an impact on the further mobility management of the person.

In this approach, the choice of destination has been quantitatively conducted as destinations within the social networks. The geocoded locations of the social network members were used to capture the social network geography. Complementary to this, the residences over their lifetimes have been taken as the origin of travel. A “mobility biography” collect ideally information about all destinations, residences, and means of transport for the interviewee’s life (Lanzendorf, 2003). The quantitative data includes information about the locations of friends, relatives, work-mates, school-mates, and the interviewee’s residences in relation to an ego-centric network. Thus, a special questionnaire focused on those network members, with whom the respondents met-up. Furthermore, the most commonly used means of transport to meet-up was enquired about as well.

There is qualitative information about the interplay between meeting up with network members and the effort required to overcome distances. This is related to their personal preferences for using mobility tools to meet face-to-face or using different kinds of communication channels to keep in touch (see Ohnmacht, 2004; Ohnmacht and Axhausen, 2005). Both the quantitative data about the network geography, and the transcribed qualitative interview material, which was coded in atlas.TI<sup>3</sup>, give insights into the interplay between social networks and travel behaviour.

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<sup>3</sup> <http://www.atlasti.com>

## **Social Networks**

There are many approaches to study human relations with social networks. Lets begin with some examples: the *community studies* and the social capital approach (e.g. Putnam, 2000) explore the social nature, for instance, of neighbourhoods. The social network analysis (see Wellman 1996, 1999, 2000, 2001; for an introduction see Freeman, 2004) and the small worlds approach (Watts 1999, 2003; Granovetter, 1983; Buchanan, 2002) analyse network data<sup>4</sup>.

However, these studies tend to overlook locations, distance, geography, and means of transport. They are all vital aspects for network analysis that bring geography into social networks. Current research has linked complex networks to the geography of communication but treated it as a largely non-travel phenomenon (see Wellman und Potter, 1999; Wellman und Gulia, 2001; Burt, 2000; Hampton und Wellman, 2001; Wellman, 1996, 1999, 2000, 2001). In fact, in social network research, geographical locations are hardly ever considered, and travel behaviour is usually neglected.

The aim of the paper is to bring mobility biographies, social network and geography together, to understand travel and mobility in a more social way. To make this clear *Figure 1* presents different frameworks of network analysis. There are four different network topographies: It is the representation of the spatial and social density of a social network. It will be used to illustrate the focus of different network frameworks:

- In terms of spatial density we can distinguish between dense and sparse networks. This is intended to capture the location (or size of the area) where this social network operates.
- In terms of social density we can distinguish between tight and loose networks. This is intended to capture the level of “betweenness” of the given network. In other words, how many connections are made between persons.
- The strength of the link – weak or strong, in a simple categorization - defines the level of proximity or closeness between to given network member.

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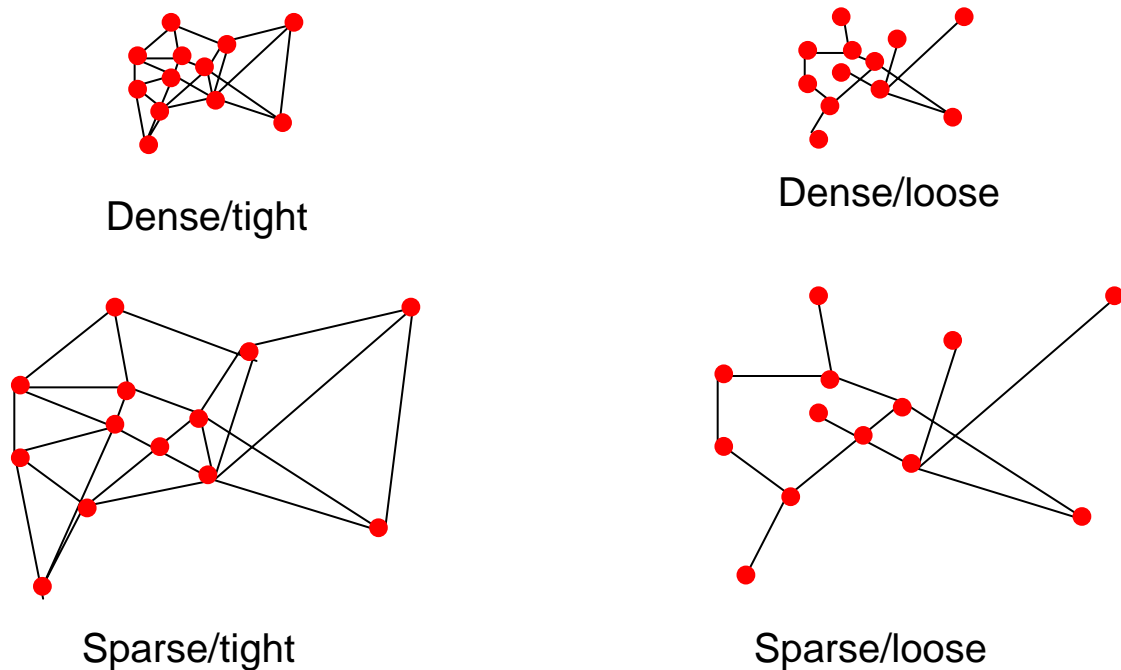
<sup>4</sup> The most important question is to measure centrality or the six degrees of separation.

In the mobility approach used by Larsen, Axhausen and Urry (2005), the links between nodes can be regarded not only as interactions, but also as the usage of mobility and network tools to support the interactions:

- Networking tools consist of means of communications, such as Email, Telephone, Voice-over-IP-Technology.
- Mobility tools consist of means of transport, such as public transport, season tickets, driver license and so on.

Figure 1 Social network topographies (Spatial/Social components)

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Adopted from Axhausen (2005b)

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*Figure 2* characterizes four different network frameworks for understanding social networks, suggested in the literature.

Figure 2 Considerations in different approaches

Social network approach	Spatial density		Social density		Strength of Tie		Tools	
	Dense	Sparse	Tight	Loose	Strong	Weak	Network tools	Mobility tools
Community studies (Park <i>et al</i> 1925)								
Social capital approach (Putnam, 2000)								
SNA (Wellman, 1999)								
Small world analysis (Watts, 1999)								
Mobility Approach (Larsen, Urry, Axhausen, 2005)								

First, Community studies always look at a small geographical unit – generally with a dense spatial density. They also analyse at a tight social density in a sense that everybody knows everybody. In other words, they are looking for strong overlapping networks with strong ties. But this framework does not normally consider the network and mobility tools, mostly it focus on walkable scales.

Second, in the social capital approach, Putnam for example, analyses the social disintegration of communities (2000). Putnam also looks at small geographies, but he describes the increase of loose networks with weak ties. He also neglects the new types of socialising (for example the internet) which mean that there is no strong need to socialise with spatial neighbours to get in touch with people. Instead new social settings will evolve. Ulrich Beck, for instance, talks about

“Issue-Communities” in terms of his individualisation thesis (Beck, 1986). Third, in social network analysis, all of these characteristics depend on the operationalization of the research interest. In general, the geography can be operationalized to differentiate between in and out. Wellman and his group, for instance, use network tools like IT Technology to analyse internet communities (Wellman, 1999). Fourth, the Small World Analysis attempts to explain mathematically the so called “small world phenomenon”. It shows that all people are expected to be separated by only six on similarity small numbers of degrees of separation. Thus, this framework focuses on sparse density, but with weak relationships. In contrast to these four frameworks, the mobility approach captures a new dimension regarding social networks (Larsen, Urry, Axhausen 2005). It considers all of these characteristics, to research the interaction between mobility tools, network tools with the network geography of a the social network.

Thus, the main focus of this investigation is to analyse networks with mobility in mind because “these networks appear to demand intermittent travel, such travel being crucial to forming and sustaining such networks produced through ‘moments of co-presence’” (Cass, Shove and Urry, 2005: 545; Larsen, Axhausen and Urry, 2005). The mobility approach “argues that extensive regional, national and transitional flows and meetings of objects, technologies, representations and people (may) produce ‘small worlds’”(2005: 22). But how extensive are these ‘small worlds’? The focus here is the geographical scale of networks within these flows take place. Referring to Chapter 2, the focus is on corporeal travel to understand why “social networks involve diverse connections, which are more or less at a distance, more or less intense, and more or less mobile” (ibid: 9).

Focussing on the geography of social networks is a chance for mobility and travel research to forge new insights into the dynamics in modern life. New questions evolve, such as: What are the impacts of having a wide spread network on one`s ability to maintain it? Which means of transport have been chosen to meet up? Which forms of communication have been chosen to keep in touch? Does the form of communication, which is used to maintain social relations in modern times, depend on distance?



To sum up, in social network analysis people are nodes and the interest are the flows of resources between them. In this case, the interest is the quality of transaction through communication at-a-distance. But my predominant interest is the physical co-presence enabled by the travel and the size of the space in which it takes place.

### 3 Where Mobilities Happen

During the interviews, the method of oral history (Schütze 1983) was utilised to collect information about the interviewees' personal mobility biographies. The overall objective is to conduct research into the geography of social networks, work, holiday destinations, and their means of transport throughout their lives. An additional instrument, in the form of a life course calendar, was used to display the information over the years. The result was a chronological database with information of relevant places and means of transport – the mobility biography – of each interviewee (for a description of the instrument see Ohnmacht and Axhausen 2004).

First, on a quantitative basis, a method to measure the geography of the spatial dispersion of different locations will be discussed, such as social networks (combining relatives, friends and work-mates), working places (dispersion over a lifetime), holiday destinations, and places of residences. The data is the result of research into the mobility biographies of interviewees over their life history. This project is called 'Biographies, Mobility Tools and Social Networks' based at the Institute for Transport Planning and Systems, ETH Zurich. This data is the source for the creation of the network geography. Secondly, on a qualitative basis, the transcribed interviews were used to interpret the geometries of the network geographies.

The first stage will discuss the method of measuring the activity space and the efficacy of this approach. It will then show the activity spaces of two interviewees and discuss them. The results of the discussion will be used to link the qualitative data of every interviewee. To summarize, in a combined method of analysis (quantitative and qualitative data used in a triangulation), I will detail two modern mobility patterns.

### 3.1 Mobilities in Network Geographies

The interviews were conducted in Berlin and Zurich between autumn 2004 and spring 2005. Thirty people participated and fifteen interviews were conducted in each city (see Ohnmacht, 2004; Ohnmacht and Axhausen, 2005 for a detailed description of the survey). This project explores the interviewees' social networks and how they stretch and shrink over their lifetimes. In addition to this information, there is quantitative data about their preferences for means of transport and socio-demographic status changes over their lifetimes. Furthermore, there is qualitative data about the interviewees' experiences in terms of the spatial dispersion of their social networks, especially with regards to maintaining relationships both near and far.

The aims of the interviews were to obtain geographical data about complex mobility patterns over time, such as residential mobility, commuting, travel in terms of social networks, and leisure travel. In total there are thirty data sets including information about the geography of the social network and places of residences, holiday destinations and places of work. To measure the size of the activity space the following items have been used:

- **Home.** Using the geocodes of the interviewees' residences over their lifetimes.
- **Holiday.** Using the geocodes of the interviewees' holiday places over their lifetimes.
- **Social Network.** Using the home locations of their social links – both weak and strong – which are related to travel and causes of co-presence. There is additional information about the means of transport most commonly used to visit social network members as well.
- **Working Places.** The spatial dispersion of working places over their life times to capture important travel places they visit for business.

This information over their life history is the source for measuring the activity space of each interviewee. To explain the method more precisely in the following chapter I will endeavour to do two things:

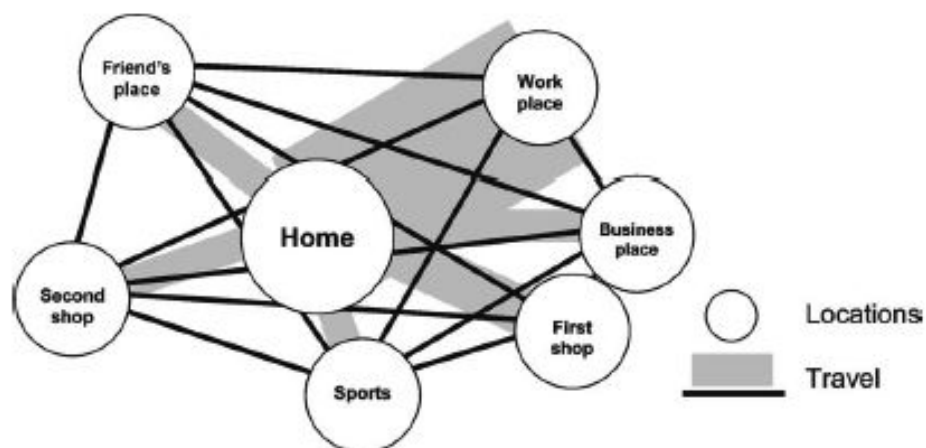
(1) The next section will present the method to capture the geography of social life using a geometry that is representing its size, orientation and form.

(2) Secondly, there is a discussion about the pros and cons of representing the geography of social life using a parametric geometry. This poses questions such as: What can this geometry capture? What does the statement represent? Furthermore, there will be a discussion about the usability of geometry in a sociological context.

### 3.1.1 Network Geography as a Representation of Modern Mobility

Measuring network geography is a methodology originally applied to home range studies in habitat research for zoological studies (tracking animal spatial behaviour) (Jennrich and Turner, 1969). Activity space “consists of the locations, which the person has visited, and the routes and areas the person travelled through, in particular those locations which have been registered and seen, but not necessarily visited yet (Schönfelder and Axhausen, 2003: 274). Likewise it represents the distribution of places visited over a period of time and the spaces that contain those places (Schönfelder and Axhausen, 2003a). In *Figure 3* an example of the different travel destinations is given.

Figure 3 Simplified activity space representations



Adopted from Maier, Paesler, Ruppert and Schaffner (1977: 57)

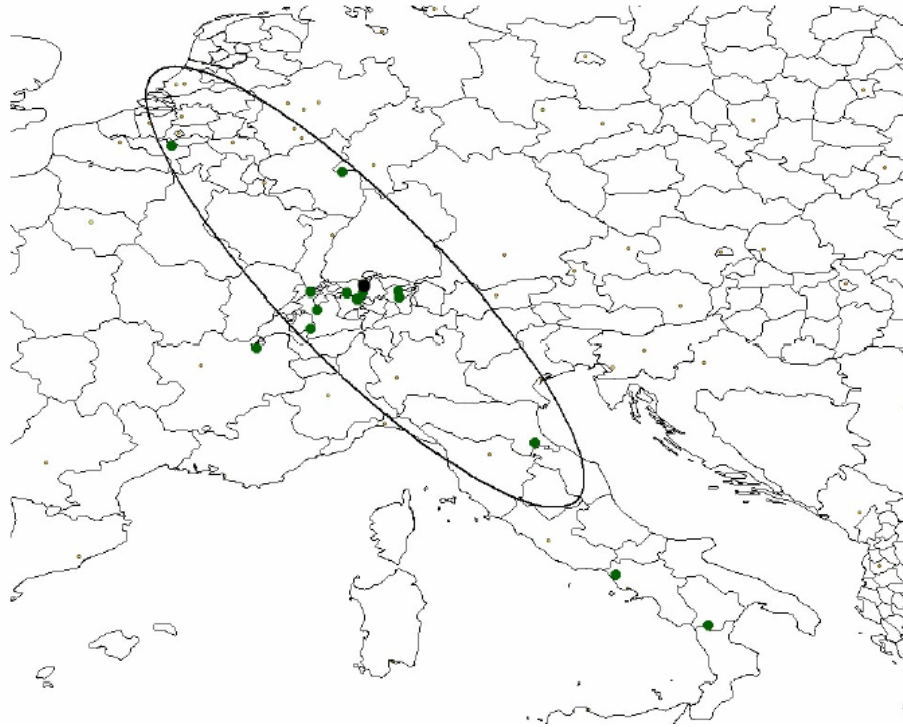
There are different ways to capture the activity space of a human being. One possibility is to measure the space with a geometrical object. The geometry is surrounding the relevant locations of an interviewee activity space size (in sq. km). The size of the object is an estimate. The sizes of the optimum geometries will be calculated so as to include 95% of the trip destinations weighted by the number of visits (Vaze, Schönfelder and Axhausen, 2005: 9). By definition 5% of the points – social contacts including co-presence in that place – will be outside the objects (see Figure 2) because of the confidence interval. The home of the travellers will be close to the centre of the object. In cases where there are more than one home a time-weighted mean of all homes during this period of time will be created. One can visualize in this case different kinds of geographies, based on the locations selected.

- Geography of the relatives
- Geography of the most important people
- Geography of the working places
- Geography of the holiday destination

In order to evaluate network geographies the concept of egocentric networks is a productive method. Egocentric networks are a feasible approach for capturing the structure and geography of a particular travellers' social network. This study concentrate on one specific actor or ego and those who relate with him, called alters. The geocoded residences of the network members in *Figure 4* represent the distribution of places visited over a period of time and the space which contains those places. A measured value [ $\text{km}^2$ ] represents the size of an ellipse surrounding all geocoded points, to capture the area of the activity space.

Figure 4 Example of a 95% confidence ellipse (95% CE)

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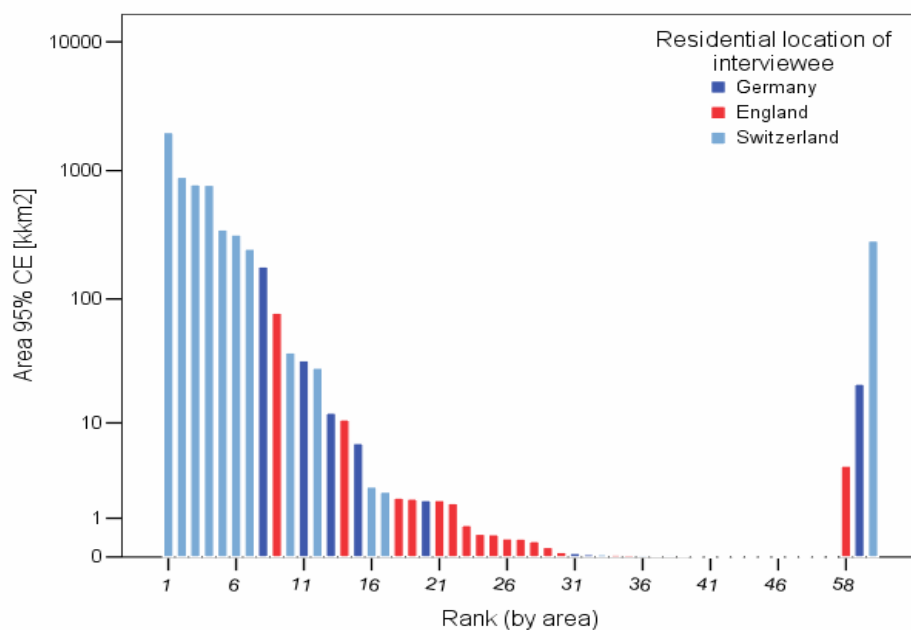


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The ellipse is drawn by combining the spatial area of the residences of the alters in the ego-centered networks. The area provides a measured value to capture the geographical area were visiting significant others take place. The ellipse makes it possible to contrast different sizes of the spatial areas of the social network. Thus, the object puts the network area in perspective by providing a measure of the size and spread of the social network geography. The interviewees' geometries could also be weighted by the number of visits to each network member. Thus, there is a more realistic representation in terms of the interplay between the size and the frequency of visits. For measuring the size of the activity space all of the social network locations were geo-

coded to city level<sup>5</sup>. *Figure 4* shows the network geography of an interviewee using the residences of every existing social contact over their lifetime, that the interviewee named during the interview. In *Figure 5* the Zurich data has been combined with additional data<sup>6</sup> set to enlarge it. The network geographies are sorted in descending order starting from the largest network geography downwards. This gives an example of how the data could be compared with respect to the sizes of the network geographies.

Figure 5 Ranking of the 95% confidence ellipse (CE)



One can see that ranking activity the network geography gives an overview of the different geographies of social networks. It should be pointed out that the descending order of the ellipse

<sup>5</sup> These geocodes represent the information about the longitude and latitude of a place in degrees for each interviewee.

<sup>6</sup> The data set is merged with the network geographies of the interviewees by the project Social NETworks and Future Mobilities.

area seems to be an appropriate measure to discuss the network geographies initially. The shown ellipse of the network geography is an absolute limitation on the activity space of each interviewee where mobility – communication and travel – takes place. In the second instance we have to identify the reasons for these geographically diverse results: What are the social reasons for a different geographical dispersion of the social network? Comparing interviewee No. 1 and No. 21 shows huge differences between the spatial dispersion of the two geographies of the social networks.

These different qualities of a ego-centric network require explanation. What is the explanation for these various spatial dispersions? Linking this information to the qualitative data material in Chapter 3, will provide first answers.

### **3.1.2 The Expressiveness of Network Geographies**

The network geography is only an approximation of the space in which a traveller is active. Likewise the geometry involves so-called “non-places” where no travel takes place (see *Figure 4*). This depends on the parametric nature of the geometry. Thus, this might be a problem in terms of merging the geometry with the ground and discussing them more individually. However, the shape of the geometry always depends on the spatial dispersion of the egocentric network and therefore it provides a good approximate of the size where travel in the social network takes place. A good reason to use the ellipse is that it is a helpful instrument when making comparisons between different interviewees. Thus, in the first stage of the analysis, it is possible to recognise initial differences in the data set and link them to the interviewees. There is a discussion about the use of the crow-fly distance method as well. This uses the Euclidean distance of the network nodes to the residences of the ego. Of course, it is possible to use the average of the Euclidean distances to the interviewees’ residences, but the mathematical measure of an activity space is a better signifier for describing spatial mobility, particularly size and orientation. By using a geometry first clues are given for further analysis. The interviewees’ spatial representation



and its direction will be used to interpret the dispersion of the ego-centric network. This analysis - both in density and direction of the geometrical representation - are more fruitful than just the information about the Euclidean average distance.

The discussion has shown that using the activity space and its graphical representation with the information of the size (in km<sup>2</sup>), is a successful method for identifying interesting differences between the respondents. In spite of the fact that the geometry is including “non-space” – a region where no travel can take place – the spatial distribution of the network members is always responsible for the shape and therefore acceptable.

One conclusion is that if you are to interpret the geographies on an individual basis, it is necessary to supplement the geometry with further information using other sources. In accordance with this approach, qualitative interviews were used to interpret the activity space individually. This analysis might be useful to get new insights into reasons of travel in daily life.

To sum up, analysis of the interviewees’ geometries will identify interesting cases for further analysis. Of course, the usage of case studies will neglect the average, but there will be a continuum of cases, which should represent fundamental types of modern mobility patterns.

In summary:

(1) The use of a geometrical measure is the backbone of the further analysis. First, insights into the geographical structure were given; at this stage both density and direction of the social networks can be analysed – especially for capturing how spatially dispersed the interviewee’ networks are, and how they are increasing or decreasing over a life course. Thus comparisons between different geometries of diverse interviewees, are possible.

(2) The usage of the interviewees’ life history data – data about places of the social network members, workplaces, residences and so on - represent an opportunity to look at how networks evolve geographically over time.

(3) Using geocodes and GIS (Geographic Information Systems) to generate a variety of spatial representations and their size (km<sup>2</sup>) is useful in combination with qualitative material to gain insights into motivations of travel behaviour.

(4) The quantitative spatial analysis and the qualitative elements of the approach (and furthermore the additional information about socio-demographic data), could be combined with the information about the preferred mobility tools of each interviewee. Accordingly, the additional information about the most used means of transport in a given life period was used to analyze mobility - and especially of personal nature.

(5) To obtain better results in the interpretation of the activity space, they have to be combined with the qualitative data of each interviewee.

## 3.2 Bringing Methods Together

To combine the network geography with further data the transcribed interviews are investigated for the following issues:

- The importance of proximity in long-distance relationships.
- The influence of parents on the personal mobility, like second-hand experiences passed in the nuclear families and influences of parents' travel behaviour on the following generation.
- How communication forms are need to maintain the social networks

First, the focus is on the method of data collection within the project. Thirty guide line interviews were conducted in Berlin and Zurich. The interviews using oral histories intended to collect information about the interviewees' personal mobility biographies. The issue of interest in this project was to develop a method for collecting long duration data and to get first insights into the variety of mobility biographies as a data source (see Ohnmacht and Axhausen 2005). The chosen sample represents a wide range of people with different occupations, income, age and education. The interviews address different cases of mobility patterns or mobility biogra-

phies. Various approaches are used to obtain a complete or nearly complete view of the mobility relevant events in life: The reconstruction of past patterns is a challenge, as the person need to remember where their contacts lived at a particular time also so called-take off situations with mobility tools. Diaries can be supplemented by personal telephone books, email directories, telephone bills, photo albums to remember such events (see Schütze 1983).

The overall objective of the interviews was to get insights into three main research topics in terms of the mobility biographies where events can evolve (see in detail Ohnmacht und Axhausen 2005b):

- First, to locate life course transitions in general. These can have impacts upon further mobility behavior.
- Second, to examine the quality of the personal social network.
- Third, to consider the relationship between parental mobility patterns and the mobility patterns of the interviewees.

The main interest is in locating events, e. g. in so called take-off situations which affect mobility behaviour. Thus, interviewees were asked to put these events into the context of personal mobility behaviour. In terms of life course transitions, following examples of how mobility patterns change during a person's life time have been located:

- Relocation - moving from one place to another involves a new analysis of the local infrastructure, changing the routines of the mobility patterns.
- Flexibility - for example people who look after handicapped people tend to acquire cars, to achieve more flexibility.
- Access to mobility tools in general, for example acquiring a driver license is a life course transition *per se*.
- Birth of children, is another life course transition for the parents. New mobility patterns evolve, for example fewer holidays. Young families tend to buy a car to organize their life more easily.
- Negative experiences with mobility tools, such as accidents also influence mobility patterns.

- Positive experiences with mobility tools, such as the first low-cost-airline flight.
- Age-related immobility with the use of support to maintain the personal mobility.

The following items present some insights into the influences of social networks upon mobility patterns in terms of the mobility biography:

- Social contacts living faraway are associated with holiday destinations, many of the interviewees say that holidays are related to local persons. It is a chance to combine holiday and visiting friends.
- Most of the interviewees` network geography increases over their life time. Except the geography of those which have a disperse family geography by birth such as diasporic cultures like Jewish people.
- Special occasions like weddings, birthdays, funerals, stag night are reasons to meet-up at-a-distance.
- Low priced communication supports long-distance social contacts, for example the German Telecom`s “Free Sunday” tariff.
- Low generalized costs of transport also supports maintaining social contacts at-a-distance. The area of low cost-airlines is helpful in maintaining long-distance social contacts, according to interviewees. Strong ties are not necessarily related to living nearby.
- As the number of events in the mobility biography increases, the social network becomes more spatially dispersed. For example, in case of high job mobility with changing residences, the personal network become more dispersed. The result may be a complex work-life-balance with a complex personal mobility management.

Next some of the data on mobility patterns between generations are discussed. In this context, we are interested in a like-father-like-son relationship in terms of mobility biography:

- There are different ways in which children accept and reject their parental mobility patterns. The consequence is to develop different types of parentally adopted mobility patterns during a further stage of the project.
- The favourite landscape for most of those interviewed was associated with the place of the parental home.
- The holiday frequency and destination is related to the holiday frequency of the parents.

- Parents and children have similar mobility tool preferences.

For the analyse two case-studies were selected. For these an interpretation of the size of their network geography will be attempted. The explanations for the size are a variety of social circumstances. In each case the network geography of the quantitative database will be shown, followed by a combination with a qualitative analysis of the life course of the interviewee. In the case of triangulation – using quantitative and qualitative data - results will be presented for the reason of being mobile.

The six initial cases are:

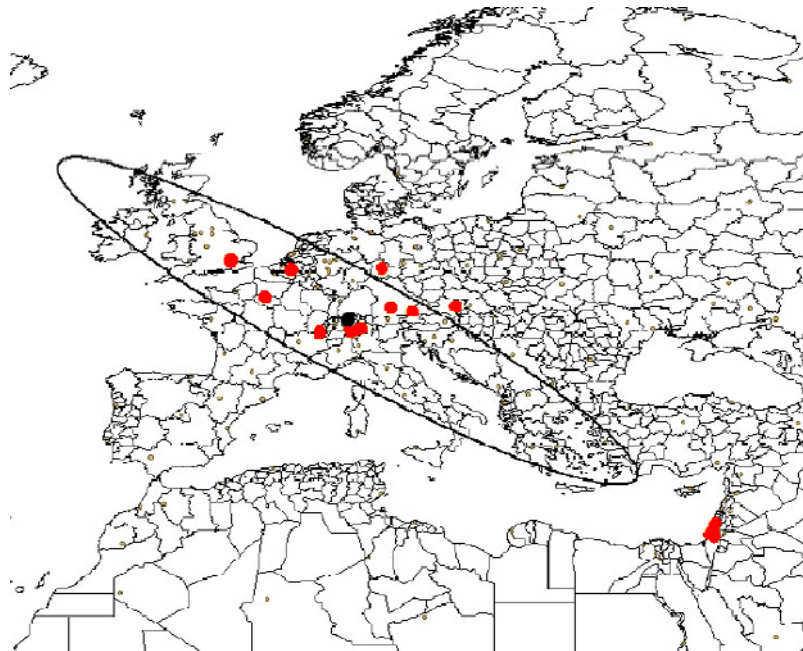
- (1) The network geography of an interviewee with a diasporic family, in particular a Jewish transnational family. Such families maintain contact when and wherever possible, for example fulfilling social obligations by attending parties, birthdays, weddings, funerals and so on. Easier and cheaper communication has clearly facilitated this (see Sutton 2004, analyzing African Caribbean transnational families).
- (2) The network geography of someone who had to change workplace because of unemployment and moved from the eastern part of Germany to its western part.
- (3) The network geography of someone who has chosen a city residence for lifestyle reasons.
- (4) The network geography of someone who was evicted by war.
- (5) The network geography of someone who has a mobile profession.
- (6) The network geography of somebody local.

In order to discuss the relationship between the size of a geography and mobility, two social network geographies will be analyzed more in detail. On one hand case number one and on the other case number six.

## 4 Two Cases of Mobility Patterns in Network Geographies

Figure 6 summarizes the network geography and data of an interviewee, a male born in 1940. The size of his network ellipse is 2 000 000 km<sup>2</sup>. He named 29 contacts in the survey. His most used method of transport is his privately owned car. The interviewee has moved three times and changed jobs five times in his life. Since he has a drivers license, his car accessibility is 100 per cent. He is a self-employed consultant. The orientation of the ellipse is on a axis from Tel Aviv, Paris to London.

Figure 6 Network geography of diasporic cultures (Case 1)

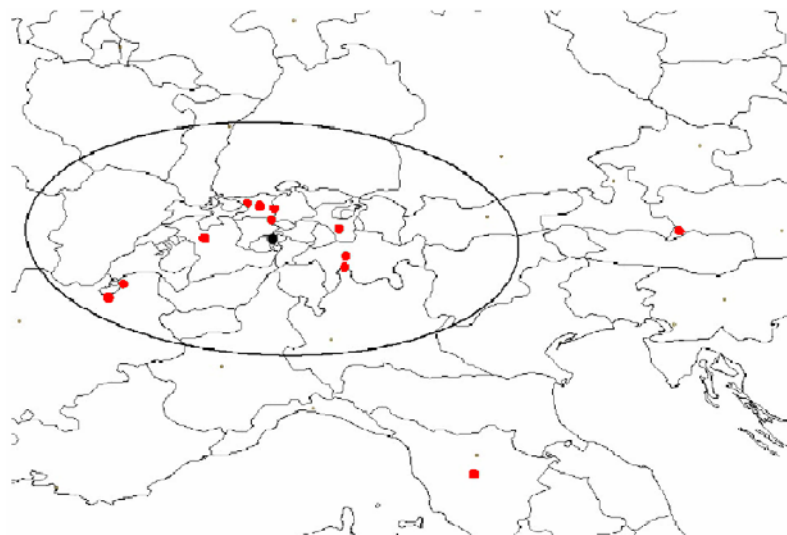


Because he is Jewish, thus he has a diasporic family geography by birth. There are nearly annual meetings with his Jewish relatives in Haifa and Tel Aviv. The geography of social contacts in his life is based on the cities: Munich, St. Moritz, Erfurt, Paris, Emmental, Zürich, Vienna, Salzburg, Lausanne, Geneva, London, Tel Aviv, Haifa, Chur. Interesting events in his personal

mobility biography are, that his father was a medical doctor for displaced persons in World War II, who always preferred to travel by car. The interviewee accompanied his father to different German cities. His first flight was 1960 from Paris to Zürich. He purchased his first car in 1963.

Figure 7 summarizes the network geography and data of a local interviewee, a female born in 1976. The size of her network ellipse is 260 000 km<sup>2</sup>. She named 22 contacts in the survey. Her most used method of transport is public transport. She has moved four times in her life. The interviewee has a 26.7 per cent car accessibility since she has a driver license. She is a student. Her family is located nearby (Canton of St.Gallen, Switzerland). Most of her friends moved to Zurich for studies, so did she. Her social life is centered in Switzerland. The network geography in her life is mostly in Switzerland (Egg, St Gallen, Zurich) and Frankfurt, Naples and Vienna. She obtained her drivers licence in 1995, currently she is using her parents' car to meet-up with friends.

Figure 7 Network geography of local persons (Case 6)



## 5 The Modern Nature of Mobilities – A Final Excursion

This approach elaborates a new methodological direction for understanding travel behaviour. The comparison of the quantitative network geographies –geocodes of the mobility relevant to places in life - and the qualitative interview material – personal engagements of personal mobility- give insights into the mobility forms in modernity. Although the findings were not representative they nevertheless pointed to examples of a wide continuum of mobility types like shown in the two cases above.

The methodologies from this analysis present a way to work with mobility biography data. Furthermore, a method has been shown which combines quantitative and qualitative elements to focus on the nature of personal travel behaviour. The further steps are to investigate further the question: What are the effects of events in the mobility biography upon the geography of the social contacts? More generally speaking, what is the interaction among life course transitions, mobility biographies, social networks and travel behaviour? For instance, to link the spatial dispersion of the contacts to different socio-demographics, different life-style groups, to milieus groups like diasporic cultures, local communities, or to highly-mobile job-lifestyles with global mobility. Are the geographies of social networks changing? Especially in case of more flexibility in life, for example highly mobile life-styles, such as double career couples with work-life balance? What is the linkage between social and spatial interactions? A new survey is designed to collect more social contact geographies to enrich the base-line data and to bring it to a representative number do develop more differentiated cases of mobility patterns in modern societies. Finally, in this phase of the project, a method has been developed to collect egocentric network data which focus on the use of mobility tools and network tools. It is possible to understand networks in combination with mobility in each sense – communication and travel in terms of a personal mobility management. It is also possible to explore the influences on how the social network shrink and stretch over a life course.



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