What Makes a Place More Familiar?: Implications of Geospatial Information Format and Content

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Abstract
Geo-local systems can significantly increase users' familiarity with new places. However, for these systems to be useful, geospatial information needs to be presented in ways that those systems can minimize users' difficulties of learning about a new place. This raises a fundamental question about what kinds and representations of geospatial information are effective in making a place more familiar, so that people can adjust to the place more easily even before visiting the unfamiliar world. This study focuses on modeling representations of geospatial information, and their effects on people's familiarity of places. The results show that content and format of geospatial information matter in their familiarity about a place in terms of their perceptions and knowledge. Designers and researchers of social computing systems can benefit from this study so that geospatial information can be more effectively distributed through online systems.

Author Keywords
Geospatial information; geo-local systems; newcomers; familiarity of places; space and place.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Geo-local systems help users resolve place-related issues by providing geospatial information about local places. Yelp, a widely used commercial geo-local system, provides information about local restaurants including maps, photos, menus, and text descriptions. *Cyclopath,* an early social-mapping system, supported bicyclers' pathfinding by providing crowdsourced online maps [5]. Geo-local systems are increasingly critical sources of the geospatial information that people use to discover and explore places of interest. Prior discussions of geo-local systems have focused on motivating contribution of and providing access to information about places [3, 5]. Less attention has been given to the nature of places and how presentation of geospatial information affects the way people perceive them. Yet to create effective geo-local systems and assess their impacts, we first need to understand the concept of place, characteristics of geospatial information, and how these artifacts affect individuals' experiences of spaces.

In the Computer-Supported Cooperative Work (CSCW) literature, it has been recognized that 'place' refers not only to the notion of three-dimensional location or structure (i.e., 'space'), but also to the recognizable and persistent traits that provide cultural and social meanings associated with spaces [1]. Thus, a place is both a physical *and* socially-constructed entity with which people interact. This conceptualization of place suggests that places are more than just structural artifacts that can be simply described by the transactional exchange of basic information. Instead, places are complex, socially constructed things that people learn about, experience, and respond to. Both aspects of places affect how individuals experience a place, such as when people are distracted and frustrated by unfamiliar structures and different culture and social environments in a new city. Characterizations of places as complex socio-physical amalgams that individuals both know about and experience, raise the possibility that geo-local systems may do more than just provide appropriate information about a location. As representations of a place, geo-local systems may also alter users' experiences of the place, affecting their familiarity, adjustment, and engagement with it. Beyond basic usability of answering a question or providing a fact, the experience of a place via a geo-local system has the potential to affect how individuals become familiar with and respond to a place. In particular, understanding use of geo-local systems as a form of experiencing the place, as opposed to a simple information query, raises questions about how geospatial information should be presented within these systems.

In this study, we characterize alternative forms of geospatial information in terms of content and format, and examine how those features affect individuals' knowledge of and perceived familiarity with a place. The experimental results provide basic knowledge that informs a broader understanding of the roles and goals of geo-local systems, geospatial information, and people interaction with both the systems and the places themselves.

Familiarity with a Place

Familiarity is a subjective, multi-dimensional construct that includes behavioral and social meanings [2, 10]. This definition is consistent with the dual nature of place, but is abstract and lacks the concept of memory. This makes it complicated to operationalize the concept

(a) Space image

(b) Place image

"There are two big wooden tables, and many violet chairs are around them. There are three picture frames and two big televisions on the wall."

(c) Space text

"A women in a meeting is talking to people in a conference room. People are sitting around a table."

(d) Place text

Figure 1. Examples of geospatial information used in the online training.

of place familiarity. Individuals' familiarity with an object is known to be related to both internal memory, i.e., reactions to a stimulus due to one's previous experience without remembering it [9], and explicit memory, i.e., the memory that can be retrieved consciously such as recognizing a friend's face [6]. These characterizations of familiarity make it possible to operationalize place familiarity while connoting the concept of memory. Consumer behavior research builds on this definition conceptualizing familiarity as having two aspects: "how much a person knows about a product" and "how much a person thinks she/he knows about a product" [4]. By combining the concept of place with this model, place familiarity can be conceptualized as a two-dimensional construct: "how much a person knows about a place" and "how much a person thinks she/he knows about a place."

Classification of Geospatial Information

Geospatial information is information about places in various forms such as maps, coordinates, pictures, or text descriptions. Features of geospatial information that affect familiarity can be classified in terms of two dimensions: format and content. Format of geospatial information, either image or textual, has been found to affect subjects' familiarity levels for objects [7]. These findings suggest that exposure to geospatial information, as either images or text, might affect place familiarity. However, from prior work, it remains unclear what differences, if any, there might be in the effects of the different formats. Content of geospatial information is another way that geo-local systems might differ. The dualistic definition of place, with the distinction between space and place provides a theoretically grounded basis for distinguishing types of geospatial content. Space information refers to information about the physical structures of a place such as placement, color, or shape. Place information, on the other hand, includes information about any human activity and significance that is characteristic of the place. Together format and content provide a 2x2 framework for characterizing the types of geospatial information that might be included in a geo-local system (Table 1, Figure 1).

	Image Format	**Text Format**
Space Information	Image of an empty conference room	Description of the colors and shapes in a conference room
Place Information	Image of a meeting in a conference room	Description of a meeting in a conference room

Table 1. Classifications of geospatial information.

Hypothesis

Each type of information is expected to have different effects on people's place familiarity. Also, we anticipate that providing geospatial information would be helpful in promoting a newcomer's familiarity of a place. Thus, it is expected that:

H1: The format (image or text) and content (space or place) of information about a place would have different effects on people's familiarity of the place.

H2: Providing geospatial information prior to visiting a place would be more effective in promoting newcomers' familiarity of the place than providing no information.

Approach

The experimental procedure for this study consists of three identical surveys, training sessions, and task

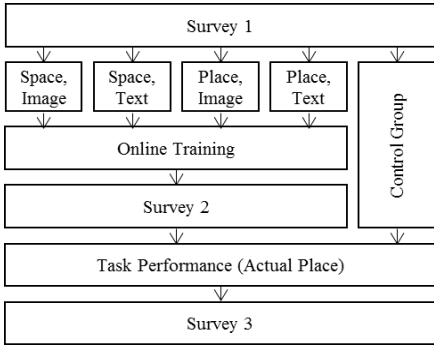


Figure 2. Experiment procedures.

performance (Figure 2). Subjects, who were new to a place, first took a survey that measured their initial familiarity levels about the place. They were then assigned to one of five conditions - a group for each type of geospatial information and a control group. Participants completed online training that provided the specific content and format of geospatial information. After that, they took the second survey. This procedure allowed for a relative operationalization of place familiarity.

Last, subjects were given a list of tasks to perform in the place followed by a third survey to assess their final familiarity levels for the place. Twenty students were recruited from a public university in the eastern United States. Four participants were assigned to each condition and randomized for gender and nationality. Each group had two males and two female participants except the space-image group that had 3 females and 1 male. Seventeen subjects were from the United States, two from China, and 1 from India. Their ages were mostly between 18 and 26, with one who was 43. The target place was a location on the university's main campus that (1) participants had never been to and (2) was structurally salient and distinct from other places.

Measure and Questionnaire Design

Based on the two-dimensional model of place familiarity, we generated questions that asked *how much they think they know about a place*, i.e., perceived familiarity, and *how much they know about a place,* i.e., actual knowledge. An open card-sort was conducted to categorize the questions. We were able to group the questions into four major categories: spatial-perceived, spatial-factual, place-perceived, and place-factual. We then conducted a closed card-sort so that each category had 8 questions; thus, 32 questions in total. A 7-point Likert-scale was used for the questions about perceived familiarity of a place, because it was the well-known measure for human perception (e.g., "I know what the internal structure of this place looks like"). For people's actual knowledge, on the other hand, 5-option quizzes were used to measure the accuracy of their knowledge and quantify it as a score (e.g., "How many elevators are there in this place?" answer options: 0~4). Then, we measured changes of each familiarity level between surveys 1 and 2, and surveys 1 and 3.

Training Session Design

A modified ESP game [8] was used to ensure that the information provided in the image and text conditions was comparable. After making 15 images each for space and place, tags were generated for each image through Amazon mechanical-turk. Using the most common tags for each picture, we generated two to three sentences of text description for the text conditions. 'Place' information in the training was about human activities in places, and 'space' information was images or text of spaces without people. All the photos used were taken by authors or department staff.

Task Design

To control subjects' behavior in the target place, we designed a list of tasks and a card-collecting mission. The task list consisted of simple commands such as "walk along the hallway and get into the first room on your right." At the same time, we put cards with letters at several locations of the target place. Subjects were required to collect all the cards while exploring the building. This ensured their routes in the place were consistent.

	Increase of median value between 1 and 2	Increase of median value between 1 and 3
Place image	M=1.0, SD=0.8	M=4.6, SD=1.5
Place text	M=2.0, SD=1.4	M=4.8, SD=0.5
Space image	M=3.8, SD=0.5	M=5.0, SD=0.8
Space text	M=3.5, SD=0.6	M=4.8, SD=1.3
Control		M=3.8, SD=0.5

(a) Results for perceived familiarity

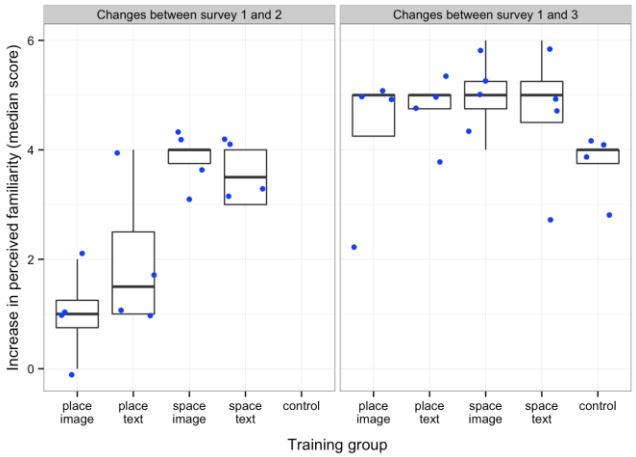
	Increase of total score between 1 and 2	Increase of total score between 1 and 3
Place image	M=-0.3, SD=2.6	M=2.8, SD=2.1
Place text	M=0.5, SD=1.3	M=3.5, SD=3.0
Space image	M=5.8, SD=1.7	M=6.8, SD=2.2
Space text	M=0.5, SD=1.3	M=2.8, SD=2.9
Control		M=2.8, SD=1.5

(b) Results for actual knowledge

Table 2. Increase in familiarity levels.

Findings and Discussion

Multivariate ANOVA and pairwise t-tests (adjusted using Bonferroni correction) were used to determine if geospatial information format or content affected subjects' place familiarity.

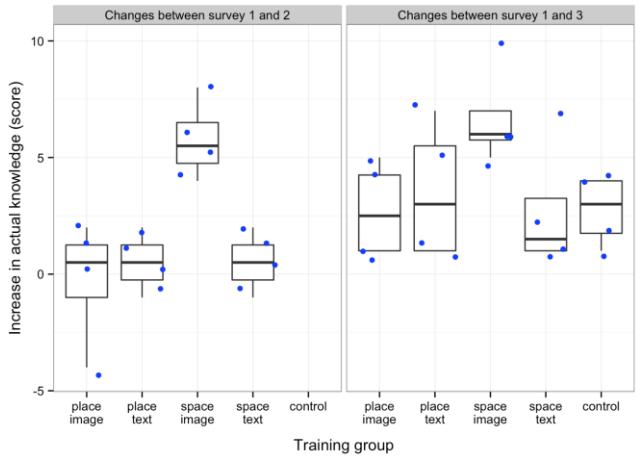


(a) (b)

Figure 3. (a) Increase in perceived familiarity before visiting the place (F=8.28, p< .01), (b) Overall increase in perceived familiarity after visiting the place (F=1, p = N.S.).

Effects of Information Format and Content on Perceived Place Familiarity

Geospatial information format and content significantly affected subjects' perceived familiarity before visiting the place (F=8.28, p<0.01, Figure 3-a). Pairwise t-tests indicated that space information in both image and text formats resulted in a significantly large increase in perceived familiarity level than place information in image format (p<0.05), so the null hypotheses were rejected for H1 and H2. However, the differences among the treatments were not significant when compared to the control group (F=1, p=N.S., Figure 3-b). This means that in the absence of a visit, the information types mattered, but once they visited, information format and content did not affect the people. The results suggest that geospatial information format and content have significantly different effects on perceived place familiarity, but that the differences may not persist when people actually visit the place.



(a) (b)

Figure 4. (a) Increase in actual knowledge before visiting the place (F=9.34, p< .01). (b) Overall increase in actual knowledge after visiting the place (F=2.1, p=N.S.).

Effects of Information Format and Content on Actual Place Knowledge

Actual knowledge, or how much people know about a place, is another dimension of place familiarity. Before subjects visited the place, space information in image format was the single most effective geospatial information in promoting people's familiarity in terms of their actual knowledge (F=9.34, p<0.01, Figure 4-a). In terms of pairwise comparisons, also, it was more

effective than the other types of geospatial information (p<0.05). Similar to the results for perceived familiarity, however, none of the contents or formats resulted in significant increases in actual knowledge after subjects visited the space (F=2.1, p=N.S., Figure 4-b).

Limitations and Conclusions

As with any empirical study, this study has limitations. Since the target place was a specific part of a university and demographics of the samples were mostly limited to American students, the findings may not be generalizable to other places or people. Also, other uncontrolled variables such as subjects' cultural backgrounds might affect the results, and a small number of samples might limit the statistical power.

Overall, the results imply that people are likely to feel more familiar and be more knowledgeable about a place if they work with a geo-local system that provides spatial images. However, the use of a tightly controlled task and route for the place visit limited subject choices with regard to how they (or if they) interacted with the place. As a result, this study should be seen as providing a constrained test of the impact of geospatial information format and content on subjects' engagement with a new place.

This study has implications not only to designers of geo-local systems, but also to other HCI researchers who are working with geospatial information. Also, this study can present a model for additional studies about geospatial information. Further studies with a larger number of samples and a broader range of places would help to better understand how people interact with and become familiar with places using geospatial information and geo-local systems.

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