Spatial Decisions as Social Context

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Location-based services and social networks

The design of location-based social network services has been mainly driven by access to novel types of data and the opportunities these data offer to improve existing location-based services or to design completely novel ones (see the ACM SIGSPATIAL Workshops on Location-based Social Networks in 2009 and 2010). There is a need for research that advances our understanding of the networks underlying such services. This concerns networks in which social relations are explicitly specified as well as implicit social networks that are defined as networks of people showing similar spatial behaviour or sharing similar spatial interests even though they are not necessarily personally acquainted, for instance, the students of a university or the participants of a frequent flyer program.

Spatial and temporal constraints are relevant even for the most elementary service, a buddy finder which informs the mobile user when some friend happens to be close to his or her geographic position. Such a location disclosure service makes two assumptions (1) the importance of face to face contacts which the service sets out to establish, and (2) the availability of data about explicit social relations, namely, the list of the user's friends. Many location-based services, however, abandon one or both of the assumptions. Social serendipity services still facilitate face to face contacts but they do so between individuals who do not necessarily know each other suggesting contacts on the basis of similar interests. In contrast, geographic recommender systems offer services that neither make use of explicit social relations nor establish face to face contacts. They identify geo-referenced data objects that might be of interest to the user based on information about the past choices of that user and the choices made by the user community. We argue that spatial and temporal constraints are especially important for services which exploit implicit social relations.

Geographic Recommendations

In our research group, we have studied spatial constraints on social networks primarily in the context of collaborative filtering approaches to geographic recommender systems. Geographic recommendations are based on a heuristic principle: people who agreed in the past in their spatial choices are likely to do so in the future. Different approaches to geographic recommender systems take different types of choices into account, for instance, travel destinations of the users, shops they visit, or—as in our research—the objects the users photograph. Data crawled from web-based collections of geo-referenced images

shows that the choice of places at which tourists take photographs is characterized by a power law relationship between popularity rank and image frequency. Typically, one to five sites in a city are photographed by almost everybody while the other sites attract only the interest of a few visitors (see Fig.1, Schlieder 2007, Matyas & Schlieder 2009)

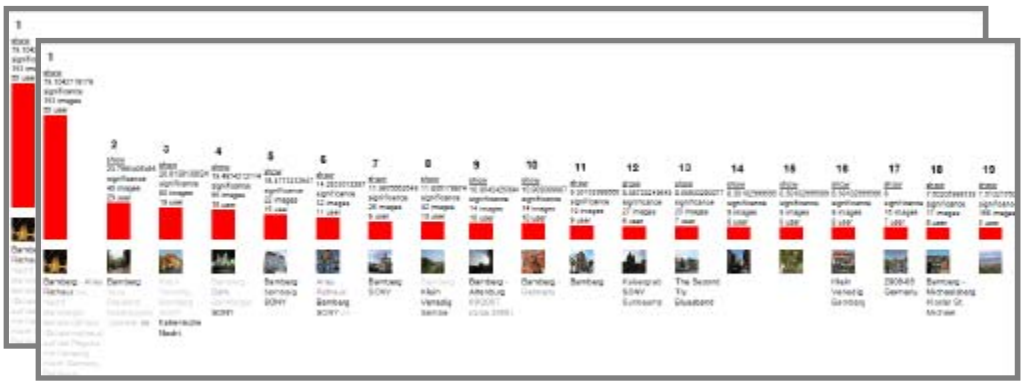

Figure 1. *Exponentially decreasing touristic interest in urban places*

Comparing the choices of different users, we found, that the differences in frequency need to be taken into account (Schlieder & Matyas 2009). A good predictor for geographic recommendations consists in spatial decisions adopted by only few users. Fig. 2 shows the places two tourists photographed. The fact that the users agreed on rarely photographed sights (rank 9, 12, 20, and 42) is much more informative than the fact that they both photographed the most popular sight (rank 1).

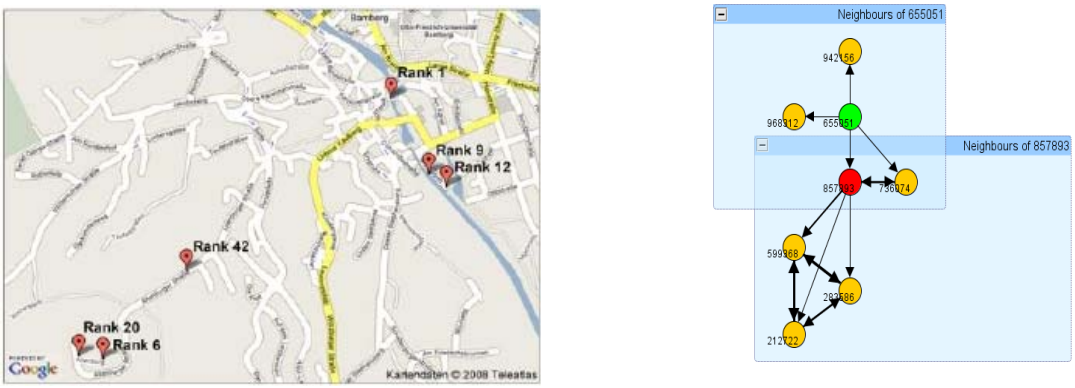

Figure 2*. Places where two users agreed in their spatial decisions and part of the implicit social network arising by grouping users that take similar spatial decisions*

Similarities in spatial decisions translate into a grouping of the users—an implicit social relation. We found that a k-nearest neighbour grouping often produces asymmetric relations in our data sets in the sense that a user *A* belongs to the set of the *k* users most similar to user *B* while *B* not being among the *k* users most similar to *A*. Asymmetry means that it is easier to predict the behaviour of B given the behaviour of A than vice versa.

Implicit Social Relations: Research Issues

We hold that successful spatial information services of the Social Web such as geographic recommender systems will have to focus on the long tail of the frequency distribution, that is, on individual differences. Open research issues include the following:

- Which types of user behaviour are best predicted by similarities of spatial decisions? Which other data sources provide the most valuable complementary information?
- Which models of temporal sequences of actions are most appropriate? How do levels of spatial granularity interact with spatial decisions (e.g., countries visited vs. cities visited)?
- How do displacements in groups constrain spatial decisions (e.g., being on the same plane vs. participating in the same frequent flyer program)?
- How do we model individual differences in the conceptualization of geographic places, for instance, the images associated with a city?

Recently, we have started to study another type of services that build upon implicit social relations, namely confirmation mechanisms for reports of events gathered in crowd sourcing networks (Schlieder & Yanenko 2010). A report about an event is confirmed by a report stating the same facts and being spatially and temporally close to the first. We argue that social network data should be used in situations affected by social biases. In such a case, a report is best confirmed by a report from an observer with a contrary perspective, a different stake holder. This raises yet another research issue, namely that of modeling the structure and dynamics of information flows in stakeholder networks.

References

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