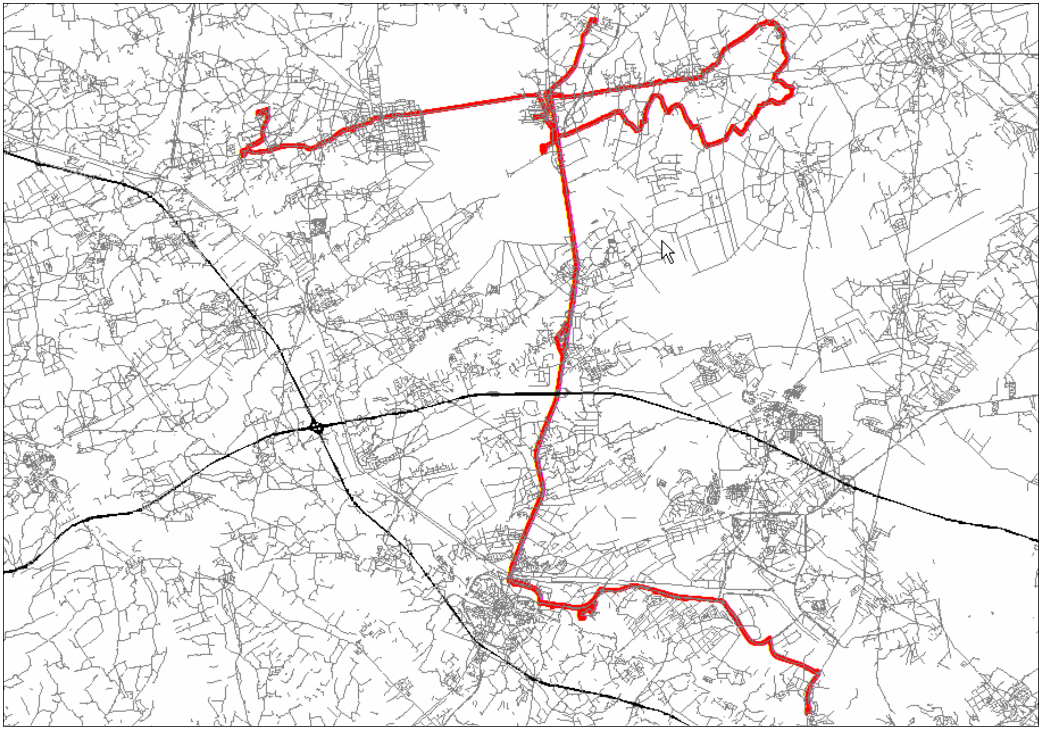

Proximity is a State of Mind: Exploring Mental Maps in Daily Activity Travel Behaviour

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Abstract

The aim of this paper is to explore the behavioural framework for the integration of the 'mental map' concept into the activity based modelling of travel behaviour. The conceptual framework and the research methodology are described. Stated and revealed preference data gathering techniques are used simultaneously to gain insight in the role of 'spatial cognition' in daily travel choice behaviour. This results in a qualitative descriptive reflection on spatial learning and activity travel planning.

Keynote of this research is the fact that spatial cognition – here defined as knowledge, experience and perception of large scale environments and its transportation systems – influences the choice set of alternatives that are known and considered by individual travelers. This could affect location choice, mode choice as well as route choice.

Keywords

Spatial Cognition, Mental Map, Travel Choice Behaviour, Activity Based Modelling

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1. Introduction

Spatial cognition is an area of interest in the periphery of various disciplines, e.g. geography, urban planning, psychology and computer science. Much of the work in this field is focussed on the definition of the content, the properties and the development of mental maps and the understanding of spatial reasoning. This paper does not provide a systematic review of the history of research in spatial cognition both because there are reviews already available (e.g. Mark et al., 1999; Foreman and Gillet, 1997), and because the research object at stake is the relationship between mental maps and travel rather than the mental map in itself.

This relationship is twofold (Weston and Handy, 2004): by travelling people learn about the environment and add the thus acquired information to their mental map. On the other hand, when planning travel, these decisions are wholly or partially based on the information stored in their mental map.

Understanding and predicting travel behaviour is one of the main challenges of transportation modelling. It is believed that travel and transportation models based on human behavioural characteristics will perform better when estimating the effect of various policy measures and that their use will lead to more realistic and thus more adequate predictions (Janssens et al., 2003). Modelling contents have recently changed from individual travel patterns (trips and tours) to activity patterns of households, bearing the context of human travel in mind. At the same time, applied modelling techniques are changing. There is a shift from macroscopic to microscopic simulation models, and at the same time computational process models or agent-based models gain importance in attempts to understand the behavioural components of travel decisions.

Integrating the concept of mental maps into activity based modelling could be a way to improve the behavioural basis searched for in transportation modelling, or, as Golledge and Gärling (2004) state: “The question facing future research is that of combining travel demand (considering people’s activities) with network supply (considering the tracks, corridors or transport systems available) with an understanding of how humans decide on where they prefer (or have) to go and how they prefer (or have) to get there. Emphasizing cognitive mapping principles may give a level of insight that has not so far been provided”. The operational research objective in the long term is thus to grasp the underlying behavioural principles in travel choice modelling by building spatially cognizant agents.

Therefore, the first step in this research project is to explore the behavioural framework of learning and planning described above in greater detail: (1) how does travel in the context of daily activities add to people’s mental map and (2) which spatial or transportational factors reflected in people’s mental maps affect their daily activity planning and travel behaviour? In order to uncover as much relevant factors as possible, an explorative, qualitative survey is used.

In this survey, stated and revealed preference (SP and RP) data are gathered using standard techniques in combination with some more advanced methods. Structured interviews are the main source for SP-data. The major research paradigms for investigating spatial cognition, such as distance estimates, sketch maps and route descriptions, are covered in these interviews. In addition RP data are gathered by means of a standard research technique in travel behaviour research, i.c. activity travel diaries, combined with the more advanced method of registration of travelled routes using GPS. Finally specialized software will be used for the processing of the data, e.g. TRANSCAD for the GPS component and ATLASti for the coding of the interviews.

This paper is structured as follows: first, the scientific framework of the project is drawn by explaining the relation between the scope of the project and spatial cognition and activity-based modelling. This results in the definition of the research goal. Next, based on the phrasing of the research questions, the second part of the paper offers a detailed description of the research methodology for the initiate explorative qualitative survey. To conclude, results from the interviews and future research plans are addressed.

2. Basic Concepts: Spatial Cognition and Activity Based Modelling

2.1. Spatial Cognition

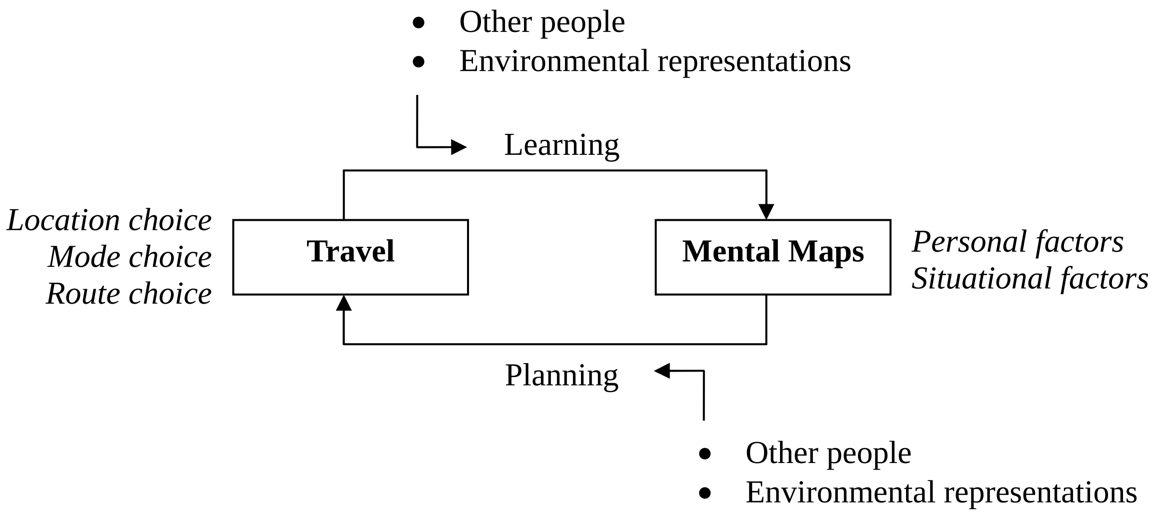
Spatial cognition of large scale environments is – and has been in the past – a research topic in the periphery of various disciplines that focus on space or human behaviour such as geography, urban planning, psychology and behavioural sciences. Moreover, the boom in computer science at the end of the 20th century provided several computational applications in these fields, i.c. geographical information systems and artificial intelligence, where spatial cognition is now a point of special interest. Over the decades this evolution has lead to a constant but rather modest flow of scientific publications on this subject.

One of the oldest concepts in this research area – but perhaps also one of the most contested (Kuipers, 1982) – is the mental map as a representation of the spatial knowledge and spatial understanding in the memory of human beings. Lynch (1960) defined mental maps as compound of landmarks, edges, districts, paths and nodes. Other authors prefer to refer to the idea of ‘cognitive maps’ (e.g. Downs and Stea, 1977; Portugali, 1999; Golledge and Gärling, 2004) when defining the properties, structure or divergences in people’s representations of large scale environments. The main critics argue that individual’s spatial knowledge is not static or map-like, but it consists of largely dynamic information that may contain much more than the two-dimensional depiction of environments. Often alternative expressions such as ‘image’ (Kosslyn, 1980) or ‘mental collage’ (Tversky, 1993) are suggested.

Travel and mental maps are intimately tied (Weston and Handy, 2004) as shown in Figure 1. By travelling through the environment, people learn about it in a direct manner. So through travel, people acquire an important part of the spatial knowledge that makes up their mental map. However, travel is not the only source of information. People can also learn about the environment in a more indirect manner from environmental representations (e.g. through maps, route planners or images) or form others (e.g. through travel reports or route descriptions).

Differences in the way this direct and indirect information is added to the mental map depend on personal and situational factors. The influence of age or gender on spatial reasoning abilities are well known examples of effects of personal factors on the development of mental maps. Situational factors influencing spatial learning on the other hand can be related to the environment and to the transport mode used. A clear example of the former is the concept of ‘legibility’ as defined by Lynch (1960). However, the latter stated importance of transport characteristics such as travel speed or involvement in trip conduction is only poorly documented in literature.

Once formed, the mental map becomes the foundation of decision making (Portugali, 1999; Weston and Handy, 2004). It reflects the internal knowledge of potential activity spaces and their accessibility by different modes and routes. It thus represents the alternatives that are known and can be considered without further consideration of external sources of information, for example social contacts or mass media. Furthermore, a mental map may also include associations that make certain choices more or less attractive than other choices. Understanding mental maps can therefore provide important insight into the planning of individual's travel and the processes involved in location choice, mode choice and route choice.



Based on: Weston and Handy (2004) page 535

Figure 1 The relationship between travel and mental maps

Knowledge about how people learn about the environment and how they respond to it in terms of their travel behaviour can be of great use for transportation and urban planners. Through research on mental maps the critical spatial factors for the use of sustainable transport modes from an individual's point of view can be identified and taken into account in transportation policy and urban planning. Integration of this mental map concept into travel choice models could take this use even a step further by enabling more accurate predictions of the effect of different policy measures.

Several research techniques and paradigms have been applied in an attempt to define mental maps and spatial cognition (Foreman and Gillet, 1997). The most common traditional techniques are sketch maps, route descriptions and distance estimates. Sketch maps drawn on a blanc piece of paper or filled in on an incomplete map are used to reveal topological and metrical aspects of spatial knowledge. Route descriptions provide spatial representations using language, whereas distance estimates provide metrical information that can be used for calculation, triangulation et cetera.

Although research techniques are numerous, measuring constructs such as cognitive maps and spatial learning, and making them operational remains difficult. Ways to incorporate mental maps in transportation models have therefore not yet achieved widespread adoption (Golledge and Gärling, 2004). A promising manner to take cognitive concepts into account in transportation modelling can be found at Arentze and Timmermans (2003, 2005), where a rule-based model capable of learning the environment has been developed.

2.2. Activity Based Modelling

One of the main challenges for transportation modellers is understanding and predicting travel behaviour in order to accomplish realistic and policy responsive forecasts. Transportation models are used for predicting the impact of land use and transportation policies on typical travel patterns, allowing policy makers to assess the likely impact of such policies in terms of changing travel demand. Moreover, the attempts to capture behavioural realism of individual travel choices have lead to significant changes in modelling content, methods and techniques over the past decade.

In the late nineties a major paradigm shift could be observed in the transportation research field from trip and tour based modelling in traditional four-step models of travel demand to activity based modelling. In this activity based approach, travel is considered as the derivative of the activities that individuals and households need or wish to perform. By taking this context of human travel into account, modelling becomes more realistic and accurate. Activity based approaches to transportation forecasting therefore aim at predicting which activities are conducted where, when, for how long, with whom, the transport mode involved and ideally also the implied route decisions.

Parallel to this evolution, both modelling methods changed from macroscopic simulation to microsimulation of travel and transport and different modelling techniques from several research areas are applied. In particular constraints based models have their roots in time geography, utility maximisation models stem from microeconomic theory and psychology, while computational process models have been inspired by psychological decision process theories (Joh, 2004).

The latter seem to offer the best possibilities to grasp the underlying behavioural principles of travel and transport phenomena because the decision process by which individuals arrive at their choices is explicitly modelled. Instead of assuming that people always make ‘optimal’ choices, these models use if / then heuristics that may be context dependent. One of the most advanced operational process models in the transportation literature to date is Albatross (Arentze and Timmermans, 2000; Janssens et al., 2004).

In addition, current research aims at modelling short term dynamics in activity travel patterns. As such, Aurora has been developed to complement the Albatross system while focussing on the rescheduling of activity travel patterns. This model was further extended to deal with uncertainty and responses to information provision and various types of learning, including the above mentioned model of learning the environment (Arentze et al., 2006).

In 2005, a research programme coordinated by IMOB was funded by IWT (Belgium) aiming at developing a prototype, activity based model of transport demand for Flanders (Belgium), in addition to exploring the potential use of new technologies on collecting travel data. The basis of this model, which has been given the acronym “Feathers” (Forecasting Evolutionary Activity Travel of Households and their Environmental RepercussionS), will be the extended version of Aurora, complemented with a number of concepts. This model will consist of an agent based microsimulator that allows simulating activity travel scheduling decisions, within day rescheduling and learning processes in high resolution of space and time (Arentze et al., 2006). The research reported in this paper is conducted in the margin of this Feathers framework.

To successfully accomplish microscopic simulation of travel behaviour in an activity based context, detailed and extensive datasets concerning time use and travel behaviour of households and individuals are acquired. The main modes of data collection employed in transport surveys in general are selfcompletion questionnaires or activity travel diaries, and interviews. Traditionally these activity travel diaries are pencil-and-paper questionnaires. However, more recently, new communication technologies have been used to supplement or replace these forms of travel diary survey collection, e.g. by use of internet surveys, mobile phones and GPS technology. These new technologies have been introduced to reduce respondent's burden, to improve data quality and to provide additional information. Currently an advanced activity travel diary data collection application called “Parrots” (PDA system for Activity Registration and Recording of Travel Scheduling) based on a GPS-enabled personal digital assistant (PDA) is deployed in a large scale activity travel survey in Flanders (Kochan et al., 2006). The detailed data collected by means of this tool will be used to develop the Feathers model mentioned above.

3. Research Objective: Building Spatially Cognizant Agents

As sketched above, spatial cognition and activity based modelling form the basic concepts for this research project. In this context ‘spatial cognition’ is largely defined as “knowledge to enable travel in large scale environments”. This includes an individual's *perception* and *knowledge* of spatial, temporal and operational aspects of his surroundings, including the transportation systems there present. Moreover spatial cognition can also be linked to the individual's *attitude* towards the environment and to his attitude towards different forms of transport. And finally, there is a link with the individual's *skill* with regard to travel. This is the ability to find locations and use different transport modes to reach those locations. The metaphorical expression ‘mental map’ will thus refer to the whole of spatial and travel related information that is used by and stored in individual's memory.

The aim of the project is to define the impact of travel on the formation and updating of mental maps (learning) on the one hand, and to determine the role of the mental map in travel choices on the other hand (planning). Usually research related to spatial cognition in large scale environments and travel behaviour is focused on spatial characteristics of the environment (urban morphology) influencing travel behaviour, while emphasizing on route choice as a part of wayfinding behaviour research and modelling (Golledge and Gärling, 2004). In this paper, however, operational characteristics of travel and transportation systems are taken into account, as well as location choice and modal choice and their relation to mental maps. Modal choice is considered to be a fundamental part of the construct of ‘accessibility’, as it is closely tied to location choice and route choice. This raises the following research questions: (1) in which manner does travel in the context of daily activities add to people's mental map? Which aspects of daily activity travel behaviour affect learning and in which way? (2) Which spatial or transportational factors reflected in people's mental maps affect daily activity planning and travel behaviour? Does the mental map affect the perception of accessibility of activity spaces?

The operational objective of this research project in the long term is to mimic real life behavioural process in transportation modelling and to contribute to the design of spatially cognizant agents that built their mental map by travelling through the environment and that make travel decisions based on this mental map of their surroundings and its transportation systems.

As stated before, the fundamentals of a similar and most promising routine are already available within the activity based Feathers model (under construction), which is based on the Aurora model. Furthermore numerical concepts to implement mental map updating have been formulated (Arentze et al., 2006), and some numerical experiments are executed to illustrate the impact of learning processes on trip choice regarding the destination and route provided by the model (Arentze and Timmermans, 2003, 2005). However, the behavioural assumptions of this model still need further empirical testing in order to validate the model.

4. Explorative Qualitative Research: Methodology

The first step in the research project reported on in the present paper consists of gaining insight in the way people learn about, perceive and evaluate the accessibility of activity spaces, and how these processes affects their daily activity planning and travel behaviour. In order to uncover as much relevant factors as possible, an explorative, qualitative survey is used.

In this survey, standard techniques combined with more advanced methods are applied to collect stated and revealed preference data. SP data are provided mainly by structured interviews in which the planning of travel within daily activity routines is questioned and some typical spatial cognition research techniques, such as sketch maps, route descriptions and distance estimates, are tested. To gather RP data concerning travel behaviour activity travel diaries, together with a more advanced method of registration of travelled routes using GPS, are utilized.

For the selection of the sample following potentially relevant key characteristics were taken into account: age, sex, education, occupation, drivers licence, possession of car, marital status, household size, parenthood, residential location and mainly used transport mode. For each value of these key characteristic, 4 to 5 respondents were aimed at to participate in this research. This resulted in a total sample of 20 respondents, which is a usual sample size for qualitative research (Mehndiratta et al., 2003). At first, respondents were gathered from the wide circle of acquaintances of the researcher and then, according to the ‘snowball method’, respondents from the circle of acquaintances of acquaintances were involved. Moreover, as the degree of motorization in Flanders (Belgium) is rather high with 481 private cars per 1.000 inhabitants and 1,17 private cars per household (Algemene Directie Statistiek, 2006), respondents without a driving licence and households without a private car were selected first.

After 2 initial testing phases of the full research procedure and subsequent updating, these 20 respondents were asked to keep a free-form and a structured handwritten activity and travel diary during one week, late spring 2005. The design of the diaries was based on previous activity based travel research (Albatross) and categorization of activities in time use research. Ten categories of activities were defined: sleeping, working, eating and personal care, housekeeping, education, groceries, shopping, services, social life, recreation. And four categories of travel were taken into account: travel as a means to go somewhere, travel in order to to fetch and deliver something or someone, recreational travel, work related travel. During this week respondents also took along a GPS receiver attached to a PDA while travelling to register travelled routes. Besides this diary, respondents were also asked to complete a general written questionnaire containing questions concerning household characteristics, individual characteristics and use of and attitudes towards different transport modes.

In addition a structured in-depth interview was conducted one day before the first registration day. This interview consisted of two major parts. The first section contained some general questions about their residential choice and their perception of the accessibility of different activity spaces in daily life, i.c. different locations, transport modes and routes. Next they were asked to specify their activity and travel plans for the week to come on a day-to-day basis. For each planned activity out of the house, some further questions concerning location choice, modal choice and route choice were asked. Depending on the extent of the planned activities, the duration of these ex-ante interviews varied from 45 to 75 minutes.

One day after the registration period, a second structured in-depth interview was conducted. In this interview the daily registered activities were compared to the previously scheduled activities, again zooming in on travel choices. To finish some general questions concerning spatial cognition and wayfinding behaviour were asked. These ex-post interviews took 30 to 60 minutes.

During the interviews several standard research techniques in the field of spatial cognition were tested. Firstly respondents were asked to assign distance values to planned and travelled routes. These estimates will be compared with the revealed data from the GPS registration. Moreover during the second interview respondents were also asked to estimate distances to activity spaces of different familiarity to the respondent, in different directions and at different distances from their homes. Furthermore, for each respondent, several route descriptions to different activity places were recorded, and will be compared to actual travelled routes from the GPS registration. Finally, the route sketch map technique was used to gain insight in the content of the respondent’s mental map for a well known, daily travelled route.

Specialized software will be used to deal with the gathered data. The CAQDAS package (Computer Assisted Qualitative Data Analysis) ATLASti will enable a digital coding of the content of the interviews. GPS data will be processed by means of TRANSCAD (Caliper) and added to the activity diary data. GPS coordinates can simply be presented as dots on a map, using the locate tool of the programme. Initial tests of this procedure reveal promising results.

5. Results

In this paper a general analysis of the interviews is presented as a qualitative descriptive reflection on spatial learning and activity travel planning using the framework as defined in Figure 1. To start with, a brief overview of the relevant indicators derived from the activity diaries is provided to describe the degree of activity and travel of the respondents in a rough outline. Next, considerable spatial characteristics of their activity travel behaviour, also derived from the activity diaries are sketched.

5.1. Activity-Travel Indicators

On aggregate level, the 20 respondents reported 888 trips and 1691 activities during 140 registration days. Activities were registered round the clock, both at home (67%) and outdoors (33%). 6,01 trips per person per day were reported (excluding travel during work or travel as work), with an average travel time of 18 minutes per trip and an average estimated travel distance of 8,92 km per trip. The average amount of travelled kilometers per day is 57. These numbers are considerably higher than Flemmish travel indicators, where travel surveys report an average of 2,74 trips per person per day and an average of 32,7 kilometers travelled per day (Zwerts and Nuyts, 2004). This difference reflects a bias in the sample towards the more active part of the population. Even though this is worth mentioning, it is far from problematic since statistical representation is not aimed at in the present explorative research.

The average amount of different activity places attended during one week is 16 per respondent. A number of these locations were visited more than once within one week (e.g. work, school). Several activities were performed at different activity places within one week. Highest scores can be found for daily groceries (3,45 locations per person in average) and social life (4,25 locations per person in average).

Respondents were divided into 3 types of residential location (A,B and C) according to the proximity with respect to public transport services and to the town centre (Table 1).

Table 1 Characteristics of ABC locations

	Proximity of railway station		
	< 1,2 km	1,2 km – 4,2 km	> 4,2 km
In city centre and built-up area	A	B	B
Remote and no built-up area	B	C	C

Data seem to reveal that residential location has no or little influence on the amount of activities performed, on the amount of different activity places visited or on the amount of trips undertaken in this research sample. The average travelled distance per day as estimated by respondents however increases with increasing distance between dwelling and PT and town centre. It increases slightly when comparing A (33,36 kilometers) to B-locations (42,01 kilometers), and it more than doubles with regard to C-locations (85,41 kilometers). Average travel time per day increases as well, yet more moderately, indicating that respondents in this sample living in A-locations and B-locations use slower modes of transport or slower parts of the transportation network compared to people living in C-locations. Further analysis of the activity diaries and linking these diaries with the GPS data enables the verification of respondent's distance estimates, while the interviews reveal respondent's qualitative evaluation of these distances.

5.2. Interviews

Global interpretation of the interviews shows that in the context of daily activities, travel decisions are seldom preceded by much deliberation. Conscious and elaborate travel choice processes are rare in daily activity routines and perceived choice sets for location choice, mode choice and route choice are very limited. Within this observation and according to the respondents, spatial factors seem to have hardly any influence on daily travel behaviour. This conclusion can be illustrated well by the fact that some straightforward questions on this subject were often answered with nothing more than a gaze at first. Space is but the very décor of people's life, and not more than an apparently unnoticed and unimportant background. Once people have settled in their activity space and daily routines have been accepted, apparently they become unaware of their familiar environment and quite uncritical towards their travel behaviour. Best example of this statement is the fact that almost none of the daily travelled distances are perceived as: “far”. Nearly every distance that has to be travelled frequently has been accepted and accordingly categorized as: “not far”, sometimes followed by the excuse-like statement: “I am used to it”. Proximity is a state of mind.

General unawareness of the environment can also be demonstrated in the way most respondents reacted to specific and typical mental map questions: they had to search for answers. Although questioned for every travelled route, distance estimates were the least popular tasks, and answers were often accompanied with a sigh and an apology: “I am not good at this”. Sketch maps of well known travelled routes and route descriptions were provided after some thoughtfull deliberation and while answering, and processing the route in their mind, people were often making mistakes and correcting themselves again. This indicates that people are not bothered with similar questions in daily life and that depicting a route does not correspond to actually driving it. Firstly, a remarkable personal factor that seems to influence the general performance on and liking of these assignments was the genuine interest respondents showed in geographical aspects of the environment and the ability to find their way around. People who don’t like dealing with spatial issues in real life (e.g. planning new trips), proved to be more insecure when testing their mental map. Secondly, people with a large number of fixed routines and only little variation in daily activity patterns produced less detail, extent and accuracy in their mental map. On the contrary, respondents with a less routine lifestyle, more changes and unpredictability seem to show more depth in explaining route descriptions. Finally, the more transport modes used, the more multimodal mental maps become and the more alternatives are recognized (but not necessarily considered) while planning trips.

Besides this, the present study reveals that a mental map is much more extensive than the activity spaces and routes recorded in one week. Spatial learning and the construction of a mental map consists of a lifelong process in which previous places of residence seem to play an important role. A number of respondents indicated when estimating certain distances that they do not reason based on their present dwelling, but based on an earlier address. They knew the distance between a certain destination and their previous dwelling, but not between that point and their present home. Spatial learning from travelling through the environment was illustrated clearly in the course of the interviews. The question: “How did you get to know this activity place”, was answered sometimes stating: “I’ve noticed it while passing by”. This is exactly the spatial learning process that is modelled by Arentze and Timmermans (2003, 2005). However, spatial learning through travel seems to differ between different degrees of involvement in conducting and therefore possibly between different transport modes as passengers do not have to pay attention to the environment while travelling. Some interviewees who were not driving actively to a certain destination, stated not to be able to travel to the same destination without assistance. Besides this direct learning from travel, indirect place learning from instruments was also demonstrated in the course of the interviews. An example of this are time-tables of railway traffic. In Belgium, railway connections are typically indicated with the names of the towns at the beginning and at the end of the route, whether this is a big city or a small village. Without ever visiting these terminal stations, people know that these towns exist and they know roughly where these are situated. And of course, people learn from each other. “Someone told me it was there”, was also a popular answer to the question: “How did you get to know that place?”.

Notwithstanding the above statement that people are unaware of daily activity space, they do demonstrate spatial reasoning when planning travel. For example in planning multistop trips or trip chains people indicate the following: “Whenever I go there, I always think about what other things I still have to do in the vicinity before I leave”. Daily activities at familiar destinations or in the neighbourhood of known places are typically planned solely from the mental map. On the contrary, visiting new places or wayfinding in unfamiliar environments was demonstrated in the interviews not to be based on spatial reasoning alone as people apply other additional information with great ease (from asking directions to specialized on board navigation instruments) and have easy access to planning instruments (routeplanners, timetables of PT,…).

As mentioned before, travel choices in daily activity context are mainly fixed, habitual routines. They are seldom preceded by much deliberation. What is more, people often perceive no choice at all. Why certain things happen at certain places often is assigned to some sort of external coincidence, having nothing to do with internal considerations: “I accidently ran into X, and he asked me to join him to the pub. Since I had nothing planned to do, I did. We visited a pub that happened to be in the neighbourhood and was open at that time”. Zooming in on location choices, in a daily activity context a number of locations are fixed, such as home, work, school, addresses of friends and family. Possibly, a number of these location choices were once part of a (deliberate) long term location decision apart from the daily-activity context. In case of the latter, there has never been a location choice situation available to the traveller. Next, there are a number of locations to visit which are chosen by others. The social network in general and members of the household in specific play an important role in the definition of peoples activity-spaces. In a way mental maps even seem to merge when people live together. Even for activities, such as daily grocery shopping, where from an objective point of view several alternative locations are available, respondents do not always recognize these different choice options. A combination of specificity of the wanted product, habit and vicinity of the location are the most cited choice factors.

Mode choice too is said to be habitual for the respondents. Certain activities at certain places are automatically linked to certain transport modes. In this cases consideration of alternatives is rather exceptional and bounded to rules: “I do take the bicycle to go to the supermarket sometimes, but only if the sun is shining and if I don’t have to bring too much”. A generally recognized spatial factor related to mode choice is travel distance. People can easily define distance boundaries for walking and cycling. Before taking the train, it seems that a certain minimum critical travel distance needs to be travelled. Cars and busses are much less clear in that sense: they are used for various distances and purposes. Interviews showed that certain areas (city borders, town centers…) can contain a strong link and even impose the use of certain transport modes: “I associate that town with busses”, “Whenever I need to do something in my village, I automatically go by bicycle”.

Finally route choice constitutes another important element in travel decisions. In case of the use of public transport, mode choice is inevitably linked to travelled route. Thus, route options were only recognized for individual travel. In case of the presence of a direct and fast route to a destination, the question for alternative routes was considered ludicrous. Moreover a strong connection with the destination seems to decrease psychological travel distance. A necessary condition for the consideration of alternative routes seemed to be a strong resemblance between alternatives, or a clear advantage of each of the alternatives, e.g. smaller travel time but greater distance and vice versa. Travel time, distance, directness, logic in direction, safety and beauty are some of the most cited factors with regard to route choice. Route choice is something people do experiment with in a daily activity context. They often try to optimize paths according to their goals of the moment and based on previous experiences. Interviewees stated to deliberately seek for variation and novelty on certain frequently travelled routes. This finding touches common ground with some of the behavioural assumptions of Arentze and Timmermans' learning model (2003, 2005). From a spatial cognition and environmental point of view, it seems more interesting to focus on variation in daily travel patterns and the constitution of travel habit than on travel habits in itself. Finally it is notable that two respondents considered themselves to be unable and extremely scared to drive in unfamiliar environments: "I get lost all the time and I panic", "I don't like driving in new places. I even panic when I see road maintainance ahead on known roads. I hate deviations". They had both overcome this problem recently by purchasing an on board navigation system.

6. Conclusions and Future Research

In this paper, a general analysis of the interviews conducted for the purpose of an explorative research with respect to the role of spatial cognition in daily travel behaviour, is presented as a qualitative descriptive reflection on spatial learning and activity travel planning. Conscious and elaborate travel choice processes are rare in daily activity routines and perceived choice sets for location choice, mode choice and route choice are very limited. At first, the role of spatial factors seems rather modest in this process. It is pointed out that variation in daily activity patterns and explorative behaviour has a more direct and clear relationship to spatial cognition than present travel habits. Nevertheless, we have been able to describe some routines in daily activity planning in relation to the mental map and some travel related properties of spatial learning that need further attention. We have also indicated the correspondence of these findings with a spatial learning model in development (Arentze and Timmermans, 2003, 2005).

Future steps in this research are to further process and interpret all gathered data from the initiate explorative qualitative research. Firstly an in-depth analysis of the interviews will enable dividing the reported activities according to habitual, planned and impulsive behaviour and describing in more detail its corresponding travel choice processes in general and its spatial factors influencing travel choice behaviour in particular. Moreover, specialized software ATLASti will be used for the coding of the interviews and deriving recognizable structures in the travel decision process information, such as if-then heuristics. Finally, stated travelled routes in route descriptions and sketch maps will be compared to actual travelled routes as recorded from GPS tracks, while distance estimates and travelled distances will be compared to the subjective evaluations.

Ultimately, based on these findings, a quantitative research will be carried out aimed at collecting data to contribute to a model of spatially cognizant agents that can be integrated in an activity based transportation model.

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