

## Visitor flows

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Visitor flows (VFs) are general or global patterns of visitors' movements built by aggregating individual visitor's itineraries related to touristic activities in a geographic space and in a certain time period.

The analysis of time-space tourism consumption has been a subject of interest since the latter decades of the Twentieth century. Spatial structure theories show that visitors' movements are one of the most relevant aspects of time-space consumption analysis. These theories show that visitors' movement analysis yields relevant information such as the supply of recreation opportunities affecting the trip experience both in nature and other dimensions, and space segmentation of demand (Kim and Fesenmaier, 1990). VFs could be a critical element to better inform management decision making. The underlying idea is that although movements could look as stochastic (random) at the individual level, global patterns will emerge after an appropriate analysis, depending on the availability of suitable data. Roughly speaking, the aim is to capture the "beaten paths" in a destination or region.

Seminal studies aimed at modelling VFs at the international level in order to explain tourism flows between countries. One of the most relevant works, by Lue et al. (1993) proposed five different patterns for pleasure travellers: single destination; *en route* (several destinations visited along the way to a main one); base camp (nowadays often called the *Hub*); other places visited while at a primary destination; regional tour and trip chaining (touring circuit). Alan Lew and Bob Mc Kercher (2006) identified that not all former basic inter-destination patterns are relevant or appropriate for describing intra-destination itineraries. As inter-destination models assume that the most direct route will be preferred between two destinations or destination and stopovers, they overestimate the importance of the routes yielding only secondary attention to destinations and stopovers and they often fail to describe fully the urban tourist flows. This resulted in a pioneering research line on smart cities or smart destinations. In order to describe intra-destination patterns

Lew and McKercher retained only three of the former inter-destination patterns (single destinations, hub and tour patterns) and added two new ones: *gateway* (the first destination reached before beginning a multiple destination itinerary) and *egress* destination (the last destination visited before returning home). Lew and McKercher (2006) propose a whole intra-destination model based on two dimensions: territoriality and linearity. The first dimension reflects the impact of the perceived distance from accommodation and attractions in four different patterns. The second dimension, aiming at reflecting “the geometry of tourism movements away from their accommodation point” (op. cit., 2006, p. 417), consists of three linear paths: point to point, circular, and complex patterns. This latter pattern is composed of two subcategories: random exploratory and radiating hub.

Envisaging VFs on the basis of random exploratory paths data, especially in urban destinations, is challenging. These kinds of visitors do not have a systematic exploratory strategy but exhibit flexible and opportunistic behaviours that proves difficulty in viewing the emergence of general patterns given the high stochastic nature of their individual behaviours. Empirical research of VFs has been limited so far by the lack of appropriate primary data (Leiper, 1989) especially during the last century when only traditional data gathering techniques such as macro statistics of international arrivals across countries or small data approaches (Baggio and Klobas, 2017) were available. Presently, new technologies allow the analysis of spatial-temporal visitors behaviours, especially smartphone technology and user generated content that allow the capture of digital traces (Shoval, 2018). One such method belongs to the Volunteered Geographical Information (VGI) obtained via either geo-tagged photographs on social media such as Instagram or Flickr or other mobile apps or ‘Destination guest cards’ which can be included in mobile apps or through a physical cards with a chip embedded into it, thereby allowing the monitoring of customer uses, sometimes in real time. Also, Global Positioning Systems (GPS) are very popular in VFs studies, even if often used on small samples of volunteer participants.

The natural structure of individual pathways data is a network and so the corresponding mathematical theory may be very useful in providing tools to facilitate the empirical emergence of VFs as generalised networks patterns. Though itineraries are time-space information, the geographical localisation is not a variable included in the network analytic model but is used at the validation stage.

Baggio and Scaglione (2017, 2018) analysed a large set of mobile phone records in Fribourg Canton in Switzerland. Baggio and Scaglione (2018) distinguish between the mobility patterns of excursionists (staying at the destination for less than one day) and tourists (that stay more than one day).

Figure 1 shows that a map showing the rendering of the visited cells distributions for excursionists (panel A) and tourists (panel B) does not present significant differences. Network analysis, however, allows for the better appreciation of possible differences. The network is built considering the Global System for Mobile Communications (GSM) cell towers as nodes that are connected by the paths followed by the visitors. This network rendering (panels C and D) clearly highlights the diverse patterns of the flows (arrows indicate the directions of movements). This confirms the theoretical approaches exposed above concerning the existences of a destination gateway (IN) and egress (OUT). The picture also highlights the difference between the two kinds of visitors’ trajectories showing a lower number of gateway and egress cells in the case of tourists

with respect to day-tripper trajectories. These relevant differences are then to be validated and interpreted by adding a geographic layer representation in order to have a complete characterization of the flows.

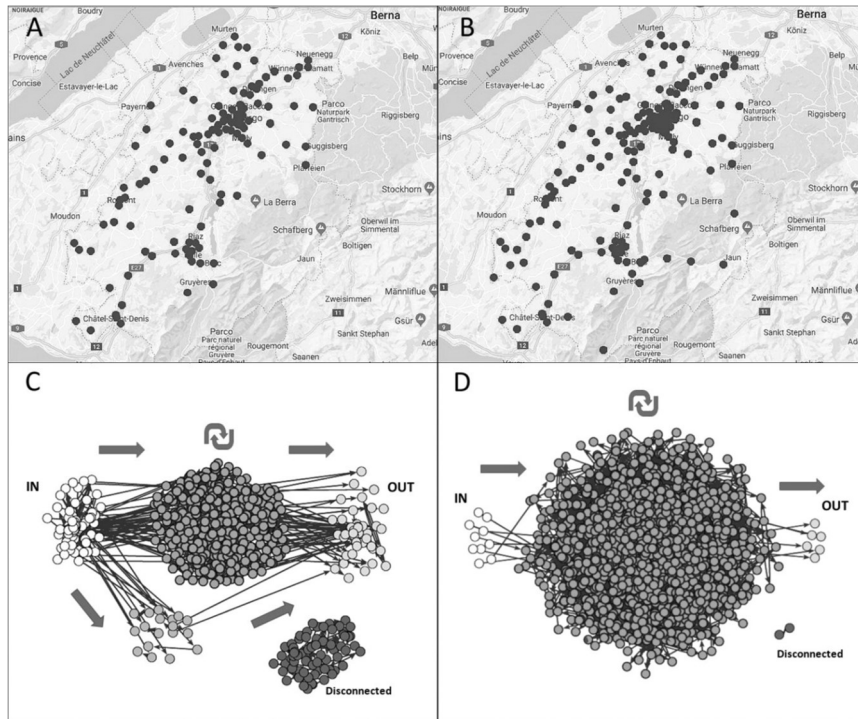


Figure 1. Renderings of the paths followed by visitors at destination

The analysis of the cumulative distributions of the trajectories' lengths shows a marked power-law shape  $N(t) \sim t^{-\alpha}$ , where  $N$  is the cumulative number of trajectories of length  $t$ . This distribution is consistent with a pattern known as "Levy flight", random walks in which the steps lengths are not of random size but follow a long-tailed distribution. In essence, we detect a number of movements in a confined area followed by "long jumps" to a different place, in agreement with other studies on human mobility (Baggio and Scaglione, 2018).

Finally, VFs have challenged the traditional concept of Destination Management Organizations based on political boundaries, as the empirical analysis shows VFs usually are not completely contained inside these boundaries. Even though VFs' structure only describes their space-time features, the addition of other elements, such as online activities, could provide better and more relevant understanding of *travel tourism networks*.

Increasing the number of cases is important since they can be able not only to provide insights into the basic VFs' characteristics, as proposed here, but can also provide a wider exploration of the possible different patterns that might be found in specific situations. There could also be a better connection of these studies with the efforts to be spent in designing efficient and effective destination governance strategies, especially concerning the flows and gatherings of visitors.

To conclude, a careful and well-grounded analysis of visitors' flows provides insights to the clusters of tourism attractions and activities. From the strategic business point of view, this analysis is able

to identify weak connections and interdependencies. In this way, potential opportunities for innovation and capitalization for future marketing and governance activities can be perceived even at early stages.

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