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Socially motivated travel and regular destination choice Survey pre-test: Methods and results

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Introduction and literature review

For transportation modelers understanding and predicting spatial behavior has been a challenging task. There have been different approaches to explain what factors influence the decision to go to specific locations and at what times of the day; new methodologies are still under development in the literature. The two main tools used to collect data on mobility patterns and decisions are GPS and Survey methods; the first method gives detailed information about each specific trip. The second method is used to understand its motivations and reasons. In order to contribute to the understanding of spatial behaviors we propose a new survey method that help understand regular activity behavior: The Place Generator and the Place Interpreter. This methodology is under development, and the results shown in this paper are the pre-test of the survey. This methodology consists on asking the respondents about the locations they regularly visit, by type of location, followed by some questions on why those places are chosen. Our interest in this methodology is to understand the social motivation of destination choice, mainly how other individuals can impact on our interest on specific locations. For this purpose, we ask questions about the perceived age, socioeconomic status and other characteristics of visitors to each location.

The massification of mobile technology has helped us understand human spatial behavior and the primary laws governing individual mobility patterns. The first theory arising from big data was that human mobility patterns can be modelled as a continuous-time random-walk process that incorporates scale-free jumps (Brockmann, Hufnagel, and Geisel 2006), which has coincidental mobility patterns with other animals, such as monkeys and albatrosses (Ramos-Fernández, Mateos, and Miramontes 2004; Viswanathan et al. 1996). But as the understanding of spatial behaviors grows, there is more evidence that human mobility tends to have a high degree of temporal and spatial regularity as individuals have high probabilities of returning to a few highly frequented locations, following consistent and repetitive patterns (González, Hidalgo, and Barabási 2008) with log-normal distributions of travelled distance

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(Alessandretti et al. 2017). Individual tendency to explore new locations decreases with time; when increasing the time individual's trajectories are observed, the harder is to find locations in their activity space that they have not yet visited (Song et al. 2010). These new technologies have been an important tool to detect the regularity of human mobility, but there is a lack of literature on why these regular locations are chosen.

The main model used to represent decision choice processes is the multinomial logit model (MNL), which assumes that individuals derive their utility from choice alternatives, this approach is straightforward in non-spatial choices, but it has added complexity when it is used for location choice due to its spatial component, generating two main problems: The first problem comes from the assumption of Independence of Irrelevant Alternatives (IIA), which states that the odds of choosing a particular alternative are independent of the size and composition of the choice set. The spatial component of the decision makes this property unrealistic for destination choice as competition is stronger between locations that are physically closer together (Pagliara and Timmermans 2009), therefore it is difficult to realistically hold IIA.

The second problem is that the number of feasible alternatives for leisure is lower than the number of known locations in an area, while some of them could be irrelevant for the individual, making it difficult to form a suitable choice set (Wang and Miller 2014). Two techniques are the most prevalent to generate location choice sets: sampling-based and heuristic-based (Phan, Vu, and Miller 2022). Sampling-based methods generate samples from universal sets of locations using random sampling or importance sampling, but creating an individual choice-set by importance of the location could be behaviourally incorrect (Frejinger and Bierlaire 2007), as it obviates the spatiotemporal constrains of the individuals. The heuristic-based model is behaviourally more realistic (Wang and Miller 2014). This method is used by Ordóñez Medina (2016), whom estimates the probability of knowing a place related to the intrinsic characteristics of the location, personal preferences and travel time to the destination. But these models could be hard to implement as it needs to identify all the geographically available options according to the specific location of the individual in a certain period of the day.

In the last years, there has been an increasing interest on the impact of social interactions in urban mobility, as social animals, we are more likely to be friends with someone that lives nearby than someone that lives far away (Liben-Nowell et al. 2005). There have been studies that try to predict an individual's location by using acquittances' locations and predicting friendships using temporal co-occurrences (Grabowicz et al. 2014). Cho et al. (2011) have modelled the impact of social networks on short range movements, finding that between 10 and 30% of all human movement is explained by social relations while 50 to 70% is periodical travel. Our mobility behaviour is strongly influenced by our social connections,

but there could be also an influence from the people we don't know in individual's destination choice. It is known that homophily is an important factor on residential location choice (Galster, Turner, and Santiago 2021), we are now interested to investigate if homophily is also a factor on destination choice.

The complexity of gathering information about location choice, the importance of regular activities in human mobility and the social motivation of travel are the main motivation to design the Place Generator and the Place Interpreter that helps build a topological space of regular activities with detailed information on the motive to choose specific destinations. The locations provided by each respondent will also be important to create a set of unchosen alternatives that can be behaviourally realistic and with detailed information on each location's visitors.

Survey structure

To contact the participants for the pre-test, we sent invitation letters to 2,000 randomly drawn people in the Zurich Metropolitan Area with a web address and a QR code to access the survey. The survey consists of two parts; the first part is related to sociodemographic characteristics, mobility tool ownership, and work and education location. Later comes the Place Generator and Place Interpreter. In the Place Generator, we ask the respondents to name up to three of each type of location included in the survey. The types of locations are restaurants; bars or nightclubs; cultural centers; supermarkets; cinemas; parks; and other leisure activities. This method helps to generate a spatial pattern of regular activities. Later comes the Place Interpreter in which we repeat six questions for each location named in the section before. The questions are:

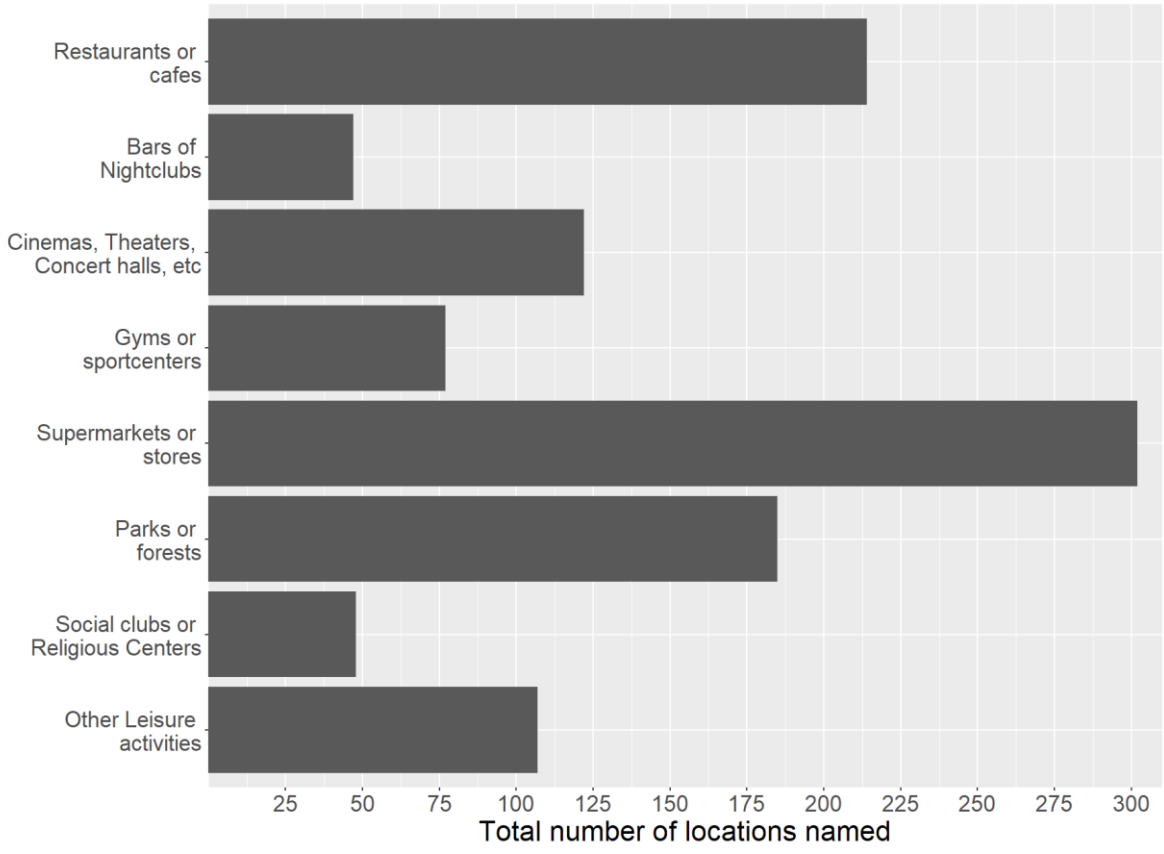
a. Which days they regularly visit the location;
b. Time of the day they regularly visit the location;
c. How often the location is visited;
d. The reasons to go, including characteristics related to the location itself (i.e., price, quality of service), and the possibility of socializing and meeting new people;
e. How would they describe the other individuals that visit a place, including age, interests, and cultural background? And;
f. The mode they normally use to go to the stated location.

At the end of the survey, we included an invitation for the second part of the survey, in which we ask for social networks and socially motivated travel.

First Results

The survey pre-test was conducted in the Zurich Metropolitan Area between the 2nd and 5th of May 2022 and included 2,000 potential respondents, which will be contacted again on the 9th of May, remembering to answer the survey. So far, 146 responses have been recorded, 19 respondents did not finish the survey, six of them (31.6%) did it during the Place Interpreter, and the other seven individuals didn't accept the terms and conditions of the survey, finishing it at the moment. Therefore, there are 121 answers for the analysis. The survey takes a median of 16.1 minutes and a minimum time of 4.6 minutes. The socioeconomic section of the survey has a mean duration of 3.43 minutes, while the Place Generator takes a median time of 4.17 minutes and a median of 5.24 minutes for the entire Place Interpreter.

In terms of response quality, on average, the respondents named 8.64 locations, mainly supermarkets (2.37), restaurants (1.66), and parks (1.46). Giving us a total of 1046 locations. Figure 1 shows the total number of locations per type asked. There was one confusion with the questions Parks and Forest in which people did not include hiking into the mountains but added to Other Leisure Activities, and therefore it is important to specify in the final survey.
Figure 1, total number of locations per type



During the pre-test, we asked for the name of the locations and the street, neighborhood, or city to be able to Geocode the answers and easily located them on a map. Even though we explicitly asked for the information as detailed as possible, a considerable number of individuals didn't specify this information. This is especially problematic with locations like supermarkets or fast food chains and it would force us to make strong assumptions about which specific store they are visiting. In the final survey, we will ask only for the name of the location and during the Place Interpreter, we will ask the respondents to specify the location of the place on a map.

The Place Generator can also give us information about the average activity space of the respondents as we ask for work location and home location, this way we can estimate the different routes and time spent to move to each location named, which also will help generate a realistic set of unchosen alternatives as we will know how much each respondent move through the city. Figure 2 is an example of an individual and the locations they usually visit.

Figure 2, visualization of the locations visited

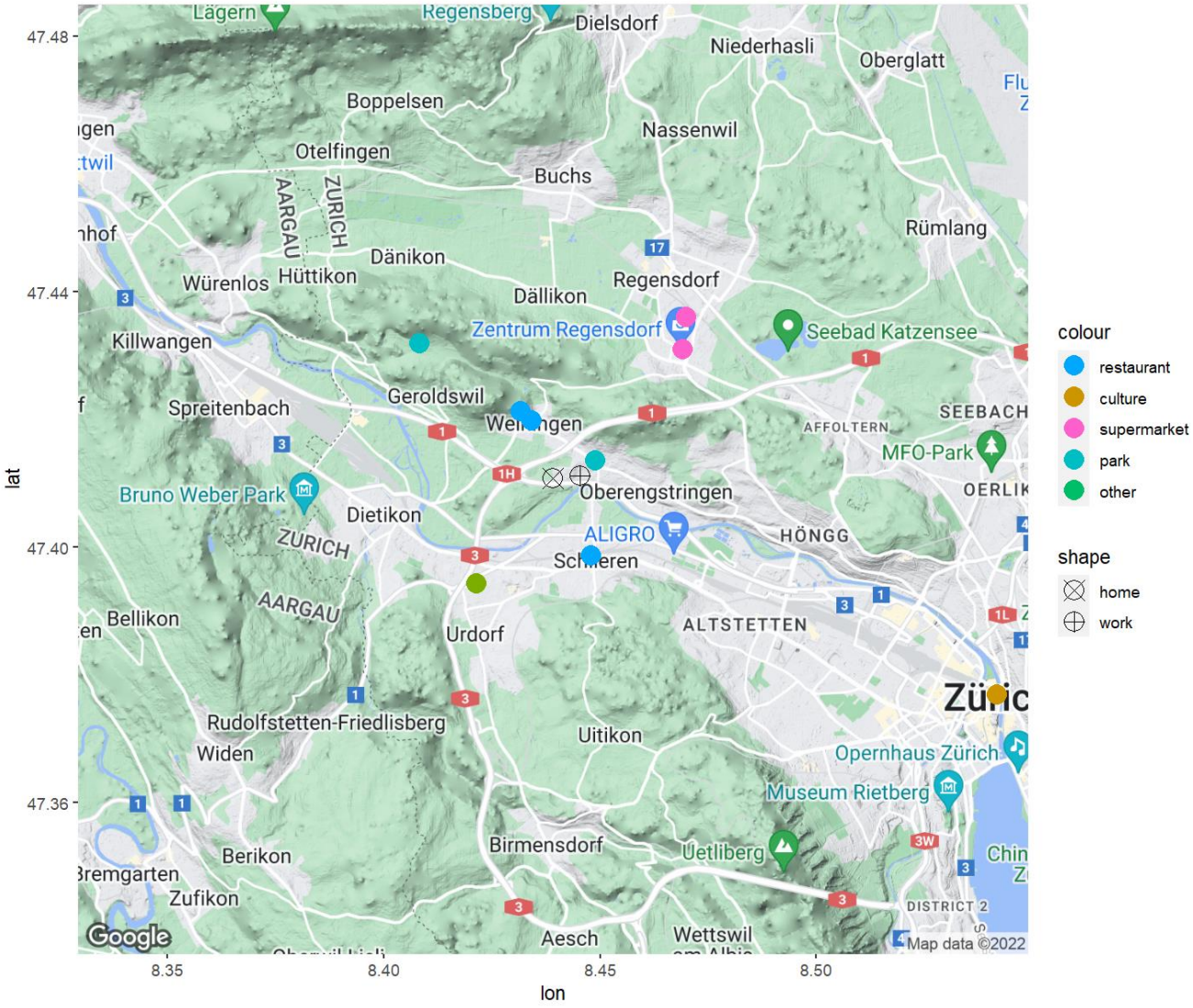
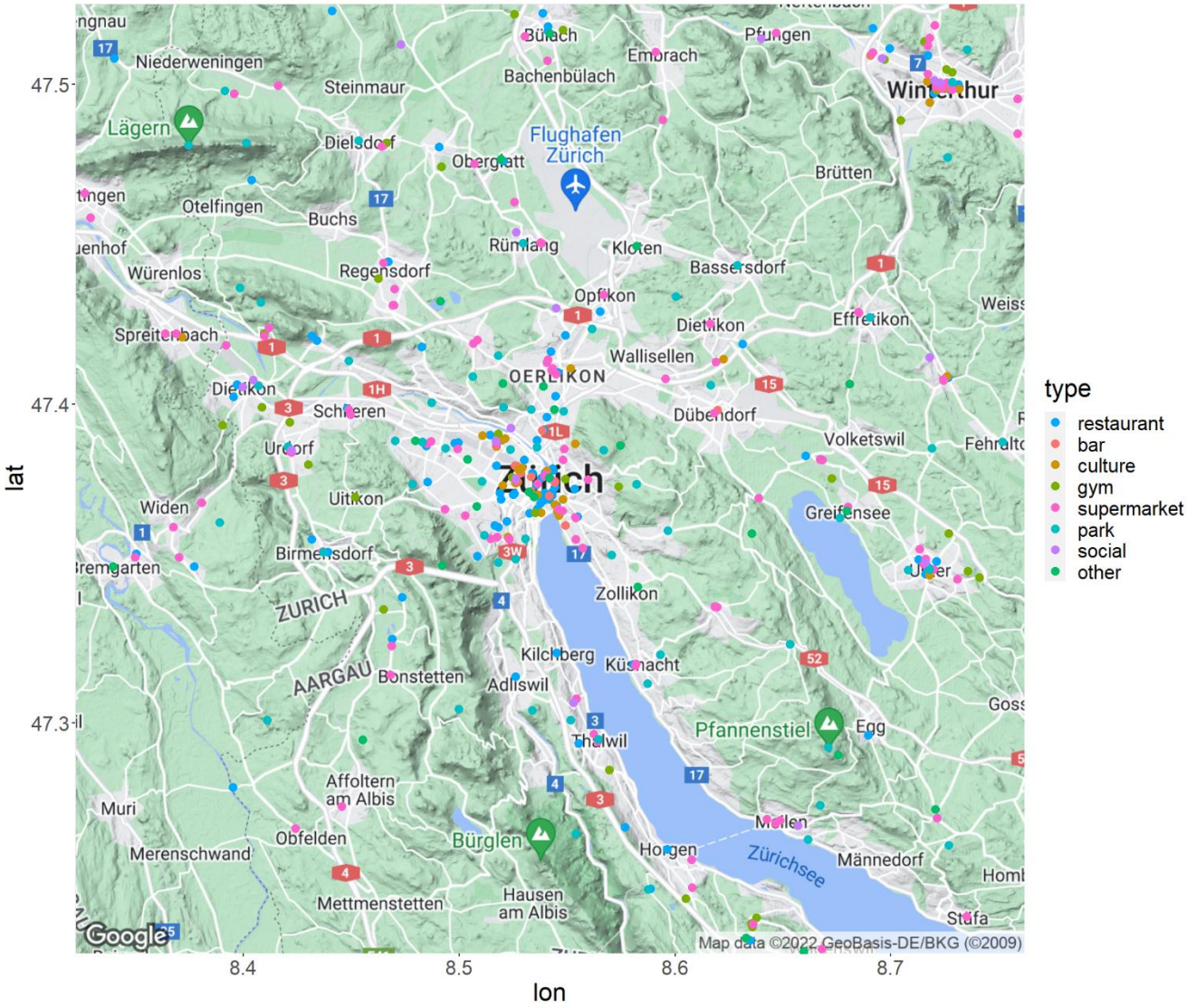


Figure 3 is the distribution of all the locations respondents have named and we were able to geocode directly from their responses and were not standard names like “Coop” or “Zurich”, leaving 494 locations (47.23%) out of the map. Even though we have loosed many locations due to the lack of information provided by the respondents, there is a high density of locations that individuals tend to visit in routinely, and therefore, if we can improve the collection of the spatial location of each activity, the method can be useful to create a rich dataset of unchosen alternatives.

Figure 3, geocoded locations named by the participants



Concerning the reasons to go to certain locations, people had to answer the question "Why do you normally go to [Name of location]? Mark all that apply", table 1 shows the results of the question in terms of the percentage of the chosen option.

Figure 1, reasons to visit named locations

	Quality	Price	Convenient Location	Decoration, environment & music	Other visitors	Easy to meet new people	Uncrowded	Other
Restaurant or café	88.8%	38.8%	89.3%	32.2%	41.6%	0.4%	1%	15%

Bar or Nightclub	46.8%	29.8%	72.3%	34%	28.3%	2.1%	14.9%	12.8%
Cultural locations	64.8%	47.5%	38.3%	31.1%	23.8%	0.8%	10.7%	21.3%
Sport centers	42.8%	79.2%	67.5%	14.3%	40.3%	3.8%	23.4%	27.2%
Supermarkets	65.8%	28.1%	73.2%	2.9%	-	-	-	2.2%
Parks	5.4%	38.9%	62.7%	14.6%	21.6%	1.6%	22.7%	32.9%
Social Activities	25%	70.8%	39.6%	45.8%	72.9%	12.5%	0.0%	16.6%
Other leisure	25.2%	67.2%	54.2%	29.9%	29.9%	2.8%	13.1%	33.6%

The "Other" answer had the option to write a text to specify, for Restaurants or Cafes and Bars or Nightclubs, the most typical responses were that they go because of other people (i.e. co-workers like it or it is good for kids) and because of its friendly staff. In the case of Cultural locations, they mostly name that they like the concerts or plays meaning they didn't understand the option "Quality of the collections and presentations" which referred to that option. In Sport-centers, they mostly named the type of sport they perform. In Parks and Forest, they also named the activities they go perform (walking the dog, hikes) and the prettiness of the location which was part of the option "Decoration, environment and music" In Social Activities and Other Leisure, they also named the activities they perform in the location. An interesting result is that other visitors are an important reason to visit the different locations, especially social activities, and restaurants and cafes, even though people do not go to those locations because it is easy to meet new people. Two conclusions can be drawn from this question: the first one is to create answers specific to each location instead of trying to standardize them to all the locations, and the second is that in Sport-centers, social activities, and others, people understand the question as what they go to do to the location instead of why they chose that specific location, that has to be fixed with a better wording of the question.

The most interesting question for further research is the type of people they think visit each location. This question will let us create the unchosen alternatives for the location choice model in which we will evaluate how the mix of people that visit each location have an impact on the individual's decision to go to the place, and therefore we put special attention to the results of this question. As we can see, these questions were properly understood as people can somehow describe the people in the locations named. Around 20% of the people answered "I don't know". Figure 2 shows the responses to this question. For example, 20.5% of the people that named a restaurant stated that the people that go there have a similar age. A first grasp of the data shows that people tend to go to places where people with similar interests go. This is true for Cultural locations, Sports centers, Parks, Social Activities, and

Other Leisure while Age and Cultural Background is less relevant for visitors. In the "Other" option, the most repeated comment was that the location had a mixed crowd and people from the same area. These options are going to be added to the final survey.

Figure 2, type of people visiting named locations

	Similar age	Similar interests	Similar socioeconomic status	Similar cultural background	Other
Restaurant or café	20.5%	15.4%	24.8%	21%	24.2%
Bar or Nightclub	14.9%	25.5%	23.4%	19.1%	8.5%
Cultural locations	7.3%	26.2%	5.7%	11.5%	1.6%
Sport centers	16.8%	61%	14.3%	9%	11.7%
Parks	3.7%	38.3%	3.4%	6.5%	15.7%
Social Activities	18.7%	66.6%	14.6%	29.2%	4.1%
Other leisure	16.8%	58.9%	14%	14.9%	5.6%

Lastly, the invitation for the second part of the survey has a positive response rate with 78% of the people accepting the invitation which is sent via e-mail 6 days later.

Conclusions and last remarks

Human mobility has very regular patterns as the probability of going to new locations is low and decreases over time (Song et al. 2010). Therefore, asking people which locations they normally visit is a valid methodology to understand mobility patterns and the reasons to choose each location. In this case, we want to focus on the social aspect of mobility, and how the type of visitors impacts the destination choice, this is why we ask people to try to describe, in comparison to themselves, the type of people that goes to the locations they go to, this way we can create a set of unchosen alternatives that help us understand the process of destination choice depending on demographic characteristics.

The survey itself was easy to understand. Almost all the questions were answered without much complications. The length of the survey is proper, varying between 10 and 20 minutes. One of the biggest worries before the survey was the tediousness of the Place Interpreter as the questions are repeated for each place, but the low number of people quitting during the Place Interpreter (31.6%) means that it is not as problematic as we were expecting.

The main problem we encountered during the survey was the lack of capacity to properly geocode the locations that people wrote in the Place Generator. To solve this problem, we will add an interactive map where people will have to locate the specific location they go, which will increase the response burden of the survey but will help with the precision of the set of alternatives and the estimation of the activity space of each attendant.

The next step for the survey is to fix all the related problems and misunderstandings mentioned in this paper and wait to have enough answers to the second part of the survey to see if it was properly understood. The final survey version of the survey will be implemented twice, the first in the Zurich Metropolitan Area with 8,000 invitations and a second time in the cities of Geneva, Turin, Hamburg, and Brussels with 10,000 invitations per city. Both surveys will include the Place Generator and Place Interpreter as well as the Social Networks.

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