An evolving network model for the structure of visitors and services in a tourism destination

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We present a growing network model to explain the visitors' behavior in a tourism destination. Specifically, we build an evolving bipartite network with two categories of nodes, lodgings (H) and services/attractions (S). In every lodging, we assume a sole tourist whose behavior is the average of all tourist's behavior hosted in the lodging. A link between a lodging and service appears if the representative tourist visits/enjoys the service during his/her staying in the destination. We assume that links are unweighted, undirected and permanent along time. The latter assumption means that, once a service is visited by a high enough amount of tourists staying in a certain lodging, the preference for this service is maintained by successive guests.

The bipartite network grows similarly to previous models for collaboration networks (e.g. Ramasco et al., *Phys. Rev. E*, 70, 036106, 2004). At any time, one new lodging and m new services are created in the destination. We assume that the representative tourist of all new hotels visit c different services, including the old and m new ones, following part of them a preferential attachment and the other part a random rule.

We show analytically that the long-term degree distribution of services in the bipartite network follows a shifted power-law distribution. This is also the case for the degree of the one-mode projections.

We have also tested the model with real data. Specifically we have collected recommendations of lodgings and services in the destination of Maspalomas-Gran Canaria (Spain) published by tourists in tripadvisor.com during the period 2005-2016, with a sample size of around 78.000 opinions on 222 hotels and 768 services/attractions. To the extent of our knowledge, this is the first growing network model to represent the structure of supply and demand in a tourist destination.