

# Approaches to GPS-survey of tourist movements within a North Sea island destination

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## Abstract

Recent developments in information and positioning technologies, converging into portable devices offer new opportunities not only for tracking tourist movements, but also for interactive description and development of experiences. In this paper, we assess the usefulness of a small GPS-GSM device to track tourist movements on a Danish island dominated by summer house tourism, supported by a central database and Internet-based visualisation. A number of methodological challenges and their possible solutions are discussed. Of equal importance to the technical issues, found to work as expected, was the psychological and ethical issues related to recruiting participants and make them share their impressions and provide information on their in-situ decisions.

**Keywords:** GPS; mobility; decision making; summer house; island

## 1 Introduction

Integration of mobile telecommunication, the Global Positioning System (GPS) and Geographical Information System (GIS) software offer unprecedented opportunities in relation to tourist activities at the destination (Stopher et al 2008). This relates both to options for *informing* tourists about where they are and what to do there, known as Location Based Services (LSB) and to options for *tracking* and *monitoring* visitors' movements in and around destinations (Shoval and Isaacson 2007). Examples pertaining to options to inform tourists about activity-based offers include creation of new experience routes, digital versions of existing routes, digital treasure hunts and geocaching (Nielsen and Liburd 2008) and place based games, all of which including an element of edutainment. One thing these examples have in common is that the various initiatives are grounded in destination marketers' enactment of routes, sights and paths that tourists would want to follow and/or experience (Breidenhann and Wickens, 2004). Accordingly, the tourist is seen as someone, who is to be *led* to a series of experiences to be immersed in on his/her way along a predefined path or

route, or to “shop” around for experiences in the touristic landscape. The challenge, to be addressed here is how methods can be devised, that allow us, as researchers, to better understand not only the movements made by tourists, but also the decision making processes driving them (Blichfeldt 2008).

## **2 Choice of location and survey design**

The pilot study was conducted at the Danish island Fanø. The choice of this specific study site is grounded in a number of unique characteristics. Firstly, the island is positioned in the middle of the Wadden Sea area, designated to be National Park from 2010. The island constitutes a municipality; one of Denmark’s smallest, with around 3200 inhabitants. Second, the local economy is heavily dependent on tourism, according to national tourist organisation VisitDenmark (2009: 21, table 13). In 2006, 37.5 % of all purchases were made by tourists (ibid: 30), with in total 989,000 bed-nights and one-day visitors, each with a daily expenditure of around 50 EUR. The main form of accommodation is holidays houses (in total 2700), rented out on a weekly basis. The by far largest group of holiday makers according to nationality are Germans and according to tourist segment, it is families with children, staying on the island for one, two or three weeks (personal communication: Poul Therkelsen, municipality director of Tourism and Business). Locally, there is great awareness that the most important resources for continued and stable development of tourism are landscape and nature, most of all, the broad, clean and sandy beach, along with wildlife such as birds and seals. These resources are in risk of being depleted if used too intensively, or visited at wrong times, for instance during birds’ breeding season (personal communication: Søren Vinding, board member of Nature Conservation society and municipality board member). When we discussed the option to track tourist movements with representatives of the municipality and the local tourist bureau (PT, see above), they expressed great interest in a study where the actual movement patterns of a representative group of tourists were mapped. This was particularly interesting in relation to maintenance of existing paths, bicycle tracks and marked trails through forest and open land as well as to establishment of new ones, physical and/or virtual in the form of GPS-mobile assisted experience routes. We thus found that Fanø would make a good test area for a system to monitor not only tourist movements in the landscape but also to question their motivation to go to certain places and stay there for longer or shorter periods. At the same time, in an experiment of limited scope, taking place in a clearly delimited area, we would have a good chance to test the set-up, the technology and the research design.

For the pilot study, five GPS-units, of the type “Lommy” were provided. They can register their actual position, speed and direction of movement, and communicate it along with supplementary information on the GSM mobile phone network (Simonsen et al 2008, for technical details: [www.flextrack.dk](http://www.flextrack.dk)). Free and internet based geographical software like Google Earth/Maps and Virtual Earth can visualise the observed movement patterns and other spatial information, for instance grid-based. Part of the study set-up was constant access by the local research team to the server where GPS-data was stored upon being received from the GSM-network and – just as

importantly – to the derived KML files for interactive inspection in the Google Earth software.

Also of importance were legal and privacy issues. It is not, and should not be, possible to track someone without them knowing it, such as can be done using mobile cell information (Ahas et al 2008). Another issue of concern is to which extent, the respondents/tracking objects should be informed about the purpose and design of the investigation? In this study, we compiled an informative text written up as a letter, to be read aloud to the (potential) participants. In the letter, participants were informed about the objectives of the study. A still un-resolved issue is whether awareness about being tracked impact the (spatial movement) behaviour of the participants?

### **3 Observations and results**

The five GPS units were all given to the participants Saturday 11 July, to be carried until next Saturday, the 18. The participants were recruited at the reception of a local cottage rental agency, where the majority of the costumers are German tourists. The office is situated on the waterfront in Nordby, the largest town on Fanø, where the ferry from Esbjerg arrives. Visitors typically stop at the office and pick up the keys for their rented cottage immediately upon arrival to the island. The potential participants were approached, typically while queuing in front of the reception desk, during the peak hours from 12 to 15. They were asked whether they would like to answer some questions and perhaps take part in a study about tourists' use of nature and landscape. If the response was positive, we would read the introduction to them – including the information that they would be rewarded with a small, symbolic present. Then, in case they were still positive, we would read or summarise the ethics statements to them, and then they were given the agreement paper with conditions and terms, for signature. At this point, the first two pages of the questionnaire were filled out, with basic address and demographic information, as well as questions about what they *intended* to do during the week to come. We then moved on to demonstrate the GPS units, how to carry and recharge them, a process taking 5 to 10 minutes. Apart from the demonstration of the units, participants were given a set of written instructions. Besides those, the participants were given (1) a recharger for the unit, (2) a notebook to be used as diary or logbook for any relevant observation they would like to make on the operation of or possible problems with the units. Finally, they were also given (3) a folder with the project coordinator's business card in order to provide a contact point in case of problems, and told to call, e-mail or send an SMS message, whenever help was needed. Finally, in the folder, they were given the last page of the questionnaire with the option of filling it out at their convenience, on one of the last days of the vacation.

Once the units had been given to the participants and we had verified that they and the system were functioning, there was relatively little work involved in the experiment. We used the text-based website to monitor the health (Voltage) of the units and the Google Earth interface to monitor the movements and the time connected of each GPS-unit. This was found to work well and facilitate the activities of the study. Upon return, the project coordinator was present in four out of five instances. In the one

instance, when we were not present, we neither received the logbook, nor the last page of the questionnaire. One other participant, upon being recruited, expressed clearly that he did not intend to use the logbook, and we decided to let him take part anyway. The participants expressed that they had found it interesting to take part in the pilot study, and would be glad to do it again. Problems with keeping the units recharged, observed by us through the monitoring system, were not mentioned by any of them. The activities, which the participants stated that they were planning to engage in during their stay on the island can be summarised as follows (ordered according to times they were mentioned): *Bicycling; swimming; being on the beach/sunbathing; jogging; roller-skating; kite surfing; beach buggy drive*. In retrospect, the data show considerable agreement with the statements given at the beginning of the survey, with the participants who had the most ambitious plans also being the ones covering largest distances and going most “off the beaten track”. The data show that all participants did indeed spend most of their time at the beach, some of them taking their car there. They also seem to prefer staying at the holiday home until late in the morning, typically with the GPS-signals starting to arrive around 10:30 a.m., as well as preferring to have dinner at home. On the other hand, although only two of the participants stated that they would “take a trip to town”, this trip was taken by four participants.

A summary map of movements and stays, based on all registered positions in the server were made using the methodology described by Bro (2010), see Appendix. The data could not confirm that the special nature at the destination is an attraction for the average tourist, at least not if using nature is taken to mean going off the beaten track.

#### **4 Conclusions and discussion**

As this pilot-study shows, the challenges facing the researcher, who wishes to combine vacation decision-making theory and geographical approaches in order to shed light on the intriguing question ‘where do tourists actually go?’ are substantial. However, as also demonstrated, the combination of GPS-sensors, GIS- and database software and possibly GSM based mobile communication for real-time applications shows potential to be(come) a powerful tool for collecting and structuring evidence on tourists’ in situ decision-making and movements at the destination. Amongst the practical problems encountered during the pilot study was the reliability of German mobile phone numbers registered in the questionnaire – our only means of communication with the participants, making feedback and check-ups in case of problems difficult. Furthermore, the logbook approach, as simple as it is, proved useful in verifying the results from the units, and could still be used as a supplement to SMS-input for an activity- or experience-map. In spite of the small scale of the project, a number of error sources and challenges were identified, including:

- Loss of signal from the units when placed in car (and driving through forest),
- Units running out of power during the day, for instance while on the beach, away on trip/excursion
- Participants forgetting the units in the cottage when going out.

There is no easy way to overcome these obstacles, at least not given the technology available at the time of writing (autumn 2009), as also expressed by, amongst others, Stopher et al (2008). Still a combination of media and technologies, cleverly directed could bring us much closer to the answers we are looking for. Concerning issues of carrying capacity related to the challenge of making tourism sustainable (Liburd 2005), analyses in GIS where the registered movement patterns are combined with land cover data could prove a useful contribution to the planning of physical and virtual experience paths. Also remaining is development of effective methods for combining data from questionnaires, in-depth interviews and/or focus group interviews (and possibly SMS-messages) with data on speed, positions and duration of stays originating from the GPS-units. In our study, the approach is predominantly descriptive, whereas more quantitative and GIS-based approaches, including agent-based modelling, are adopted in other research areas (see for instance Gimblet and Skov-Petersen 2008). However, the use of on-line, interactive surveys, as demonstrated by Simonsen et al (2008) could prove to also be adequate for studies of tourist mobility during the vacation and *in situ* decision-making.

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## Appendix

Map of movements and stays on Fanø, Denmark. Registered by five participant families during the period 11 to 18 June 2009. Map created by Anders Sorgenfri and Henrik Harder, AAU. Algorithm by Peter Bro, AAU.

