

Putting Systems into Place: A Study of Design Requirements for Location-Aware Community Systems

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ABSTRACT

A number of innovative *location-aware* community systems have emerged; however, work to date in this area lacks a firm foundation. To remedy this, we present a conceptual framework and a series of studies into how *socially-defined places* influence people’s information sharing and communication needs. The first study identified a relationship between people’s place-related activities and their information needs. The second study clarified the connection between social networks, places and people’s interaction and information preferences. A third study, in progress, aims to expand upon and quantitatively assess the validity of our initial findings. Our findings argue that system design must factor in users’ activities and social networks, alongside place.

Introduction

The ability of designers to incorporate the concept of physical place into “community” systems has been quite limited. However, the widespread adoption of technologies such as the Global Positioning System (GPS), 802.11, Bluetooth, and RFID has the potential to change this. Numerous systems have explored this field, yet to date, their efforts have lacked a firm theoretical, conceptual, and empirical foundation - our research program aims to remedy this problem.

People, acting individually and collectively, actively structure their environments. They create specialized types of *places* to support a variety of activities [2], which constrain possibilities for action and communication. Some relevant observations are:

- A shared physical environment promotes informal social communication [7].
- The design of a place simultaneously encourages certain activities and discourages others [1][3].
- Places act as “social” filters [8].

The P3-Systems Conceptual Framework

The P3-Systems conceptual framework organizes the design space of location-aware systems into a 2 x 2 x 2 structure [4][6]. The major distinction is between **People-Centered** and **Place-Centered** systems. People-Centered systems employ user location to support awareness and informal communication and identify previously unknown affinities between users. Place-Centered systems link virtual spaces to physical locations and provide information on use of physical space by people. People-Centered systems can be further divided into absolute location and relative location. Place-Centered systems can be subdivided based on user activity and virtual spaces. The final dimension differentiates between synchronous and asynchronous systems, which include 'historical' data.

Table 1 summarizes the P3-systems framework.

P3-System Design Approaches		<i>Synchronous Communication or Synchronous Location Awareness</i>	<i>Asynchronous Communication or Asynchronous Location Awareness</i>
<i>People-Centered</i>	Absolute User Location	<i>Provides remote awareness of current user location</i>	<i>Provides people’s location histories</i>
	Co-location / Proximity	<i>Provides real-time inter-user co-location for the exchange of social information</i>	<i>Provides co-location history to enable future interactions</i>
<i>Place-Centered</i>	Use of Physical Spaces by People	<i>Provides online representation of user’s current use of physical spaces</i>	<i>Provides history of people’s use of a particular space</i>
	Interactions in Matching Virtual Places	<i>Provides synchronous online interactions spaces related physical location</i>	<i>Provides asynchronous online interactions related to physical location</i>

Research Activities

We designed a series of studies to investigate how the notion of “place” could be incorporated in to various P3-System designs, and explore the potential of various P3-System features. The first study examined the relationship between place and information needs. The second study looked at the relationship between place types and informal social communication. The third study aims to empirically verify and refine the findings of the first two studies.

Study 1 – Exploring the relationship between place-types and place-information

Our first study built on ideas from the environmental psychology literature and took them in the direction of system design. Specifically, we wanted to probe the extent to which certain types of places foster specific activities and how much this in turn leads to consistent place-related information needs.

We had 10 informants keep a diary for a day of the places that they visited and then further probed and elaborated the descriptions they generated through semi-structured interviews.

We were able to identify distinct place types and place-related information. Additionally, the studies deepened our understanding of place-related information needs by identifying several important considerations:

- Activity, rather than place, was the primary determinant of information needs.
- Within this understanding, the frequency of the activity and the persistence of the information played key roles.
- Interactions between these factors were also noted.

Table 2: Relationships between Places, Activities, and Information Stability

Activity Frequency	Stable Information	Dynamic Information
Frequently	Need: Low	Need: Moderate/High
Infrequently	Need: High	Need: High

In summary, this study identified the need for variables beyond the limited scope of place alone, when assessing information needs.

Study 2 – Exploring the relation between places, interaction, and information

Our second study explored the utility of various P3-System features, particularly in relation to informal social interactions. We examined two complementary questions:

1. What are people’s specific needs for place-related communication and information awareness?
2. What data are people willing to provide – about themselves or a place and associated activities – to enable place-related communication and information awareness?

The method used was similar to that of Study 1. Twenty individuals were used as informants.

We found that activities and social connections with others, associated with a particular place, related to social information sharing and retrieval preferences. For example, people described a general desire while at their place of work, to be provided with information about the location of colleagues and were willing to share personal location data with their work colleagues. However, informants did not typically want to share information about their location while at *work* with those not associated with *work*. This generalized with university students typically being open to sharing their personal location data while on *campus* with other students, but not with family members who were ‘detached’ from the *campus* social network.

The above findings were further refined by informants who specified four basic needs for which they would like information about other people in a place. These were:

- To support ad-hoc interaction with familiar people.
- To support ad-hoc interaction with strangers based on social matching.
- For better task coordination.
- To avoid people.

Study 3 – Empirical Verification and Refinement

To expand on the findings of Studies 1 and 2, we are currently conducting further studies using a combination of in-place surveys and Context-Aware Experience Life Sampling Methods (CAES) [4].

Implications for the Design of P3 Systems

From the numerous findings of these studies we can extract two main lessons.

- Place alone does not determine information needs; user routines and social relationships must be integrated.

- While people are willing to share their location information with others, for a seamless user experience the relationships between users, places, and their social networks will have to be simultaneously taken into account.

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