Decisions made along the tracks in forests

Hans Skov-Petersen[1], Frank Søndergaard Jensen[1], Jette Bredahl Jacobsen[1]

Introduction

Destination choice and path selection are two core characteristics of human way finding (Golledge 1995). As opposed to most types of spatial movement (transport), recreational behaviour in nature is less goal-oriented. Often, the trips we make in nature are more motivated by the qualities of the track we traverse than the destination we are targeting. The path selection is also influenced by the social effects of encountering other visitors. Accordingly, assessment of the route selection in nature must be assessed in terms of preferences for different types of tracks (and the landscape they traverse), encountering agents, and the qualities and functions of the destinations visited.

Method

During the present study relative preference for nature type, encountered agents, and direction towards destination was studied in a Conjoint Stated Preference (CSP) experiment. The experiment was conducted as part of a national Danish house-hold questionnaire survey in 2008; in total 1258 responses were obtained (66% response rate). During the survey respondents were asked to imagine being at a junction of a path network in the forest. They were asked to rank optional choices of path segments ("Which way would you choose?"). Each option was represented by a 'card' constituted by a combined text expressing forest type (along the optional segment), agent types encountered, and direction relative to the destination. Further, the forest types were displayed as a photograph and the agent types were shown as an icon. The photographs representing forest types have been used in earlier preferences studies (Koch & Jensen 1988, Jensen 1999) and can therefore serve as validation of the findings.

The experiment provides an addition to the classical single-attribute preference studies: It enables assessment of preferences - and accordingly potential choices - in more realistic situations, where 'trade offs' have to be made among options combined of multiple attributes. The experiment was constituted by three variables: the forest type (9 levels), encountering other 'agents' (8 levels), and the direction of the path relative to the destination (3 levels). The forest types include e.g.: 'Old open broad-leaved forest on sloping terrain' and 'a forest lake'; agent types include: 'two roe deer', and 'ten mountain bike-riders'; and finally 'opposite the direction you wish' as an example of a directional choice level. On the cards a combination of images, icons, and texts were included (see fig. 1).

[1] Forest & Landscape, University of Copenhagen, Rolighedsvej 23, DK-1958, Frederiksberg, Denmark, hsp@life.ku.dk, fsj@life.ku.dk, jbj@life.ku.dk

Figure 1: Example of a 'choice'. Translation of the Danish text: 'A path/road where you can see two runners. The path is across the direction you wish, through an old, open broad-leaved forest'.

Results

The results were analyzed by a rank-ordered logistic regression and showed that all attributes and their levels affected the probability of choosing a path. As expected, going in the opposite direction than the preferred has a negative value (everything else set equal) and is the least favoured option. A path segment leading straight towards the destinations is regarded as more positive than one across the bearing towards the destination. The least preferred agent type to encounter was 'ten mountain bike-riders' and the most preferred was 'two roe deer'. Meeting no-one is regarded as the second most positive. By calculating the choice probabilities for each attribute we are able to get a measure for by how much more the roe deer option is preferred compared to meeting no-one. It appears that meeting two roe deer is one-third more preferred than meeting no-one. For the environmental attributes we see that 'dense middle aged coniferous forest' was least preferred and 'old open broad-leaved forest on sloping terrain' was the most preferred. The results for agent types and environments confirms what have been found by Koch & Jensen (1988) and Jensen (1999), but add to that how much more each attribute is valued as opposed to the others – in relative terms.

Further analysis will enable the evaluation of relative preferences; for instance to which extent visitors are willing to make de-tours to experience or avoid certain forest- or agent-types. Beyond immediate results, the results of the study can be applied as parameters for agent-based simulation models (Jochem et al. 2008, Gimblett & Skov-Petersen 2008, Skov-Petersen et al. 2008). The parameters obtained can be transformed into probabilities of choosing optional path segments, given their characteristics. This way, results from a CSP experiment can be directly linked to the spatial explicit choices made by visitors en route in a recreational path network. In spite of the obvious potential in combining choice experiments and agent-based simulation (Skov-Petersen 2005, Hunt 2008), the linkage has rarely been put in action in relation to studies of recreational behaviour (Hunt 2008). This can be due to choice models primarily have been developed and published through economic journals, which might be less frequented by recreation/simulation researchers (ibid.).

References

Gimblett, R. and Skov-Petersen, H. (2008). Monitoring, Simulation and Management of Visitor Landscapes. 2'nd rev. Arizona University Press. http://www.uapress.arizona.edu/onlinebks/Monitoring_Visitor_Landscapes.pdf

Golledge, R. (1995). Path selection and route preference in human navigation: A progress report. Lecture Notes in Computer Science. Vol. 988/1995. Springer Berlin / Heidelberg.

Hunt, L.M. (2008). Choice models: Estimation, Evolution, Limitations and Potential Application for Simulation Modeling. In Gimblett, R. and Skov-Petersen, H. 2008. Monitoring, Simulation and Management of Visitor Landscapes. 2'nd rev. Arizona University Press.

Jensen, F.S. (1999). Forest recreation in Denmark from the 1970s to the 1990s. The Research Series No. 26-1999.The Danish Forest and Landscape Research Institute.

Jochem, R., van Marwijk, R., Pouwels, R. and Pitt, D.G. (2008). MASOOR: Modeling the Transaction of People and Environment on Dense Trail Networks in Natural Resource Settings. In Gimblett, R. and Skov-Petersen, H. (2008). Monitoring, Simulation and Management of Visitor Landscapes. 2'nd rev. Arizona University Press.

Koch, N.E. and Jensen, F.S. (1988). Skovenes friluftsfunktion i Danmark. IV. del. Befolkningens ønsker til skovenes og det åbne lands udformning. (Forest Recreation in Denmark. Part IV: The Preferences of the Population.) Ill. Forstl. Forsøgsv. Damm., København, 41 (1988).

Skov-Petersen, H., Kefaloukos, P. and Snizek, B. (2008). Kvintus.org - a choice based agent-based simulation model integrated with Google Maps. Proceedings for the Fourth International Conference on Monitoring and Management of Visitor Flows in Recreational and Protected Areas Management for Protection and Sustainable Development Montecatini Terme (Tuscany, Italy) - 14/19 October 2008.

Skov-Petersen, H. (2005). Feeding the agents – collecting parameters for agent-based models. Computers in Urban Planning and Urban Management (CUPUM). http://128.40.59.163/cupum/searchPapers/papers/paper60.