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ORIGINAL ARTICLE

Making the city my own: uses and practices of mobile location technologies for exploration of a new city

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Abstract
In this paper, we present an interview study of 13 recent newcomers to New York City, focusing on their early experiences of exploration and use of mobile location services and other tools for getting to know their new city. We describe their reasons and intentions behind exploratory practices using digital tools and emphasize how they make meaning out of new places in relation to technology tools as well as their previous places. Mobile location technologies make the process of finding specific places and exploring new neighborhoods a digital search task but discourage the notion of wandering and exploration. We point out missed opportunities for socio-technical systems supporting place making and place discovery and suggest that digital exploration tools should stay peripheral to the activities that people enjoy as tech-free but support a wider notion of search for salient characteristics of places.

Keywords Location-based services · Mobile technologies · Place technologies

1 Introduction

Moving to a new city can include a daunting set of tasks, including getting to know the new neighborhood in terms of establishments and places of interest, and creating a new sense of home. With location technologies now pervading our lives through mobile smart phones, these provide assistance in many situations related to finding one's way about in a new city. Although research has explored use of technologies in relation to relocation from many perspectives such as disasporas [1], communication with social and family relations at home [2], and reevaluation of patterns of technology use after a significant move [3], fewer studies have put emphasis on the technologies that are available to a city's newcomers for more mundane explorations of neighborhoods and other activities of "getting settled." While relocation is a fairly common life event, the practices of exploring a new neighborhood and finding new places such as supermarkets, restaurants, and recreational areas are still non-trivial in an unfamiliar city; not only does the places and establishment have to live up to the person's lifestyle and preferences, the lifestyle and preferences possibly have to be adjusted to the availability in the new city.

In this paper, we present an exploratory study of the role of mobile and location technologies for settling in after a long-distance move to the city of New York. New York was chosen as a context of interest because we were interested in how people make meaning out new places through wandering and exploration—unlike rural areas where one's main transportation is a car, residents of New York mainly walk and/or use public transportation. This could open up many opportunities for serendipitous interactions as well as meandering that may not otherwise make sense when studying navigation via cars.

We investigate these issues in order to have a better understanding of how mobile technologies are used in situations of new residents and to understand what kind of features aside from location-tracking would assist individuals in their different modes of location sensemaking. We then point out a selected set of missed opportunities for technology design in this space; we also point to the need to look at relocation and moving to a large new city from a holistic perspective, for designing mobile interactive technologies.

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2 Related work

While the topics of migration and mobility have been extensively researched, most studies focus on social issues, rather than technology use. However, since technology is increasingly playing a role in communication among migrants, researchers have started to look at these factors. Of other work related to this project, we found wayfinding and navigating to be of particular importance.

2.1 Migration and residential mobility

Many studies have looked at both national and transnational migration, for example in relation to ICT use for transnational migrants; one study for example illustrates how migrants produce connected lifestyles and thereby generate new transnational habitus [4]. When considering use of communication technology in relation to immigration or moving, these studies often focus on the communication between newcomers and their relatives "back home," such as how the use of long-distance telephone cards worked as the "social glue" connecting transnational migrants to their relatives and friends back in their native country [5]. Other researchers highlight that the emergence of the mobile phone has strengthened the connection between the people who remain in the country and their immigrating relatives [6]. In terms of public media use, research has looked at immigrants' use of media such as satellite television watching from the "home country" being a status symbol for first-generation immigrants but not for second and third generations [7]. Where some research focusing on online integration between groups of immigrants found that these are not very strong without actual off-line relationships [8], other studies documented how transnational migrants to New York City struggled with online identity management and privacy maintenance in relation to friends and family abroad through social networks [2]. This latter study also illustrates a particular use of locative media where newcomers "show off" to friends and family abroad by checking in to particularly well-known or desired venues on social media, using this functionality for impression management [ibid]. Before the advent of the smart phone, Shklovski and Mainwaring explored how ICTs were used for a long-distance residential move and found that not only had did the moving people have to renegotiate their use of electronic maps, they also renegotiated their use of individually (not always local) used digital services [3].

2.2 Wayfinding and navigation

Our study focuses particularly on the wayfinding and navigation challenges that arise for a city's newcomers as a premise for getting to know a new city. A large set of research studies has looked at wayfinding and navigation, however, mainly for certain populations such as cognitive or visually impaired [9, 10]; the more social aspects of exploration and wayfinding for newcomers have been studied to a very limited degree. In this paper, however, our analysis addresses wayfinding and exploration on a *meso-level* where the goal is to trace and describe higher level mental models and reflections around these, in order to provide broader research and design guidelines in relation to social navigation systems.

In terms of different types of wayfinding, Allen [11] categorized wayfinding tasks into three types: travel to a familiar destination (*commuting*); travel to a novel destination (*quest*); and exploratory travel in an unfamiliar environment (*exploration*). He argued that people behave differently when they are undertaking each of these three wayfinding tasks and that it is the *quest* task that requires tools such as maps and directions, i.e., symbolic means. Allen's concept of *exploration*, however, is almost exclusively reserved for tourism; he argues that as soon as people have moved to a specific place and have daily obligations such as work and chores, wayfinding becomes fairly utilitarian.

Related to place discovery in a digitally connected world, research within the socio-technical space of location deals with mobile social networks. Humphreys emphasized how technology can be used to both facilitate and avoid sociality in urban public spaces and suggest that there is a "parochialization of public realms through mobile social networks" [12]. In her study of Dodgeball (a now defunct location-sharing application), she described how location-based social services were used to triangulate between social ties in relation to public places, and her research lead to a foundation for further research into location-based social media where "check-ins" are performed for self-presentation and identity management [13] as well as for place revealing technological and poetic/computational purposes [14].

In terms of other digital resources for urban exploration and place discovery, peer-review systems such as Yelp and TripAdvisor have become common for people to use either for pre-visiting or in-the-moment searching. Most research, however, looks at the content of the reviews, such as fake reviewing [15] or motivation of reviewing [16]. The actual "on the ground" practices of place discovery with these tools have yet to be addressed.

In our study, we explore on-the-ground use and point to the gap in support for ad-hoc discovery of places with non-salient characteristics. Our study was inspired by Simmel's [17] notion of wandering in the metropolis, which he addressed from a sociological viewpoint already in the early twentieth century. He describes the metropolitan man as opposed to the rural man in both posture and intent when walking in public. Where the rural man has a set path, the metropolitan man has many more options for activities as well as future occupations.

Casey conceptualizes place as the distinction between dwelling as *residing* and dwelling as *wandering* [18]. Residing involves building places to which it is possible to come back to, and also supporting social needs such as dwelling, upbringing, and education. Dwelling can also be accomplished by wandering. Relatedly, Harrison and Dourish, take the notion of place into the age of social computing and describe how collaborative systems should support our sense of place rather than the structure of space: place being the cultural and communally held understanding of behavior and interaction [19], which emerge through inhabitation and settlement. Places provide a sense of meaning to people, particularly through returning and as we will elaborate on here, this meaning making is important to newcomers.

In terms of people's understanding of place, Lynch and later Milgram investigated people's mental maps of different cities, by having them draw maps and explain the researcher how different landmarks were connected and how they understood their local city [20, 21]. These studies provided a unique understanding of how a city can be understood independently of an objective "correct" map, but instead through people's individual understanding of for example what places were safe and comfortable to frequent and which were to be avoided. Bentley et al. conducted an updated small-scale map study with focus on location-based services and found that newcomers (tourists) did not think of the city (Chicago) in terms of neighborhoods, streets, and transit routes to the same degree as residents. Instead, newcomers were more likely to draw and think of the city in terms of landmarks [22].

While there are undoubtedly commonalities regarding navigation between tourists and residents, it is important to note that there are some fundamental differences in terms of goals and routines that necessitate the current examination on residents. While tourists have short-term and ephemeral goals of engagement with the location, residents' interests are more long term. Moreover, residents may have needs for everyday living that tourists do not need. Due to these and many other differences, even in the academic field of tourism studies, scholars distinguish between the behaviors and attitudes of tourists vs. residents.

Our research here utilizes and builds on Casey's [18] conception of dwelling as well as Allen's [11] themes of wayfinding by focusing on goal-oriented *quest* and more open-ended *exploration* via wandering to understand the on-the-ground practices of city newcomers and the technologies they use to engage in these practices. The aim is to provide a foundational set of concepts for understanding and designing socio-technical exploration systems. Thus we had two general research questions that guided our research:

RQ1. What are the goal-oriented and open-ended practices of city exploration and navigation for newcomers in the city?

RQ2. Which mobile technologies do newcomers use for these practices?

3 Method

The study is based on hour-long semi-structured interviews with 13 people who had moved to New York in the past year. We interviewed participants in their own setting, either at a neighborhood cafe of their choice (9) or in their home (4). This served as a good reference for understanding where the participants led their daily life. Interviews were based both on the participants' recollection of how they explored their neighborhood when they first arrived and how they continuously explored neighborhoods and other areas at the time of the interview. Due to the vast size of New York, all participants reported at the time of the interview that they still did not know the majority of the city and still had a need to continuously explore.

We recorded the interviews and transcribed them immediately. The questions were categorized around the themes of (1) finding a home and neighborhood, (2) early experiences finding new local places, and (3) navigating the new neighborhood. Within each topic, we inquired into digital tools used for the activity and how that fitted into the explorations and searching for new places.

The data was analyzed using elements from grounded theory [23]. We started out by categorizing a wide set of topics that we had asked into, adding snippets of the interviews to each category. The categories varied between structured simple topics such as "reason to move here" and "how long they planned to stay" and more complex issues such as "how to get to know a new area" and "how to discover new places of interest." We continued to categorize what tools were used for exploring their new city. We then used constant comparison to compare these statements and find which were common and which were more unique. Our description of data and results are based on both types of statements.

3.1 Participants

Part of the goal of this study was to look at how people with a certain level of technical and social resources explore and navigate a new city and local area, as opposed to people with limited resources, a limitation that might affect practices [24]. For this purpose, we specifically looked for Western middle class participants who would not necessarily struggle to have Internet and smart phones available during the move. Another focus was to inquire mainly people who did not necessarily have an existing network in the new place, as opposed to for example immigrants who move into an already existing diaspora areas (e.g., Chinatown) where exploratory challenges are

of a different type because it would adhere to another culture or the mix of two cultures. Finally, lower socio-economic status newcomers face possibly harsher and different types of challenges than our focus of navigation, place discovery, and service technology choices. Our recruitment was therefore limited to middle-class newcomers who moved due to their work situation or was following a partner.

Recruitment was a combination of personal contacts (asking acquaintances if they knew someone who had just moved to New York) and snowball sampling (asking participants if they knew someone else who had just moved to New York). The participants were between 23 and 42 years old with a median age of 32. They had been in New York for between 1 and 6 months with a median of 5 months. We interviewed ten women and three men. Each participant had a unique story as to why they had moved to New York but generally six of the participants had moved for a specific job and five had moved due to their partner's job. None of these five had a paid job outside the home yet but two were actively seeking one. The last two moved due to other reasons: being freelance artists (one writer, one dancer), the art scene in New York provided more opportunities for their careers.

In terms of occupations, the participants held a variety of jobs such as client service manager in an auction house, graphic designer, IT professional, or stay-at-home-parent. Six of the participants had moved internationally and were from different Western European countries (in terms of immediate previous residence) and seven had moved from other areas in the USA. What they all had in common was that none of them had spent any significant time in New York before. An outlier was the participant married to a native New Yorker who had spent several separate weeks over a year in New York, previous to the move. This also meant that none of the participants had any close relatives in New York.

All but one participant lived with other people, probably reflecting the limited housing availability in New York for the single people (which accounts for six participants). For participants with partners or families, they lived with those and five of the six single people shared apartment with others. They all lived within the boroughs of New York, either on Manhattan or in Brooklyn; most lived on the Lower East Side, Hell's Kitchen, Williamsburg, or Park Slope. Participants have been given pseudonyms here to preserve anonymity.

4 Results

A move is a drastic life-changing event, yet it had different meaning and different level of significance to the participants. What they had in common was a broader desire to explore the city and their neighborhood, and a need to familiarize themselves with the new city culture, both in their description of their initial move and now, 1–6 months later. Everyone was fluent in English already (although four had English as a second language), mitigating communication problems, yet a distinction emerged between the participants who had moved far away before and the ones for whom this was their first big move. Some had to start off their move with a job search, others already had a new job available to them. These personal circumstances gave participants a distinct perspective of the city.

4.1 Exploring

Participants all described how, shortly after arrival, they wanted to explore their area and beyond, and for which they used a variety of approaches and tools. Where some described having been content just walking inquisitively around in range of neighborhoods, others explained their exploration as more hesitant and decided on parts of neighborhoods more selectively. Lisa, for example, talked about how she had been introduced to Greenwich Village and now liked to walk around in that area: "I've got to know Greenwich Village fairly well because I've got some friends that live there. I love it. [...] I had occasion to go there quite a few times, and now I choose to go there and have a wander or sit in a café or look at the shops, whatever." Cathy on the other hand reported being more bold in her explorations, taking advantage of New York being a richly diverse city: "I like going on the Upper East Side and the Upper West Side because it's completely alien to me and I've never really been there. I really enjoy going up there and just having a browse around and look around at what… Because it's quite a crazy place up there as well. People with just ludicrous amounts of money behaving strangely. I've always enjoyed the audacity… To observe the audacity of Manhattan and New York life and I love to go to the MET which is up that way anyway."

It was not uncommon for the participants to have explored "quintessential New York" during the first few weeks such as Jim who went to Times Square: "I went up to Times Square a couple times, which was fun […] just to see it and like, "I'm in New York now!" I'd go see all the big exciting things". Participants were mostly excited to be here and wanted to take in the New York atmosphere through walking around, seeing the city and, being part of it. Georgina reported being advised by her father to go and befriend local shop and restaurant staff and since she was also looking for a job (in order to support her dancing career), she had walked into each local coffee shop and restaurant shortly after her arrival securing a part time job in one of them.

As illustrated by the few examples above, talking about initial and current experiences, it was difficult for participants to distinguish between journeys with distinct goals and journeys for general exploration. Instead, it was obvious that they often combined journeys to include both the quest for

particular goods or items and the goal of exploring their local neighborhood. We categorized their exploring behaviors into three types: *wandering*, *walking*, and *heading for*.

Wandering People are wandering around with few time-constrained aims, open towards new places that would show up, that being cafes, shops, or public parks. This is the situation where people are open towards new establishments and where they enjoy exploring new areas. This exploratory mode was according to our findings, the mode where the least mobile technology is used.

Walking People are walking purposefully with particular aim, but often not specified in detail. They might be looking for a pharmacy where they need to buy shampoo or a good bagel shop close by. This mode of exploration is one where technology is often used, particularly if the walking needs to take place more efficiently.

Heading for People are going directly to a new specific place (i.e., Restaurant Morandi) for a specific purpose, for example meeting a friend at a restaurant where they have never been before, or going to a yoga class at a particular studio. This mode of exploration is for the vast majority following directly after an Internet search, either on a map or a website.

Depending on participants' lifestyle and amount of free time available to them, all three modes of exploration were used to a certain degree, at different times. The stay-at-home parents as well as the job-seekers (4) did a fair amount of wandering during their day when the children were at school or daycare. The characteristics of wandering were a desire to "suck in the neighborhood feeling" (Pedro) and "people watching" (Cathy). Georgina used it with an additional goal: to make friends in the neighborhood and get a job. This activity was obviously particularly prevalent early on in the participants' move, but also later on, to explore unfamiliar neighborhoods or to explore with visitors.

In terms of walking, Jim explained that he and his partner went out for dinner very frequently and would walk around to find a new good restaurant. They would often use the review application Yelp just before walking into a restaurant to check the reviews before deciding. They also had a slightly messy system of staring any establishment they had been recommended or had good experiences with: "… usually everyone has a place they recommend when you talk to them, so whenever someone recommends something I just … if you look it up on Google Maps you can hit the star, and it puts a star on your map. […] my Google Maps, it's just covered with stars. I probably have like 100 plus random places starred that someone at some point has told me that they liked it. […] [Sometimes] we'll end up walking home. Then I'll pull up my map at certain points and I'll see if there's anything I have starred around where we're at. If it is, then I'll just sort of meander us that way and we'll go check it out. That's the primary way to explore in New York, just sort of get recommendations, note them, and then I pull them up through that. I use Yelp a lot to find really good places". Other activities of walking included Lisa looking for a playground on the way home after picking up her two children (Fig. 1). Finally, "heading for" was a frequently used exploration mode; particularly, Nora and Ann used this since they both had moved into apartments with roommates who had been in New York slightly longer than themselves. They would receive a text late in the afternoon asking them to join their friends at a particular bar or restaurant and would head over there after work, directed by their mobile map. The "heading for" was distributed equally in terms of frequency in relation to early experiences and more settled times due to its functionality-oriented characteristic.

Finally, it is important to emphasize the blurred distinction between exploring a neighborhood and exploring places (often restaurants and cafes) in a neighborhood. Places are an integrated part of a neighborhood and different establishments integrate a neighborhood. Walking through a street to find a pharmacy might reveal a yoga studio that the participant had been looking for. Georgina for example found her dance studio through such walking serendipity. In terms of tools for discovering neighborhoods, participants were also relying on personal recommendations, for example in terms of where they might find a shops they would like, alongside a bar with a good set of happy-hour drinks, in addition to the New York neighborhoods that are well-recognized by people through popular culture.

Fig. 1 A list in Lisa's home of places she and her family wanted to go see. At the time of the visit, they had managed to see 3–4 of the places but kept the list so they could go back

4.1.1 Finding and creating places with meaning

A salient part of particularly wandering, was the notion of finding places (cafes, restaurants, shops, parks) with meaning to the participant. As Pedro explained: "I want to make the place my own. Once I find my hidden gem they are my little hidden gems". The meaning of the place manifests itself through the discovery and the repeated visits to the establishment. Making the new places "their own," was important to many of the participants and they expressed the actions they would take to make this happen such as tagging it in their map application and make small-talk to people working in the establishment. What was important to some, such as Pedro, Cathy, Emily, Georgina and Tim, was that this discovery was somehow low-tech. A place received more *value* as a meaningful place if it was discovered without the help of an application or a map, if it was "stumbled upon" or possibly recommended by a friend or trusted acquaintance. It was the premium of off-line exploration, wandering, which took time but then also resulted in more *value* of the places found. Having found a place through an application where 150 people had recommended it and given it four stars, did not provide the place with the same kind of significance to these people.

Dissecting the concept of meaning further we uncovered three types of meaning that people attached to places: personal meaning, relationship meaning and community meaning. Personal meaning was the meaning they attributed to the place through personal knowledge and discovery. Emily for example found the parks to have particular personal meaning to her because she would go there and relax: Brooklyn Bridge Park is another one of my favorites. [...] [It] has a really beautiful view of the Manhattan skyline." Relationship meaning was the meaning that was attributed to a place where a relationships was significant such as a particularly romantic dinner or a restaurant that the children liked because it was the first place they went when they arrived: "[We] went back there quite a few times subsequently because I think for the children, they found something that they recognized that was easy, very straightforward… They were happy; we were happy" Finally, places with community meaning were places such as playgrounds, parks and supermarkets. Lisa and her family went "church shopping" the first few weeks: "The first few weekends we were here, we went to different churches to sort of get a feel for the options and see what's out there. [...W]e were experiencing something that was really quite different at times, what we were used to in church back home. Each of those holds a special memory."

4.2 Tools for exploring

Participants used navigation tools such as Google Maps, HopStop (an online city transit guide), downloaded subway maps, and NYCBikes (app for public bike sharing system) in tandem with recommendation applications such as Groupon, restaurant apps, Open Table, and TimeOut NY (magazine/website that includes recommendations). Some apps had both navigation and recommendation functions, such as Yelp, Foursquare, and food truck apps.

Of note, none of the users used Google Maps for recommendations, despite ratings being available on it. Yet, the most used application was in fact Google Maps, which was not only used for navigation but also place discovery such as searches for restaurants, specific shops, etc. The goals and purposes of other apps overlapped significantly. Ann was particularly fond of Yelp: "I use Yelp all the time, for everything, whether it's like a vintage store or if it's a restaurant. Like say you're doing a restaurant, you can do it by type of restaurant, and then you can check in and then you can get a free thing." She said that she had a strong trust for strangers' recommendations on Yelp and could tell when people were being overdramatic. "Generally, I will go through like a hundred Yelp reviews before I pick a place to eat," she added.

Jocelyn used Foursquare for both getting recommendations but also for memorizing places she had went to and liked: "I was never ever using it before, but then I started to realize I was going to all these cool places, and I could never remember where they were because it's so big. I remember which area, but there's so many streets... so I really started using that to try to remember and map where I was going and what I was doing." Pedro used the star functionality in Google Maps to pin particularly good places that were recommended to him: "If we're in a new area, we'll just actually pull up the map to see if there are any stars around there." Georgina, on the other hand did not use any navigational tools in the beginning, instead she relied on the kindness of strangers to find specific places.

Cathy explained a significant distinction between her different navigation tool practices: If she was on her own she would not rely on digital tool as much as if she was with her children: "[On my own I] prefer to just wander and have a look. If I was going to go a restaurant [...] If I'm over that way [in Manhattan] I'd have a look at restaurants, "That looks nice, have a look at the menu," but I do not tend to use [Google Maps] to find places to go". With her family, on the other hand, she reported looking up places beforehand. Similarly, if participants had friends visiting, they would plan their meal with more care such as Jocelyn: "I had friends visiting and they were like, where are we going for dinner? I said, you can have any type of food you want in New York. They wanted to try an Ethiopian restaurant, so I went on Yelp." Pedro on the other hand explained how him and his partner would often check the reviews of a particular restaurant as they were standing on the doorstep to the place, in order to confirm their impulsive choice.

In terms of tools for more long-term planning of exploration, participants also used very traditional materials such as

paper lists to constantly remind themselves what places they wanted to visit. Irina had such list posted on her fridge. Lisa kept a calendar in the kitchen to keep track of everyday activities but also a handwritten list of places and areas they wanted to see. In a way, these lists worked as pre-visiting reminder tools, where the digital tools focused on in-the-moment exploration and decision-making aids when planning something new.

4.3 Challenges to newcomer exploration

The participants talked about their newcomer experiences mainly in positive terms, after all, most had moved here not only voluntarily but also with great excitement to be in the quintessential cosmopolitan city of the world. When probed, we uncovered challenges as well. Cathy for example had been meaning to walk from her home in Brooklyn to Manhattan over the Brooklyn Bridge one afternoon but accidentally ventured into an area where, as she expressed it "I was not supposed to be". Her Google Maps directions had sent her through, but were obviously not able to communicate what she could only sense with her own instincts: this was not a safe area for a White middle-class woman to walk through, even during day time. Irina explained a similar occurrence in more broad terms: "Especially in Brooklyn, there's some kind of unsafe areas, which is super annoying. I mean, I would definitely walk some places, but then you don't walk there because it's like, you start to walk, like "no, no, no, wrong section. You walk down a few blocks and then it starts being uncomfortable." None of the participants' digital tools had been able to help them single out unsafe areas.

Other problematic issues around navigational tools emerged when they did not work as intended. Georgina said she used HopStop in the beginning for navigating the subway but then found it did not really reflect true times of the trains. At the time of the interview she said she had stopped using it and either used Google transport directly on the map or simply the route map.

5 Discussion

5.1 Wandering as a distinct type of urban exploration

Three levels of urban exploration emerged from our study: wandering, walking, and "heading for". Not all people had the time or need to wander their neighborhood, particularly after initial settling, yet all participants demonstrated the two latter characteristics continuously. Still, the aimless and often technology-free activity of wandering was seen as a premium, something desirable that could potentially help them later. For example, the participant who had been advised to befriend local shop staff utilized the wandering as a steppingstone to get to know her neighborhood better and eventually be able to navigate on her own, without having to ask for directions. Although she described how she later implemented her smartphone use in her navigation, the initial navigation reflected a curiosity of her analog environment. This reflects Lingel's description of wandering as an information practice, where people acquire local urban information without technology support, but instead use informal, unstructured walks to obtain personal fluency of a neighborhood [24]. But where Lingel describes this as a very common practice among her transnational participants, it was a rarer activity among our participants, possibly due to sample differences: Our participants were professionals, many with families, mostly moving specifically for work and had a busy daily life from day one. Lingel's participants on the other hand, were mostly single young people with different priorities in their everyday life; where Lingel's participants wandered the city without interactive maps on their phones, often due to them not having smart phones available to them (or the required data subscription), our participants, contrastingly, all had smart phones and did the technology-free wandering specifically for the sake of the activity itself.

This distinction between different types of wandering relates back to Casey and his description of dwelling as wandering [18]. He refers to two types of parallel and simultaneous processes of attention that a wanderer must pay: The concrete navigational attention of immediate surroundings, needed to not walk into obstacles or onto the road, and the "circumambient field within which the focal field itself is set" [18], meaning the broader environment that adds to our sense of place and broader navigation (i.e. houses, landmarks, etc.). The simultaneous attention that Casey describes then only seems possible through wandering and partly through walking. The heading-for that we described, led to environmental attention being directed down at the device and technology instead of the broader environment.

Yet, using navigational technologies is also a way to prevent external resources of confusion. Taking Simmel's view of metropolitan life and behavior into the twenty-first century, the in-the-moment use of navigational technologies for walking and heading-for can be viewed as people's way of dealing with constant stimuli ("the profound disruption with which the fluctuations and discontinuities of the external milieu threaten [the person]" [17]) that is thrown our way in the modern urban environment. Simmel argues that we turn to our rational mentalities when walking in the metropolis. Here, our practices are structured by "set paths" for interaction, since we do not have personal relationships with bypassers, shop keepers or others we interact with in the urban landscape. These rational methods include digital navigation where less emotional mental activity is necessary and where people can minimize local attention to the broader environment as described by Casey [18].

5.2 Emergence of familiarity and meaning making

The second theme that we discuss is one relating to familiarization and meaning making with regard to the places that participants discovered and explored. We found that exploring a neighborhood was not only for exposing places (restaurants, shops, parks), but for creating meaning within this new setting, specifically on three levels: personal, relationship and communal. This meaning making was essential to the more profound experiences of the city and for learning to feel at home.

Each individual city inhabitant has a unique way of viewing an area or a neighborhood, sometimes referred to as a "personal geography". One way of identifying new places, objects or entities is not necessarily stemming from it being individually familiar to a person, but because it conforms to a stereotype that has already been constructed by the person through cultural and social experience [3]. We noted how participants' sense of familiarity slowly emerged as they moved about in their neighborhood, building up their notion of the area through both stereotypes ("this is what a corner store looks like, this is what a playground looks like") and new interpretations about how these particularly objects looked like *in New York*. At the same time as this notion is very individual with emphasis on utilitarian places (e.g. playgrounds for the families, bars and cafes for the participant looking for work in that type of establishment, dance studios for the dance artist), the familiarity is also a communal familiarity that the participants needed to have in common with other inhabitants in order to build the common understanding and meaning of the places, a so-called "public geography". That common meaning was used to communicate with others in relation to objects such as landmarks used for navigation and the obvious subway stations. Most of these "public geography" objects were available on a regular street map.

Returning to Lynch's [20] description of inhabitants' perception of their city through landmarks and distinct neighborhoods, our participants' early unfamiliarity with places and areas clearly needed to be tackled through different navigational activities, with or without technology. The obverse of the fear that comes with disorientation is the "sweet sense of home", which is "strongest when home is not only familiar but distinctive as well" [20]. People's desire and need to become familiar with an area therefore also emerged from a mental distinctive-making process of areas, particularly "home areas," balanced with the goal of finding the common mental picture carried by large numbers of the city's inhabitants. This common culture, the basic geographical nature that New York inhabitants share was quickly adopted and affiliated with the need to feel familiar within these areas. But on an even more fine-grained level, in terms of individual establishments, meaning making also takes place on an interpersonal level. The interpersonal way that Georgina approached her new neighborhood, with acquainting herself with not just the places, but also the staff, and the recognition that people encountered in establishments making them feel at home [25], were all part of familiarization and the meaning making process. While these rich and complex acts and interactions in the city's parks and streets are not new [26], personal devices and applications have changed at least some of the premises for place discovery, yet proved limited assistance for meaning making as we witnessed in our findings.

5.3 Implications for designing technologies

It was clear that current mobile digital tools were skillfully and creatively integrated to manage the moving and early settling process. Participants learned which tools and applications worked well in their local environment, based on recommendations and experiences. Combined with personal recommendations, participants formed their presumptions and early understandings of their new neighborhood as well as the establishments and places they frequented. But the evaluation of credibility of online sources was complex [27] and personal recommendations were valued higher, due to the level of relevance to participants' particular situation. Such importance of relevance illustrates the significance of not only peer-to-peer review systems but also more broadly information sources based on interpersonal similarity. Peer-evaluation services today such as Yelp, Trip Advisor, Open Table and other topic specific review websites are "one size fits all," with no indication of the reviewer's qualities other than perhaps reviewer experience on that particular service.

Another issue of limited digital services was in relation to participants' sense of safety or more general walkability. New York is very diverse in terms of socioeconomics and although it is generally walkable for most parts, participants still found places that they did not feel safe or walkable for other reasons. No present technology can assist in finding appropriate walking routes through cities; such information will have to be collected through for example public crime statistics and personal recommendations. Not only is there a tremendous missed opportunity in this design space, but the consequences of the technology, as it presents itself currently, is that people are misled into believing an area is walkable since routing applications simply indicate a route based on roads and footpaths. The qualities of these roads, in terms of pavement, gradient, and sense of safety are not factored into any route.

We are not the first to suggest design guidelines for digital map services; several scholars have called for more nuanced map implementation with more detailed information on places and Google Maps, for example, does increase their level of detail continuously. Yet, these technologies are still not designed for *places* such as what Harrison and Dourish suggested almost 20 years ago [19]. The map applications are still very *space* oriented and instead of integrating functionality for

place, with the result that users are using several complementary applications almost "on top" of each other to understand establishments and areas in terms of place. Although there are several missed opportunities for map services and technologies, this shortfall also represents a particular complex part of socio-technical systems: the inherent gap between the human perceived social situations and possible technical mechanisms [28]. We are not suggesting digital services that directly interact with the wandering practices documented here, but peripheral applications could provide valuable options for facilitating discovery practices. Location triggering applications suggesting relevant places might be useful and amalgamations of social media images could provide a more detailed sense of the new area.

While there is naturally tremendous value in close-knit local communities, there is also no shortage of scholars arguing that community is slowly being lost to the television and Internet generation [29]. The counter argument is that much of the community has shifted to the Internet, which we also witnessed by our participant's frequent use of social media services for access to the local community such as local Facebook groups (i.e., "Park Slope Moms"). We therefore emphasize the importance of leveraging meaning making of new local places through digital services to create a closer-knit community. Where the meaning making of places and establishments did not rely on participants' use of digital services, it was not void of it either. But the values that participants put on the non-strategic wandering shed light on the value of peripheral and pre-visiting information services. Where tourism information tends to focus on specific landmarks and "places of interest", less information is available relating to specific characteristics of neighborhoods, at least in simple format. Smaller local businesses could take advantage of social media profiles for this type of peripheral connection with customers to build up community. However, the important lesson here is not only one of missed opportunities for location-based services but the value that people who are building up their understanding of their new city and new places, assign to technology-less exploration.

6 Conclusion

In this paper, we investigated mobile digital technologies for people's exploration of a new urban area, particularly for exploring neighborhoods through more subtle characteristics than map-based navigational searches. We found that the main challenge was when participants had to learn and adopt the "local" urban exploration technologies. Many state-of-the-art social media services and navigational tools are great at pinpointing places through specific criteria (the request of finding a sushi restaurant in the West Village or a public playground in Williamsburg), yet our participants used these for only a sub-set of their navigational and place-finding tasks. Finding a nice establishment that fulfills a set of rather vague criteria (such as finding a playground suitable for 2 year olds or a café with power outlets available that also make coffee with almond milk) was still only managed and succeeded through on-the-ground exploration (i.e., wandering and sometimes walking) and personal recommendation. People are very creative in working with available technology and appropriation of digital applications took place on all stages, from preparation to just-in-time preparation, to being on the ground. However, we also found that wandering was actually a desired activity that added to the perceived value of the establishment itself, once found. Through our documentation of New York newcomer practices in terms of discovery and exploration of neighborhoods and places, we found several layers of meaning making, which led to suggestions that technology support stay peripheral to the activities that give people pleasure. Finally, we call for a more holistic and less map-oriented approach to digital service development for people exploring a new urban area.

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