Emerging urban futures and opportune repertoires of individual adaptation
Timmermans, H.J.P.; Arentze, T.A.

Published in:
SerVicE_Magazine

Published: 01/01/2011

Document Version
Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

• A submitted manuscript is the author's version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

Citation for published version (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 05. Dec. 2018
Perspectives of Game Theory

As decision processes in real estate development projects become more complex, we have to find theories that can support the governance of such processes through interventions. Game theory can be applied to real estate development project environments, resulting in a very basic understanding of players' choice behavior and expected decision outcomes. Together with recommendations concerning the application of intervention strategies in conflict situations. However, one should realize that game theory presents an abstraction from reality: not all intricacies of real-life interaction processes in real estate development projects are covered, and deliberately so. The aim is to use the abstract representation of the interaction structure as a tool to understand the behavior of the involved parties a bit better, not to mimic real-life to every detail. Furthermore, a major critic of the classical game theory is the assumption of completely rational players with complete information. To partly overcome the problems related to the assumptions of game theory, the concept of bounded rationality can be introduced. This can be achieved by combining game theory with methods that enable the possibility of having a 'vector' or 'multi-valued' utility function. This is a main subject in the research of the authors, of which the first results can be found in Glumac (2010b) and Blokhuis (2010).

References

Emerging urban futures and opportune repertoires of individual adaptation

This paper summarizes the goals and scope of a new large scale research project, funded by the EEC.

The ultimate goal of this research project is to develop the first comprehensive model of dynamic activity-travel patterns in the world, expanding and integrating concepts and partial approaches that have been suggested over the last few years.

Dynamics pertain to different time horizons. Long-term decisions such as demographic change, changing job or house may also prompt or force people to adapt their activity-travel patterns.

Exogenously triggered change involves change in the urban and/or transportation environment and/or the larger socio-economic institutional contexts. It may be unplanned or planned (policies). The integrated multi-agent model will simulate the primary, secondary and higher order effects of such emerging urban futures on dynamic repertoires of activity-travel patterns. A multi-agent model will be built to capture these dynamics. In addition to the multi-agent model, the PhD/postdoc projects will result in improved understanding of the effects of various policies, based on a variety of statistical analyses, and in guidelines about the most effective (set of) policies in contributing to integrated urban sustainability, and in elaborated theory about spatial dynamic choice behaviour.

“Activity-based models should be considered as alternatives to spatial interaction models.”

Introduction

An understanding of complex activity patterns (time-space behaviour) of actors is essential for improving the effectiveness of various kinds of policies and for assessing the market potential of new real estate projects. An activity-based framework constitutes an integrated framework as it (i) combines economic, social and other activities, (ii) is based on a highly detailed, comprehensive spatial and temporal representations (minutes and geocodes/small postal zones), (iii) combines different methods to simulate behaviour, (iv) focuses on the complex interdependencies between activities, household members, time periods, locations, etc., and (v) constitutes the basis for deriving measures of economic, social and environmental impact and feasibility. For these reasons, the activity-based perspective has rapidly gained momentum, especially...
Activities are conducted to satisfy underlying needs and desires. Needs are dynamic and influenced by lifecycle stages. Also the resources change dynamically as a result of lifecycle. It means that individuals will face a relatively stable set of conditions, will learn until a relatively stable set of context-dependent choice heuristics can be applied to cope with the situation and develop a repertoire of effective choice strategies. Successful strategies will be reinforced. Unsuccessful strategies will no longer be applied. Because needs occur in different cycles, the organisation of activities is a multi-day decision problem, with time intervals depending on the kind of activity, the extent and nature of any substitution and variety-seeking. In the short-run, at the start of the day, activities for that day need to be scheduled, although the scheduling may also have occurred earlier. However, due to the inherent uncertainty at this time horizon, some activities, including travel may require more time (or less time) than expected. Unplanned activities need to be rescheduled. It means that individuals can change one or more of various choice facets of their activity schedules.

By implementing activities, individuals visit particular destinations and experience attributes, thereby reinforcing their beliefs and updating their memory trace regarding their awareness of alternative destinations in their environment. In addition to these dynamics that result from conducting activities, individuals may hear of new alternatives through word-of-mouth of members of their social network. Moreover, individuals may be passively exposed to advertisement or other information, or they may be actively searching for information. It is assumed that the acceptability of information is a function of the similarity between the people involved and the general acceptance of the alternative in the social network. Simularity is a function of person characteristics, attributes, group membership and spatial distance.

Adaptation of activity-travel patterns does not only come about due to endogenous factors (changing needs, learning, etc) but also because exogenous factors (changing supply, policies) trigger or force people to rethink the way they have organised their activities in space and time. People will first try easy short-run rescheduling, but if that is ineffective, they will consider midterm or even long-term decisions.

“Needs are dynamic and influenced by lifecycle stages.”

Research questions and methods
Based on this conceptual framework, the research programme will address a series of linked research questions, necessary to develop a multi-agent model that will simulate both emerging patterns and evolving dynamic behaviour due to exogenous change and due to endogenous change, triggered by a set of innovative policies aimed at sustainable urban futures.

Panel survey recording for two months activity-travel patterns of a representative sample of 1,500 respondents, using GPS-enabled cellular phones technology and Web based prompted recall will be conducted. We can automatically trace the space-time behaviour of individuals participating in the survey. GPS traces provide information about route, destination, timing choice and duration.

The sample will be divided into sub-samples. Respondents in every sub-sample will be invited to stated choice/adaptation experiments. More complex and advanced travel simulation experiments will also be required for the projects where data about learning is necessary and in case individual respondents are required to respond to emerging aggregate patterns. These patterns or the collected effect of other travellers will be based on computer simulations.

Qualitative data (protocols, decision tables, laddering techniques, CNET etc.) will be used to collect data about the reasoning behind responses and serve for triangulation.

Individual projects
The program consists of five PhD projects and a postdoc project for the integration of the PhD projects. PhD projects address a specific dimension that is assumed to influence the dynamics of activity-travel repertoires, however considering interdependencies with other dimensions. Project 1 will examine the effects of future urban form on dynamic repertoires of activity-travel behaviour. Project 2 will examine the effects of pricing strategies, while project 3 will explore the effects of increasing energy prices. Project 4 will be concerned with the effects of social networks, while project 5 will investigate of ICT.

Conclusions
This paper has briefly described the motivation, scope and project description of the U4IA research project. Although undoubtedly various operationalizations will require much further thought, it seems that most key theoretical concepts, research methods, modeling principles and data challenges have been sufficiently explored to combine these into an integrated multi-agent model. The model will allow one to simulate space-time behavior of individuals and households and how this changes over different time horizons. These behavioral patterns can serve as input to several performance indicators in a variety of application domains. Assessing the feasibility of new real estate projects as a function of their use is an obvious application.

Acknowledgements
The research leading to these results has received funding from the European Research Council under the European Community’s Seventh Framework Programme (FP7/2007-2013) ERC grant agreement n° 230517 (U4IA project).

The views and opinions expressed in this publication represent those of the authors only. The ERC and European Community are not liable for any use that may be made of the information in this publication.

References

FIGURE 1
Overview of conceptual framework

Activities are conducted to satisfy underlying needs and desires. Needs are dynamic and influenced by lifecycle stages. Also the resources change dynamically as a result of lifecycle. It leads to activity agendas that change slowly over time, primarily due to key lifecycle events. Some needs are personal, others are defined at the household level. Consequently, conducting activities may also satisfy needs of others and be beneficial to one or more underlying needs and this interdependency needs to be taken into account.

At the mid-term level, this means that individuals will face a relatively stable set of conditions, will learn until a relatively stable set of context-dependent choice heuristics can be applied to cope with the situation and develop a repertoire of effective choice strategies. Successful strategies will be reinforced. Unsuccessful strategies will no longer be applied. Because needs occur in different cycles, the organisation of activities is a multi-day decision problem, with time intervals depending on the kind of activity, the extent and nature of any substitution and variety-seeking.

The general framework, underlying the research project is depicted in Figure 1. The problem of organising activities in time and space involves the interdependent choice of which activities to conduct (activity generation), where to conduct these activities (destination choice), when and how long (timing and duration choice), with whom (choice of travel party), the transport mode(s) involved (transport mode choice) and the route to take (route choice), subject to spatio-temporal (destinations that can be reached within certain time windows), temporal (sequence of activities) and institutional (e.g. opening hours) constraints and available resources (income, cars and other modes of transport). It is a spatial problem in the sense that attributes of the environment, including the transportation system, influence the decision making process. However, this influence is indirect in the way that individuals base their choices on the incomplete and imperfect information available about the environment (their cognitive environment). Some attributes are relatively stable, others vary and yet different ones emerge as the result of the accumulated decisions of many individuals. It makes the decision context inherently uncertain.