Regional and Sub-Regional Tourist Mobility Measurement System (eGIStour)

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Abstract

The technology advances in the field of digital systems, such as GPS (Global Positioning System) tracking devices, have opened a new research field within the tourism discipline. The utilization of GPS devices, combined with space-time analysis techniques facilitates a better understanding of the visitors' behaviour diversity, and their respective mobility patterns when in route. Acquiring such knowledge is fundamental for improving the quality of sub-national data available to local or regional destination management organizations and tourism stakeholders, thus gaining a better positioning for the destination as a whole. Hence, the project's scope embodies the development of a measurement, analysis, modelling, and flows of visitors control system, as well as, the execution of an empiric study within the previously mentioned urban destinations.

Keywords: flows of visitors' measurement; visitors tracking; mobility patterns; visitors' behaviour; space-time analysis; destination management;

1 Introduction

Sightseeing, going for a walk, shopping, enjoying a meal at a restaurant, visiting museums, and many other activities, are recognised as inherent to urban tourism, and all of them are evidently linked to a time and space context, however, the study of tourist mobility has not being capturing much attention within the fields of human geography and tourism research (Shaw et al. 2000).

Past research conducted up to date focused on the movement of visitors among different destinations, or from one market of origin to other destination areas, applying concepts of distance decay, market access, and the valuation of time. The methodological complexity embodied in such studies had discouraged most researchers from conducting similar studies at regional and sub-regional levels (Shoval and Isaacson, 2010).

Spatial research in tourism has recently been increasing due to the rapid development and availability of small, inexpensive, and reliable tracking devices. In fact, since the end of the 1990s there have been significant developments in the field of applications for tourists, including location-aware mobile information systems (Shoval and Isaacson, 2010). On the other hand, current travel behaviour attempts to get new trip knowledge using tracking data: trip purpose, trip length, trip duration, departure and arrival times, travel modes, etc. And for this tracking data is combined with multiple different data: exact routes data, land use data, detailed GIS data, etc. (Bohte & Maat, 2009)

Despite the latest advances, a theoretical framework, explaining the interaction of factors underlying the visitors' spatial activity within an urban environment (Lew & McKercher, 2006; Schuessler & Axhausen, 2009), has not yet been developed. eGIStour has the aim of creating a system for the measurement, analysis and monitoring of visitors mobility, in order to answer such absence of knowledge. At the same time, this system is a work in progress given that it embodies the methodological complexity mentioned earlier but it successes at opening a path for advancement in the field.

The objective of the system presented here is to respond to a significantly wide question: what do tourists do within a specific destination, when, for how long, with whom and where exactly, and does this behaviour change according to certain visitor profiles? For the purpose of this paper, out of such broad enquiry the research questions object of this paper refer to how tourists consume the destination according to the transport used, and whether tourists explore nearby destinations when staying at simply one urban area.

Answering such questions, the system has the ability to break a highly significant barrier; it enables the development of studies that monitor flows of visitors at regional and sub-regional levels, something that the industry has long been asking for. Indeed, the study of tourist mobility is not only key to facilitate the execution of an excellent tourism destination management, but it also embodies deep impacts within transport and infrastructure development, tourism product development, marketing strategies, tourism industries' commercial visibility, as well as within the management of cultural, social, and environmental impacts (Shoval & Isaacson, 2010).

The following sections of this paper explore the methodology applied; describe the empiric study conducted, the results obtained to date, and the conclusions. Moreover, it provides a hint on the widespread future research possibilities that this system enables.

2   Methodology

Given the wider purpose of this system, this section explains the methodology conceived to respond to the broad research question concerning regional and sub-regional tourist mobility, which hence includes the methodology required to address the questions mentioned above.

2.1 Empiric Study

In order to assess the system when answering such research questions, an empiric study has been launched in July 2010 in three cities: Bilbao, San Sebastián and Vitoria. The population of the study embodies the number of visitors registered in hotels within the Basque Country's three main cities (Spain): Bilbao, San Sebastián and Vitoria in July and August 2010 which are 66.636 and 74.742 for Bilbao, 51266 and 51535 for San Sebastián, and 27576 and 29197 for Vitoria (EUSTAT, 2010). The sample gathered for the mentioned period has been 135 visitors, collecting 38% in Vitoria, 36% Bilbao and 61% San Sebastián, these figures are expected to be balanced by 2011 growing to 500.

The process of sample gathering has been conducted by professional pollsters, who approach visitors staying at hotels. The pollster addresses the visitors in the morning, completes the questionnaire with the visitors answers, the visitors take the device with them for the rest of the day. Once the visitors get back to the hotel at night, they give the device back to the reception desk staff and they receive a gift in return to thank the collaboration.

2.2 Instrumentation

In order to provide an answer to the research enquiries mentioned earlier the eGIStour system has been created and it embodies two modules. The first module refers to the process where the data is collected and the second module refers to the visualization and analysis of such data. The first module, at the same time, embodies a client-server architecture, where the client side consists of a mobile device that includes two applications developed for Android operating system. The first one contains a questionnaire which is completed by the pollster in real time. In addition, it registers and stores the questionnaire data, location (latitude, longitude) and time information every two minutes, as well as the number of satellites used to trace the GPS triangulation. The second application sends such data, in XML format, into a server. Android has been chosen given its learning curve for customized application creation, reasonable cost and universality. Concerning the questionnaire, the variables gathered are: main reason for choosing the destination, stay duration, which night is the visitor on the day of the enquiry, number of prior visits, travel group composition, age and country of residence (should the visitor be a Spain resident, the province is registered as well). The questionnaire has been designed following the Survey IBILTUR (Study of Visitors Behaviours and Typologies within the Basque Country).

The server side consists of a storage module with an implemented service which is listening and waiting for XML data to be received. Once this service has received the data, it is processed and stored into the PostgresSQL database, which embodies a PostGIS module that provides a great capacity for spatial analysis.

The second module counts with a CICtourGUNE develop visualization application and a full analysis system. Prior to any visualization or analysis, the data has to be cleaned. Concerning the visualization side of the process, a GIS application has been developed using Adobe Flex which shows different heat maps depending on space time filters, or questionnaire defined variable filters.

2.3 Analysis

As for the analysis system, the IBM SPSS Modeler has been used to process a predictive analysis. In order to be able to start the spatial analysis, the distance and time between points is measured and registered. This measurement assumes the limitation of the fact that distance between points differs from the real distance travelled by the visitor.

In order to conduct data mining and predictive analysis some prior criteria has been defined concerning areas describing the urban destinations, points of interest, time frames, and mobility.

The empiric study is being conducted in urban areas; hence it is a pre-requirement to define a five vertex polygon around each of them, so that what means in and out can be clearly established. Moreover, distinguishing among 'use of transport', 'walk' or 'being still' is of key interest to destination managers, hence the following criteria helps discern each scenario, in a similar way made by Jong and Mensonides (2003) :

- If the speed is below 0,3m/s then the visitor is being still.
- If the speed is between 0,3m/s and 2m/s then the visitor is walking.
- If the speed is higher than 2m/s then the visitor is using transport.

Then, in order to look into the use of motor transport within one of the urban destinations, all those visitors who have spent five hours or more outside of the urban polygon have not been considered.

Concerning the assumptions, the study assumes that the satellite tracking is fully exact when there might be a margin of error embodied in spatial satellite data. Moreover, when defining the criteria to determine in and out, near, at, on foot, motor transport, detailed in Table 2 and Table 4...etc, assumptions have been made.

2.4 Scope and Boundaries

This process embodies three limitations. First, the scope of this study consists of Spain residents or international visitors staying, at least the night of the enquiry, at three or four star urban hotels, hence, living out visitors who visit the destination without sleeping in it, and those stays at any other type of accommodation. Second, a communication barrier, visitors may solely speak languages that the pollsters may not master. Third, the tracking process consumes significant amount of battery which limits the duration of the test to a day.

3 Results

The results offered in this section refer to the two specific questions mentioned earlier: how tourists consume the destination according to the transport used, and whether tourists explore nearby destinations when staying at simply one urban area.
Both have a significant impact on the diverse sides of destination management, such as transport infrastructure development, activity offer at the urban destination of study, and marketing strategies for the city itself and the region around it, to name but a few.
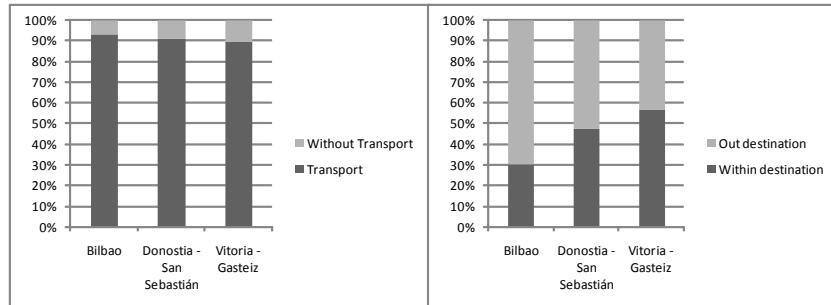
Fig. 1. Using motor transport & exiting the urban destination of stay

Regarding the above left figure related to the usage of motor transport within the destination, it appears that visitors of the three cities at some point of the day used a motor transport. Moreover, the right figure related to the visitors exiting the urban destination shows how Bilbao is the city that stands out by visitors exiting it to explore the nearby region.

4   Conclusion

The eGIStour system represents a new method to measure, model and monitor flows of visitors in urban destinations, enabling the visualization of sample data via a Web application which counts with a user friendly interface. Moreover, thanks to a spatial and temporal filter implemented in the visualization application, it enables the drawing of preliminary conclusions at first sight.

Furthermore, the key to this system is that it allows destination management organisations to gain a level of understanding of the visitors' activity within a destination that up to recently was out of reach. A clear example of such novelty is the information gathered on the utilization of motor transport within a destination, as well as the amount of visitors that exit the urban destination where they are staying to explore nearby areas. The former proves the impact that town planning has on visitors, the latter draws attention over the marketing plan strategies for the urban areas and the whole territory surrounding them. Therefore, both of them are mere reflections of how every aspect inherent to regional/estate management converge and impact the tourism industries, hence, improving such holistic understanding helps improving the competitiveness of regional and sub-regional destinations.

In fact, this document presents, not only the results that have been obtained out of the current limited sample, but also draws attention over the infinite analysis possibilities that are ahead of researchers, thanks to this system.

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