On PlaceMark: Collaborative Authoring, Place, and Identity

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(ABSTRACT)

Mobile, digital technologies are thought to augment and transcend the limits of our places, yet they raise the issue of what our places are. PlaceMark is a simple, distributed collaborative authoring environment constructed in conjunction with a site-specific writing activity. This system is examined as a *cultural probe*, investigating how new media students engage in collaborative writing and how they construct place. Findings include that students engage in the activity as if in *parallel play* (influencing one another implicitly rather than explicitly), that approaching the notion of place through writing may require development (working through issues brought to the place and the exercise), and that students' relationship to place, at least when asked to write about places that may be considered natural, is not characterized by certainty in behavioral framing.

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Chapter 1

Introduction

Place is a part of our everyday lived experiences. This work is is about the relationship between our experience of place and the mobile, digital technologies we use to augment and transcend their limits. While places, according to Harrison and Tatar, frame our behavior and potential for action, ubiquitous digital tools may obfuscate the framing and blur the significant distinctions of the places around us (2008). In response, this project is concerned with supporting active engagement with place. We present PlaceMark, a collaborative writing tool conceived as a thought piece for platial media systems. In examining PlaceMark through the lens of a cultural probe into the nature of collaborative writing *in situ*, this work aims to reconceptualize the design of place-oriented ubiquitous systems toward those which support place *noticing* and *reflecting*. In this reconceptualized approach, PlaceMark is not used to *tell* users where places are or why they are significant, but instead, it is used to *ask* them to identify places and to reflection their importance.

In the process of using PlaceMark in a new media context to engage a particular, historically-charged campus site, what emerges is less of a platial narrative than a set of reflections of the authors' selves as *evoked* by the place. Furthermore, the anticipated collaborative authoring activity unfolds not as a joint activity toward a common goal, but rather as a form of *parallel play* in which their own writings are not explicitly, but implicitly influenced by others.

1.1 PlaceMark Overview and Design Context

PlaceMark is a multi-user, collaborative authoring system in which users compose textual entries in a private work space and anonymously publish them to shared collections within the group's purview. It is designed for the creation of shared narratives, with strong support for sharing experiences of embodied reflections of place and places. Tightly intertwined with its corresponding collaborative authoring activity, PlaceMark's value as a system stems from serving as a provocative embodiment of alternative design goals. It takes a fresh, reflective approach to the relationship between users, ubiquitous systems, and place.

PlaceMark is a product of an interdisciplinary collaboration between human-computer

interaction researchers at Virginia Tech and the English Department at Hollins University, a women's liberal arts college. This collaboration is associated with the Hollins Community Project (HCP)—"an experiment in new media that explores the ethics of new media interfaces through the emplacement of history, narrative, and embodied affect" (Boyle, 2007). The exploration of these themes is conducted via the examination of particular places in relationship to particular technologies and genres. Indeed, one view of place-based education is that it encourages the study of places that are truly local, not necessarily popularly significant (Smith, 2002). The HCP focuses on a particular place: a field and trail site on the Hollins campus that now appears to the casual eye to be in a state of nature. However, partially buried within the foliage are artifacts of its history. Dramatic components of this history (to modern eyes) are remnants of quarters occupied by the slaves of the students before the U.S. Civil War and subsequently by their servants. Recent remnants come from re-use of the area to display student art and objects of study. A path is still used to connect the main campus with the homes of many of the people who work there. The trail and field sites are a "borderspace" between the Hollins Community and the campus (Boyle and Crandell, 2009): it both bridges the communities and, by its generally untended status and lack of official acknowledgement, occludes the relationship between the two.

With PlaceMark, students engage with this space, developing shared narratives of their experience with the places they identify there. Students are asked, "What are the places here, and why are they significant to you?" In response, they reflect on the space, construct their narratives, and sample the work of their peers during the exercise. Instead of passively digesting official narratives of the place, the students actively engage in creating unofficial, iterative narratives of their embodied experience. They are encouraged to notice places, and engage with them creatively. Furthermore, with the support of the software, they are able to integrate their reflections with those of their peers who are working throughout the site as well.

There are three specific ways in which PlaceMark approaches the relationship between place and its users differently from related systems. First, instead of using the system to define where significant places are, we are *asking* the students to find places significant to them. Contrast this to platial media systems that contain preloaded multimedia triggered at particular locations which implicitly communicate an official or condoned narrative of the place. Second, the PlaceMark design avoids substituting place with location. While linking content to location is useful in some applications, and location is certainly an important aspect in defining places, such an emphasis over-privileges location as a component of place. Third, we are downplaying the dominant conflation between place and Cartesian representations by deliberately not including a map feature. This, of course, is related to disconnecting location and place.

1.2 Cultural Probes

Developed for a new media class, we wanted students to use PlaceMark as *cultural probe* tool, enabling them to deepen their thinking through collaborative writing about particular

places. Originally meant as a resource for gaining multifarious and provocative perspectives about design contexts (Gaver et al., 1999), cultural probes have come to be used for a wide variety of purposes in the interaction design world (Boehner et al., 2007). At heart, cultural probes provoke and reveal; they generate creative opportunities and insightful perspectives for designers (or writers). Probes can illuminate conflicting interpretations of user experience and serve as a kind of kaleidoscope through which designers can develop a more rich (and challenging) understanding of users and situations (Gaver, 2007).

Cultural probes can be a special kind of hypothesis testing in that the investigators form hypotheses—their expectations—that are reified in the built artifact. The hypotheses are tested by giving the artifact to others to live with, with the expectation that the others will do something different with the artifact than expected—that is, the hypothesis will fail in ways that inform.[1] The indication of interesting departures from the initial hypothesis can be detected in semantic differentials, that is, in different ways of describing, using, or interpreting the system. Thus, students creating entries would reflect on how their words were heard and built upon by others and "redesign" or develop their thinking as a consequence.

Furthermore, the system and student authoring activity is analyzed as a cultural probe. Probes are not meant to assess whether a particular design worked, but rather to enlighten the designer about the various ways in which artifacts, designs, and activities can be interpreted by others who may not be privy to the "intent" or "purpose" of the design (Sengers and Gaver, 2006). In the present case, we look to the student writers constructs of meaning about the system of tools, topics, structures and products—in short, the genres that they develop with our software system.

PlaceMark was developed to enable *writing in place* about a particular site and a topic of the writing course was a specific place. In this work, we are *cultural-probing* the particular constructions of place that the tool enables.

1.3 Thesis Overview

Chapter 2 covers related work on place, its significance, and elaborates on how notions of place are leveraged in current efforts in ubiquitous computing designs. Chapter 3 follows with a thorough introduction to the collaborative PlaceMark system with its roots in the Hollins Community Project. Chapter 4 covers the user sessions conducted with PlaceMark both in a middle school setting and on the Hollins University campus. It includes analysis of the students' writings and experiences in the field, as well as what we learned from the cultural probes. Finally, chapter 5 concludes the work to date and lays out future work in the PlaceMark project.

[1] Cultural probes are not usability studies. User studies scrutinize the designed artifact and users' interaction with it, whereas cultural probes are not used to determine whether the artifact was effective toward a particular end, but rather, to provide insights into how the artifact was purposed and interpreted by the user.

Chapter 2

Place and Collaborative Systems

While we create the places around us, they, in turn, shape us and frame our behavior and practices (Gruenewald, 2003; Harrison and Tatar, 2008). This work seeks to support active user engagement with place, through using ubiquitous digital systems to promote platial *noticing* and *reflecting*. Rather than alerting users about important places or otherwise providing a dominant narrative about places' significances, we encourage users to actively engage in constructing places as they experience them and are influenced by the constructions of the people around them. This chapter frames the current effort in the context of research in space and place, ubiquitous computing, platial media, and collaborative systems.

2.1 The Significance of Place

Places are not simple or passive, but rather, they actively influence our behavior and lived experience (Tuan, 1977). Often conflated with mere location or physical space, place is a construction *imbued with meaning*: "space is the opportunity; place is the understood reality" (Harrison and Dourish, 1996). Place is attached to cultural meaning, and it is a focal point for activities and patterns of living. Furthermore, while spaces and environments can clearly constrain our ability to act (e.g., they define physical, visual, or aural boundaries), place "frames the appropriate behavior" for that environment (Harrison and Dourish, 1996).

Drawing on semiotics and linguistics, Harrison and Tatar provide a frame for the constitution of place by arguing that place is the "semantic tangle of people, events, and loci." (By *loci*, they mean "the space-places that exist (or do not [exist]) prior to the commencement of place creation") (2008). On this view, places are defined as *webs of mutually constituting concepts*. For example, a geographical coordinate is not, in itself, an adequate description of a place. Though it might signify a location that is meaningful, much of its meaning is derived from the people who are, have gone, or do go there and the events in which they engage. Place must be considered holistically as the intersection of socially- and personally-defined meanings and interpretations of lived reality.

Places are significant not only because they frame our behavior, but because they are intricately interwoven into the fabric of our cultures—we make them and they shape us. As

a semantic tangle of people, events, and loci, place is a construction of human making. From the physical spaces we create (towns, buildings, roads, etc.) (Dourish, 2006), to the events and rituals we perform, and even the places we may consider to be the most void of human involvement (i.e., the wilderness (Nash, 1982)), people *make* places. Reciprocally, places teach and shape us:

> ... as centers of experience, places *teach* us about how the world works and how our lives fit into the spaces we occupy. Further, places *make* us: As occupants of particular places with particular attributes, our identity and our possibilities are shaped (Gruenewald, 2003, p. 621).

Drawing on language used above, places actively frame our behavior and frame our selves (and vice-versa).

From this mutual constitution, we are bound to the places where we live, work, and play. We are not always explicitly aware of places and how they shape us, but we ought to *notice* how we make and define them (personally, socially, culturally, historically, etc.), so that we understand how they constrain and enable action, and how they preserve and shape our values. Casey writes, "To live is to live locally, and to know is first of all to know the places one is in" (Casey, 1996, p. 18) in (Gruenewald, 2003, p. 627). PlaceMark, the software system described in this work, is designed in an effort to foster this noticing and the reflection on places necessary to begin unpacking the web of meaning from which they are constructed.

2.2 Platial Media

The artifacts in our environment create possibilities for action. Likewise, ubiquitous digital systems (e.g., mobile phones, wireless communications, Global Positioning System (GPS) technology, etc) change our capabilities for action, potentially augmenting the information to which we have access, expanding our ability to communicate with others across boundaries of space and time, and ultimately multiplying our choices for engaging with places. Dourish writes, "the technologically mediated world does not stand apart from the physical world within which it is embedded; rather, it provides a new set of ways for that physical world to be understood and appropriated" (2006, p. 304). Ubiquitous computing creates new possibilities of interaction between people, the technologies they use, and the places in which they use them.

In *Human-Machine Reconfigurations*, Suchman urges a reconceptualization of users and their tools in terms of *agency*. Instead of attributing agency to merely the human actor or the object (as in the case of artificial intelligence), Suchman argues that we consider agency for action at the *interface* between objects and people (Suchman, 2007a,b). In the present discussion, we can extend this line of thought to Harrison and Tatar's semantic tangle of place: the potential for action and behavior occurs at the intersection of people, their platial context (including digital tools), and the events that occur.

For several years, designers and researchers in many fields of computing have explored the interactions between place, digital systems, and people, often searching for means by which users' location or, their context, can be leveraged to support engagement with the places and people around them. They have subsequently created numerous kinds of systems in the category we will call *platial media*.[1]

The prevailing wisdom among designers of these systems is that place (or at least components of place—location, people, and activities) can be a *resource* for storing, organizing, structuring, constraining, and delivering information. From this approach, users' physical, social, or temporal context can serve as triggers or filters for helpful services and content. Jones et al. have created a taxonomy to describe platial media systems (which they refer to as "P3-Systems"—linking People-to-People-to-Geographical-Places) (2004a). The P3 taxonomy divides these systems into two primary categories: *people-centered* and *place-centered*. People-centered systems connect people by drawing attention to the physical proximity of individuals or by providing information about their physical location (e.g., such a system could inform users that a friend is in the library). Place-centered systems, on the other hand, connect digital information or virtual locations to particular physical locations (e.g., systems which allow users to create "digital graffiti" (Burrell and Gay, 2002)). The P3 taxonomy can be partitioned further by the particular means by which systems accomplish these general goals of connecting people to people or people to locations (Jones et al., 2004a). It is important to note that this taxonomy was developed to chart out the design space for platial media systems to be leveraged in matching design requirements with features in their respective areas of concern.

Researchers are utilizing platial systems in several domains. Some of the earliest systems implemented were various forms of digital tour guides (and the frameworks to support them), providing contextual information to augment physical navigation of buildings, urban areas, and heritage sites (Abowd et al., 1997; Cheverst et al., 2000; Walker, 2007). Others were developed to explore user-driven, location-based information sharing and public conversation (digital graffiti) (Burrell and Gay, 2002; Espinoza et al., 2001; Fagerberg et al., 2003; Lane, 2003; Counts Media Inc., 2009). Similarly, the ActiveCampus system provides information for its users regarding the geographical whereabouts of other users on the system on a university campus (Griswold et al., 2004). The comMotion system attempts to infer important, frequently-visited places in an effort to provide contextually important personal information to its users upon demand (Marmasse and Schmandt, 2000). Also, designers have leveraged location-sensitive technology in creating multi-player outdoor games (Broll and Benford, 2005; Benford et al., 2005).

In education, platial media systems are being developed to create *ubi-learning* scenarios to facilitate students' interpretations of indoor and outdoor learning experiences. This allows them to collect data in the field and augment their experience of science-related activities (Cole and Stanton, 2003; Rogers et al., 2005; Harris et al., 2004), and to develop place-oriented stories (Bouvin et al., 2005). Similar to tour guide systems, other systems for

[1] In the literature, these systems go by various names, including *location-aware*, *location-oriented*, *context-aware*, *context-sensitive*, *place-oriented*, etc.

education augment student field trips to culturally recognized sites; specifically, Halloran et al. describe a platial media system that provides location-triggered information regarding an historic property and allows touring students to record data to later construct stories about their visit (2006).

This is, of course, not an exhaustive list of platial media systems. A recent increase in the availability of mobile devices equipped with GPS and data services (e.g., the Apple iPhone) has prompted a swell of market-ready location- and context-sensitive applications. The systems referenced above are a sample of recent research initiatives for inclusion in the subsequent discussion, and demonstrate the wide range of domains where place is leveraged as a system resource.

2.2.1 Sensing Context

Whether implicitly or explicitly, all platial media systems attempt to capture some notion of the user's context, some notion about the user's place. Typically, this is done by connecting various bits of information anchored around a location or similar orienting mechanism. Many of the systems that operate outdoors use GPS devices to discover user location (e.g., Benford et al., 2005; Marmasse and Schmandt, 2000; Bouvin et al., 2005). Indoors, systems can infer location from Wi-Fi routers or other types of radios (e.g., Abowd et al., 1997; Burrell and Gay, 2002; Fagerberg et al., 2003).

Part of the trouble with using these technologies in trying to capture place is that they require the designer to decide what constitutes part of the place. GPS systems have built-in inaccuracies, and tend to demonstrate a "drifting" behavior, depending on overhead clearance (Broll and Benford, 2005). If a system has a user's location coordinates and is trying to connect those coordinates to "near" data, how does it decide what constitutes *nearness*? Benford et al. describe an example of this problem in their outdoor gaming system in which player confusion and frustration resulted from a conflict between users' understanding of what is near (based on physical proximity) and how the system had defined boundaries for various game objects (2005). To solve this issue, the authors speculated about several techniques by which "nearness" could be redefined based on the physical location of users in relation to each other (or creating "linked personal auras"). Supplementing people and their activities in spaces required more context than the designers originally intended.

Systems which rely on statically-positioned Wi-Fi routers encounter different issues. The E-graffiti system, which allowed users to place digital-graffiti at various locations, utilized indoor Wi-Fi routers on a campus network. Due to this limitation, the system *explicitly defined campus buildings as individual places*; the buildings became containers for place-related information (Burrell and Gay, 2002). Of course, this kind of demarcation does not make sense in all (if not many) circumstances. For instance, such a system might ignore boundaries between floors or rooms—distinctions that may be critical in terms of place construction and experience.

One of the challenges in developing platial media systems is designing them to behave appropriately in place. When projecting a research agenda for the ubiquitous computing

community, Abowd and Mynatt claimed that one of the chief concerns for designing context-aware technologies would be to improve context sensing (seamlessly merging sensor systems and determining which parts of context is relevant to the user). This implies that the research goal is to design systems that better *understand* the world of the user (2000). The creators of the P3 framework conducted a pair of qualitative studies about people and their information needs and wants in various locations; they concluded that context-sensitive systems must include a concept of *socially meaningful places* (as opposed to locations), and that in order to serve the user properly, these systems must be sensitive to users' relationships with places, the users' relationship to the people in the place, accepted modes of behavior, and users' attitudes and interests (Jones et al., 2004b). Jones et al. are clear that context-sensitive systems that are truly context-sensitive must juggle a large variety of factors to be effective (2004b). They do not, however, speculate on the *implications* of systems that essentialize place by conflating it with something simple like location, for example.

Claims about creating systems with the aim of developing a more complete context-awareness should be taken with caution. Suchman addressed the inherent issues in designing artificial intelligence systems that attempt to interpret user actions and provide meaningful, relevant responses. She claimed that such systems inevitably confront the problem of capturing, representing, and interpreting an unending "horizon" of indexicality of human communication and action (2007b). Like the knowledge on which human communication is based, places are *active* and *evolving* conceptualizations; they are not static. At the very least, we must be skeptical of the degree to which these systems will ever be able to "capture" place and operate appropriately given the dynamic nature of our lived experiences.

Instead, it is more likely that we will continue to design systems which essentialize place—that is, define it based on a *mere subset* of the semantic tangle of people, events, and loci. In effect, these tools will augment places with information, services, and potential for action, perhaps appropriate in some conditions, but inappropriate for others. Hence, a disconnect is created between place and our opportunities for action in interfacing with these tools. This undermines behavioral framing, culturally, socially, and physically defined. The result is an obscuring toward, and a breaking of, place.

However, this does not imply that our ubiquitous, mobile, context-sensitive tools are of no use, nor should they be "considered harmful." Instead, we should at least take a reflective look at the trajectory of current design tendencies. Given the complexity and importance of place, what does it mean for us to integrate powerful platial media tools into our experiences? How do they affect our noticing or perceiving of places? PlaceMark, the system presented here, is designed not to understand or sense place, but to be a vehicle for communication and sharing experiences of place. It uses location-oriented features, but primarily as means of expression. With it, we avoid identifying or demarcating places, but rather ask, *What and where are the places, and how do you experience them?*

2.2.2 Context-Sensitive Information

Platial media systems provide services by linking aspects of the user's context with meaningful information. Depending on the application domain, this information can come from several different sources. Early tour guide systems depended on developers or administrators to create system content (for examples, see Abowd et al., 1997; Cheverst et al., 2000). Urban mediascape projects designed to explore the interaction of history, place, and locative media have utilized this method as well (Longford, 2008; Knowlton et al., 2004). So-called ubi-learning systems have depended on a combination of pre-entered and user-generated content. For example, the Ambient Wood system contained preloaded multimedia triggered by user actions at various locations, but also allowed students to capture measurements and data from the environment in which they were working (Rogers et al., 2005). The literacy field trip system described by Halloran et al. relied on multimedia content created by the system's developers and site managers, with which, as in Ambient Wood, users would encounter the media by arriving at various predetermined locations (2006). Users would create their own content for use later in creating narratives about their experiences at the heritage site.

There are two primary problems with depending on content developed by administrators or developers. First, systems that depend on administrators to enter data are not sustainable or robust over time.[2] Researchers have recognized this problem. Several have focused their efforts on creating mechanisms for user-generated content which either usurps or complements content created by administrators (Bouvin et al., 2005; Schuler et al., 2007). The information in these systems is more dynamic and potentially more relevant and rich.

More pertinent to the present work, however, is the second issue with relying on pre-generated content. In other words, such "official" content implicitly identifies the places that are recognized as "important." For example, if an administrator creates content which is triggered at a particular location, that administrator is signaling to the user that location (read, "place") is significant, implying that other places not linked to a trigger might be less important. This implicitly privileges one place over another, while discounting the experience of the user.

The creators of the Yellow Arrow project explicitly address this issue. Yellow Arrow is a public project "built around the general philosophy that every place is distinct and engaging if seen from a unique perspective" (Counts Media Inc., 2009). Users in urban settings can place yellow arrow stickers in public spaces. Each sticker has an associated identification number. The user can then post media about a place (recordings, images and text) to the Yellow Arrow website, tying content to the sticker. When members of the public encounter the arrow stickers, they can use their mobile phones to access content related to that sticker, browse for it on the web, or attach their own media to the sticker ID. The main thrust here is that users can share their own stories of place, marking the *unofficial* places, and creating

[2]This problem is akin to that of websites which rely solely on content generated by web administrators. It is expensive and difficult to create content which is fresh and useful, thus the recent movement in so-called Web 2.0 sites that leverage user-driven content to remain relevant and engaging.

their own narratives of experience.

The Urban Tapestries project operates in a similar manner. Users of this system create their own trails (or "threads") of digital content attached to locations in an urban environment. According to Lane, Urban Tapestries "enables a community's collective memory to grow organically, allowing ordinary citizens to embed social knowledge in the new wireless landscape of the city" (2003, p. 169). Its user-centric design is a deliberate affront to systems based on administrator-generated content "which control and author the user experience" (Lane, 2003, p. 169).

The significance of these projects is that they, unlike systems which privilege non-user-generated content, emphasize the process of *place making*. Users who generate narrative content are actively engaged in noticing, reflecting, and constructing representations of the places meaningful to them.

User-generated place-labeling is supported by a few of the systems reviewed here. In particular, because of the inherent incapability of their Wi-Fi-based positioning system to interpret "place," Fagerberg et al. added a feature to their E-graffiti system called *place labels*; this feature allowed users to generate socially-meaningful names for the places from which they leave place-relevant notes (2003). Place labels served as containers for other messages within the system. The comMotion system attempts to infer the locations of its users' important places by noting the location of recurring GPS blackouts (presumably due to the user entering a building). The system subsequently prompts the user to name the place (Marmasse and Schmandt, 2000). Moreover, Jones et al. conclude that place-labeling is the first step towards systems that provide appropriate services for socially meaningful places (2004b).

Generally speaking, PlaceMark follows line of work avoiding using content created by administrators, developers, or instructors, and instead leaving the place-marking to the users. The purpose is to encourage an *active* engagement in the writing process and place noticing.

2.3 PlaceMark and Conventional Collaborative Tools

Like many of the locative media tools mentioned, PlaceMark is a collaborative tool. To create a reference point for understanding the properties of PlaceMark, this section describes the landscape of what might be considered "conventional" collaborative tools. While unique, PlaceMark does not exist in full isolation from any of the systems mentioned here. In fact, it contains variations of features of many collaboration and communication tools. Though none of these systems was designed for the same context as PlaceMark. It is important to highlight how they are insufficient or inappropriate for the activities in the current project.

When comparing conventional collaborative systems to PlaceMark, we can focus on particular properties which affect interaction, coordination, and collaboration among users. In particular, table 2.1 on page 11 lists several systems and their respective properties in terms of the unit of user control, the stability of system content, content organization mechanisms, and the level of synchrony between users and the content they create.

Table 2.1: Content and coordination properties of collaborative systems

System	Unit of User Actions	Stability of Content	Content Organization	Synchrony and Data Delivery
PlaceMark	create and share entries & tags, rearrange order of entries	text stable, order of entries editable by all users	linear list of entries	nearly-synchronous, push
Google Docs	compose and edit document text	all content unstable; editable by collaborators	linear text in single document	nearly-synchronous, push
Wikis	compose and edit pages, sections, elements of page	most content unstable; admin. can lock	pages, linear text, sections, hypertext	asynchronous, pull
Blogs	compose and edit posts, create and apply tags, filter reader comments	typically stable in practice, but author can change posts, filter comments, tags	posts, linear text with sections, hypertext	asynchronous, pull
Online Forums	compose and share post, create and apply tags	varies—some content editable by author, admin. can filter/remove	linear hierarchy of posts	asynchronous, pull
Instant Messaging (IM)	compose and send statements	all content stable	fixed, linear list of comments	nearly-synchronous, push
Email	compose and send message	all content stable	messages, linear text, can be organized by properties in clients	asynchronous, push/pull

First, in the writing activity associated with PlaceMark, authors must be able to compose entries in a private space, independent of the others' process of generating text (thus the unit of user control is limited to creating individual entries instead of being able to edit the *entire collection* of entries). Furthermore, the content of the text need to be stable. This provides referential integrity when one author wishes to address or "talk back to" an entry from another author. Additionally, in terms of content organization, PlaceMark supports a shared, linear listing of the entries (as opposed to a hierarchical, or free positioning in a two-dimensional space, for instance). Like organizational techniques of positioning and grouping (Yamamoto et al., 2000; Shipman et al., 1995), linearity as a form of organization can impose constraints on interpretation and meaning of the texts, and in this case, is reminiscent of conventional narrative genres.

The two most relevant collaborative tools to discuss in the context of collaborative authoring are wikis and shared document editors like Google Docs.[3] In Google Docs, the document is the object unit with which users primarily interact. After creating documents, users appoint collaborators who gain permission to also edit the document. One of the primary points of attraction for shared document editors like Google Docs is simultaneous editing. The system maintains the most recent version of the document on a central server; users' changes are submitted to the server and then propagated to all of the other collaborators (Dekeyser and Watson, 2006). The system tries to create a sense that all authors are working on the most up-to-date copy at the same time. However, in fact, it is often what Clark called "nearly-synchronous"(Clark and Brennan, 1991), with changes taking as long as ten to twenty seconds to propagate, depending on the network connection speed. Furthermore, because any collaborator can edit any part of the document at any time, it is possible that their edits will conflict. To avoid these conflicts, the users must establish their own mechanisms of coordinating the editing process *outside of the system.* Such conflicts in text construction do not exist in PlaceMark because each author can only work on text privately before sharing it with the group, and once it is shared, it cannot be modified. Similarly, an additional drawback of Google Docs for the present purposes are the document-level editing capabilities of the users. Any user can modify any portion of the document to which he has write privileges. Thus, the notion of stable content is lost.

Likewise, wikis lack content stability. While this is clearly an intentional design decision important to wiki communities, it defeats the present goal of stable referential integrity to creative output. Like Google Docs, the means by which content is edited in a wiki allows users to "step on each others' feet," so to speak. While functionality varies by system, in pbwiki,[4] for example, one author can create a new section of wiki page while another also creates a new section. The author which posts the change last will *overwrite* the content created by the first. This is a symptom of the unit of user control at the page or page section level.

While shared document editors and wikis allow for entire documents to be modified by users at once, online forums provide a much more limited unit of control for their users—

[3] `http://docs.google.com`

[4] `http://pbwiki.com`

the post. A *post* in an online forum is analogous to an *entry* in PlaceMark. Forums can be configured for anonymous user submissions, and, like PlaceMark, can easily support tagging. However, forums are predominately *hierarchical* and meant to facilitate *threaded discussion* through explicit replies, directly supported by the system. While PlaceMark users can write in response to extant entries, the PlaceMark genre is not that of discussion. Explicit linking, at least in the manner of forums, limits the degree to which any particular entry can be *interpreted* as a member of the larger collection. In PlaceMark, the authoring context of each entry is ambiguous. Furthermore, while the positions of posts in forum threads are locked, PlaceMark entries can be reorganized, augmenting the interpretive possibilities granted by the ambiguous context.

Similar to forums, blogs support individual entries (or posts) as well. They allow for content persistence, tagging, and (potentially) author anonymity. Blogs in their current form, however, do not support the kind of linear aggregating and potential for shared organization of PlaceMark. Furthermore, they operate on the same pull model as forums and standard web pages. Alternatively, one might think of PlaceMark as a kind of blog reader, in which posts made by several individuals are pooled in a single location. However, while blogs are meant for *broadcast*, PlaceMark entries are really intended for a group sharing a specific experience.

PlaceMark also bears resemblance to variations of instant messaging (IM) applications. Unlike blogs and online forums, IM systems update in real-time on a "push" model. (In other words, content is *pushed* down to the users' machines instead of being *pulled* or periodically *polled* like a traditional web page or forum.) Yet, like forums, IM systems are typically dialogic in nature and users' individual contributions typically only make sense in their original order; typically users cannot rearrange the conversation entries, even if it made sense to do so.

Context-sensitive tools notwithstanding, it is clear that from among what have become some of the standard collaborative tools, PlaceMark is unique. Again, this is not surprising, given the unique nature of the activities it is meant to support. This section merely clarifies the software's niche, indicating that it could not be filled by an existing system and provides a context for understanding the system.

2.4 Chapter Conclusion

The research context in which the present work is situated includes a barrage of ubiquitous systems existing in several design domains. Whether in the context of education, travel, community building, or narrative construction, all attempt to leverage the interaction between the physical and social context of the user and pertinent digital content. We have seen tendencies to conflate location with place, to push for systems that (either implicitly or explicitly) try to perform the interpretive grunt-work to identify places, and (with some exceptions) a general move toward systems designed to tell users where places are, instead of the other way around. Of primary concern here is the way the system is designed, approaching places as things to be noticed, places as framers of behavior, and people as makers

of places.

What happens when people are asked what this place is instead of being told? How do users conceive of place, particularly when geographical location is not privileged by the system? What is the role of location information in systems designed for place-noticing?

The following chapters describe the PlaceMark system and a collaborative authoring activity that it supports. Throughout its development, this project has existed in a design space unlike most of the systems reviewed here. Rather than replacing them or usurping their role and utility, PlaceMark should be understood in part as a provocational reaction to the design goals in these domains and as a thought-piece on the relationship between ubiquitous systems, people, and the meaning of places. It is used here as a cultural probe in understanding social place construction and collaborative authoring.

Chapter 3

Collaborative Authoring and PlaceMark

PlaceMark, the multi-user, collaborative authoring system described here, exists in the design space of the Hollins Community Project (HCP). The thrust of the writing activity on the Hollins site—embodied engagement with place, history, and narrative—is supported by PlaceMark's unique combination of collaborative and location-oriented features. This chapter further elaborates on the design context of the system and details PlaceMark's capabilities, interface, and key implementation characteristics relevant to the user experience.

3.1 Design Context

As discussed, the HCP is a new media project exploring the relationship between embodied experience and the historical context of a particular trail and field site on a college campus. The historically-charged landscape becomes the subject of the project participants' reading. Buried in this space are layers of objects, carved geographies, and remnants of the relationship between the college and the Hollins Community.

Student participants (the users of PlaceMark) are faced with the *learning* goals of confronting and understanding the relationship between their own experience of the place of Hollins and its actual history of slavery and racial discrimination. With the software, they are being asked to notice, explicate, and share their experiences of place and places *in situ* toward the production of textual narratives. PlaceMark facilitates the construction and sharing of these texts.

3.2 Supporting Collaborative Authoring

In collaborative systems, it is crucial that the interface mechanisms for multi-user interaction are suitable for collaborative processes at hand. Suthers points to *affordances* in collaborative technologies which affect how a system scaffolds learners' activities, providing focusing

guidance toward pedagogically significant actions (2006). For example, system properties can *afford* potential for participant negotiation, resources for referencing in conversation, information persistence for later reflection, and reinforcement for *intersubjective* knowledge creation (Suthers, 2006, p. 12-14). Furthermore, information representation can affect the processes and points of focus for collaborative learning (Suthers and Hundhausen, 2003; Dwyer and Suthers, 2005). Tools which lack the appropriate levels of constraint on user action may not be most effective in focusing action and attention to that which is most significant.

Perhaps the most significant scaffolding PlaceMark must provide is that for reflecting, noticing, and sharing. It should focus students toward the social nature of place construction while supporting their expression as individuals in a larger group activity. Thus, the system should encourage the movement of students' attention from the *private* sphere of their own authoring to the *public* collection of place construction. In learning scenarios, Vahey et al. suggest that creating room in collaborative systems for private reflection and idea development prior to joining the public sphere might afford more freedom for learners to experiment, take risks, or make mistakes privately prior to public participation (2006). (In the present case, student authors construct text privately prior to publishing to their peer group.) Moreover, they argue that tools that offer both private and public modes of operation allow students to engage in activities which blend the two dominate metaphors of learning—public participation, and private acquisition.

PlaceMark as a Multi-User System

PlaceMark creates opportunities for student engagement through defining the notions of *multi-user* and *collaborative* in very particular, tailored ways. In the context of an academic environment, the software was designed with the assumption that multiple students would participate in a group activity where each member runs the software client individually on her own device (specifically a laptop); the networked software allows them to create and manipulate content both individually and as a group. The software supports multi-user manipulation of *shared* digital objects, particularly special text objects.

Hence, the interface is not shared in the sense that a multi-touch surface or a whiteboard is shared (in a many-to-one physical mapping between users and system artifacts). Recently, some education technologists and researchers have focused on shared interfaces for collaboration which create such a many-to-one mapping. These systems are intended to facilitate fine-grained coordination in which the users develop and *continuously maintain* a shared understanding of the task at hand (e.g., Kerawalla et al., 2008; Rick et al., 2008). Instead, the present system leverages a wireless network to coordinate shared data between client systems which are manipulated and viewed individually.

The software is intended as a tool for creating a *shared narrative*. The written output is not a cohesive document, but a linearly arranged collection of individual textual entries with different voices, which, considered together, form a group narrative of a shared experience of places. In effect, PlaceMark and its respective authoring activity are not continuously

Table 3.1: Conceptual interface object properties

Object	Properties
Activities	Logical containers for entries and tags
	Contents persisted across sessions
Entries	User-generated textual entity
	Shared, anonymous, and immutable
	Can contain location and time stamps
Tags	User-generated
	Can be embedded into locations within entries
	Mechanism for annotating, organizing, and augmenting

collaborative in the fine-grained sense, but the software creates possible *points* for collaboration and co-incidence—not in the individual's writing process, but in reading, interpreting, commenting, annotating, and tagging.

3.3 Conceptual Interface Objects

While the context of use and the system interface are integral in structuring users' experience with PlaceMark, it is the conceptual (or logical) objects behind the interface and their behavior that form the essence of the system. This section describes three such objects: *activities*, *entries*, and *tags* (see table 3.1). These objects and their respective properties define the granularity of collaboration as well as the inherent flexibility and constraints of the system. The interface follows from these objects.

3.3.1 Activities

Activities form the contexts of all user action within the system and act as conceptual containers or logical groupings of all user-created content. Each item of user-created content resides in exactly one activity. Thus, users must "join" an activity prior to creating, viewing, or augmenting content in PlaceMark. (It may helpful to think of activities as special chat rooms, rooms in a multi-user domains [MUDs], or common "spaces" shared by a group of PlaceMark users.) When creating activities, users assign to them meaningful names based on particular topics, group actions, or subjects of reflection (e.g., "Hollins Field [12 Dec. 2008]").

Activities and their contents can be persisted across sessions of use. Thus, content from one session can be integrated into later sessions. Furthermore, users can export content from one activity to be imported into any number of other activities.

3.3.2 Entries

Entries are units of text (notes, comments, narratives) created individually by users on their own machines. Creating, reading, and reflecting on entries are the users' essential activities with the software.

During an entry's lifespan, it moves from the *private* confines of the author's system to the *public* sphere of the activity. First, entries are created privately. That is, they are composed on the users' local machines; during this process, they cannot be viewed by anyone but their respective authors. Upon completing entries, authors share (or publish) them to the activity in which they are working. Shared entries become *public* in the sense that they are visible to all users in the entries' respective activities. Hence, entries are not published to a specific set of users, but to an *activity*. Note that once entries are shared, they are visible, but not editable (not even by their respective authors). The intent here is to create a sense of referential consistency within the collection of entries. This allows other authors to reference or build upon existing entries without concern that they will be modified later.

PlaceMark does not explicitly tie entries to the identities of their authors—they are anonymous. This is a subtle, but important aspect of the authoring process. Anonymity is supported in PlaceMark to balance a sense of identity and textual ownership in the collaborative writing process. Of course, authors know which entries they created. Yet, by placing these entries among other anonymous entries, the hope is that the authors develop a sense of shared ownership over the collection of entries *as a whole*. Additionally, anonymity potentially provides a safety net for creative risks (Davis, 2007).

Alternatively, making entries anonymous risks reduced author accountability in terms of quantity, quality, and content of written output. Ultimately, textual composition is a student-driven process and must be managed and supported at both the individual and group levels. As an educational process, collaborative writing with PlaceMark is subject to instructional management strategies and methods. It is not the goal of the design to enforce any particular method of management.

Stamps

During an entry's authoring phase, users can optionally insert special textual *time* or *location* stamps into the body of the entry text. Time stamps contain the date and time of when they are inserted. Location stamps are composed of GPS coordinates (longitude and latitude), designating the user's geographical location at the moment of insertion. As elements in the entry text, stamps are *not* treated as special objects, and, like any other part of the entry, are fully editable by the authors.

Stamps are *compositional resources* for authors. In narratives of place and embodied experience, time and location can be important vehicles for expression. As quantified representations, stamps are only one of the many ways authors may convey platial aspects of experience. Additionally, these stamps maintain a referential quality; embedded in entries, they become resources by which users can compare, arrange, and find meaning in the narratives of others.

Geographical coordinates are mathematical abstractions, and without more context (such as a map), their meaning as locative units cannot be used easily for understanding location and relative positions—this is the case in PlaceMark. However, as creative material for thinking about place, location coordinates augment the texts in which they are embedded. While quantitative location coordinates appear to have objectivity and certainty, they are, in essence, abstract. While qualitative descriptions appear to be subjective, they are based in mental or physical experience. The interweaving of these two forms of expression is part of an emergent provocation for reflection on the nature of place and place demarcation.

3.3.3 Tags

While entry texts cannot be edited once they are shared, they can be marked with *tags*. Like traditional tags in blogs, forums, or email, PlaceMark tags are short textual labels created by users and embedded into entry text. Tags share many properties with entries; they are created by users; once created, they cannot be edited or removed; their authors are anonymous; and, tags are shared within the activity (table 3.1). Once created, a tag is stored in a public list and becomes an available resource for other authors.

The generality of tags makes them quite flexible. Possible uses include peer feedback, augmenting entry content, peer interpretation, organization, and post-activity processing. Authors can treat tags as tools for augmenting or appending meaning to existing entries. Finally, the extra information provided by tags supports the possibility of creating other representations of entries in the future such as tag clouds, diagrams, and mappings.

3.4 User Interface and Features

PlaceMark was loosely designed under the principle of *zensign*—the design approach that functionality *not* included in the system is just as important as that which *is* included (Tatar et al., 2008). Subsequently, the user interface was intended to be simple, streamlined, and easy for students to grasp quickly. Thus, primary functionality exists in a single window and is divided into three sub-screens: "New Entry," "Organize Entries," and "Tag Groups." This section describes how users might interact with the software and elaborate on certain design decisions not discussed elsewhere.

3.4.1 New Entry

All text entry authoring occurs on the "New Entry" screen (figure 3.1). During the authoring process, users can optionally insert time or location stamps into the text at the position of the keyboard cursor by clicking on the "Stamp Time" or "Stamp Location" buttons, respectively. On this screen, the system makes no functional distinction between the main text of an entry and any inserted location or time stamps. Users can modify them like any other portion of text.

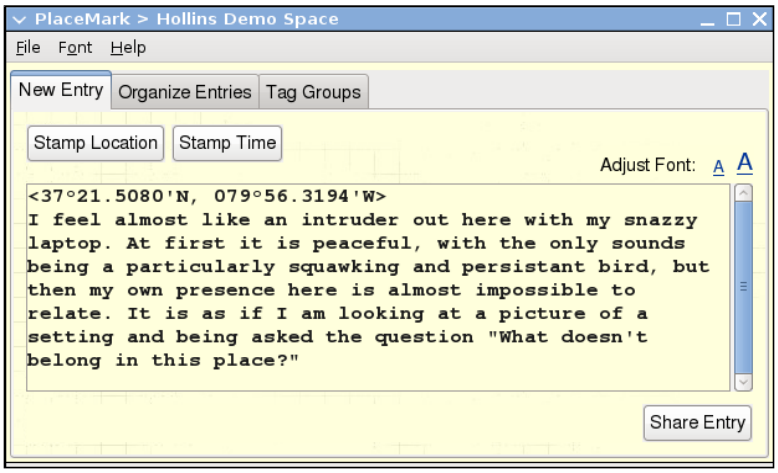

Figure 3.1: New Entry screen. Users insert location and time stamps at the cursor position by pressing either of the stamp buttons in the upper-left corner.

Unlike other parts of the interface, the New Entry screen is entirely *private* to the user's local machine. To share a finished entry, users simply press the "Share Entry" button. This publishes the entry to the activity in which the user is working. Once shared, entries cannot be deleted or modified. However, they can be viewed, re-arranged, and tagged in the "Organize Entries" screen.

3.4.2 Organize Entries

In the "Organize Entries" screen, users can view and organize all of the entries that have been created and shared within the activity in which they are working (figure 3.2). All entries are displayed in a vertical, linear list. As users create and share new entries, they are appended to the bottom of the list. The order in which the entries appear in the list is flexible, however; users can reorder the list by dragging and dropping entries into new positions.

Unlike the authoring area in the New Entry screen, the entry list is a *shared resource*. That is, the order of the entries is the same for all users in the activity. Consequently, if one user changes the order, it changes for every other user as well, in a nearly-synchronous fashion.

In general, PlaceMark supports sharing entries so peers can be exposed to and respond to each other's observations on place. The linear list representation influences readers' interpretation of the text; likewise the *order* of the entries has an impact on how the texts are understood. (By changing the order of entries, users are effectively changing the context in which the entries appear.) In designing the system to support a single, shared ordering, we are attempting to support a common entity to which users may reference, particularly in post-activity discussions. Additionally, the shared list allows users to share particular

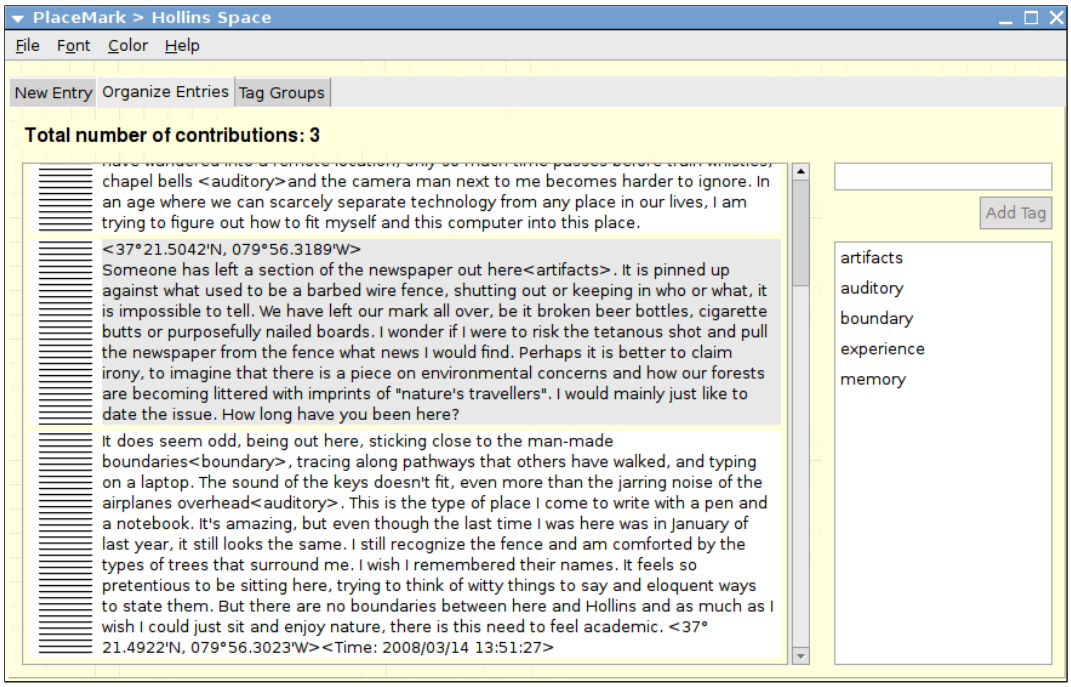

Figure 3.2: Organize Entries screen

orderings or groupings they find meaningful.

Tags

The Organize Entries screen is also where users can apply tags to entries. Tags are user-generated and reside in a shared list. (This list is to the right of the entries list in figure 3.2.) Any user can embed any number of tags into specific locations within any entry (regardless of its authorship), and multiple copies of the same tag can be embedded into a single entry. Because shared entries are immutable, tags are the only means within the software to add (or change) entry content or meaning. While there is no limit to the length of the tags, the interface might encourage shorter tags, given that they are composed in a small text box and displayed in a relatively narrow list. Like traditional tagging, PlaceMark tagging facilitates entry organization and grouping not possible with the simple list.

3.4.3 Tag Groups

While the process of tagging takes place on the Organize Entries screen, the "Tag Groups" screen contains features for organizing, viewing, sorting, and exporting entries grouped by sets of tags (figure 3.3). Working left to right on the screen, users create a subset from all shared tags in an activity, and then view the entries which contain those tags inside a private list on the right. These subsets of entries and tags can be exported to an XML file to be

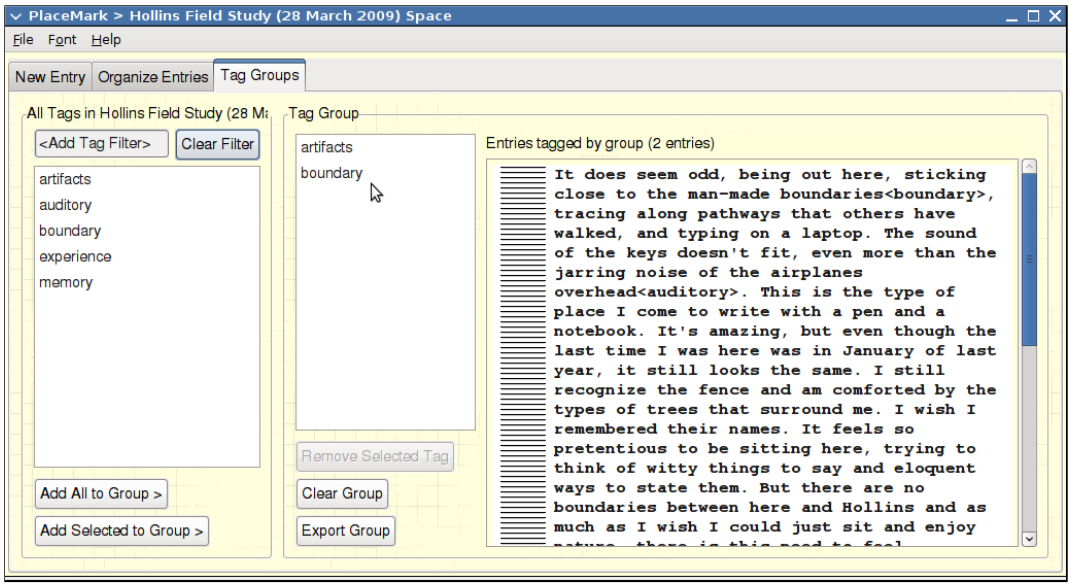

Figure 3.3: Tag Groups screen. The entries on the right are those from the activity containing the tags *artifacts* and *boundary* (as selected in the Tag Group collection).

processed by other software or to be imported back into PlaceMark activities in the future. The tag management screen was designed primarily for activities following writing sessions in the field (discussion, analysis, etc.), though its use is not limited to that context.

3.4.4 Virtual Compass

PlaceMark generally does not treat time and location stamps as special objects. They are, in essence, indistinguishable from the text of the entries. There is, however, one exception. Designed to support collaborative writing about places *in situ*, PlaceMark includes a feature which aids students in physically navigating to the locations at which location stamps (and by extension, their respective entries) were created. This feature is called the *Virtual Compass* (VC) (figure 3.4).

When a student clicks on a location stamp in an entry, the VC window displays an arrow on a cardinal axis, roughly indicating the direction the student must walk from her current location to approach the area where the stamp was created. Because the GPS devices do not provide orientation information, users must orient themselves to the north using a standard compass. Additionally, the VC window provides the rough distance (as a range) between the user's current location and the location indicated by the stamp. As the student moves, the VC updates its information accordingly. As opposed to an exact distance, ranges are used because GPS receivers operate with a fairly large margin of error (approximately 10 meters, or worse, depending on weather conditions and line-of-site issues from trees or buildings). Ranges are used also because the relationship between the location designated and the place

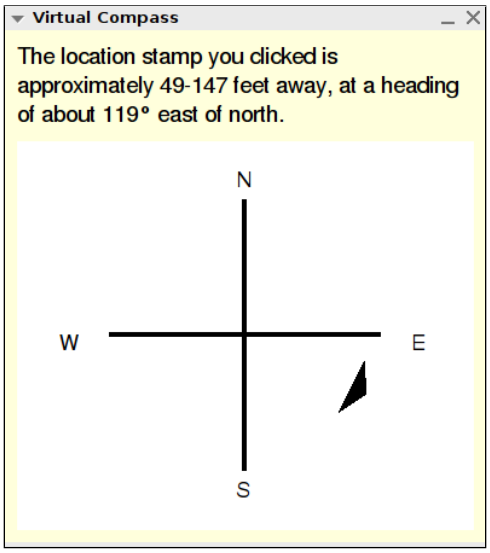

Figure 3.4: Virtual Compass window

referenced by the mark is usually unspecified.

As the primary feature in PlaceMark which makes sense of the location information associated with entries, the VC replaces the more traditional platial media feature: the map. While some form of a map is used in several context-aware systems (e.g., Griswold et al., 2004; Bouvin et al., 2005), the PlaceMark design is aimed at anchoring the user in a more embodied, user-driven experience of place.

Maps are not impartial media for communicating information; on the contrary, they, like all forms of information representation, convey the biases of those who create them. They are socially constructed and act as "brokers of power"—map makers, through abstract representation of geographies, locations, and places, cannot avoid conveying what *they* think is (and what is not) important to map users (Crampton, 2001; Harley, 1989). *With PlaceMark, instead of telling students where the places are, we are asking them to identify places.*

From a didactic point of view, we are trying to avoid conflation of place with geographical location, yet we do not want to ignore abstract mathematics as valid means of (partially) describing place. Instead, we wanted to emphasize a more embodied experience of place. The irony of this design decision is not lost on us; by avoiding maps we wanted to avoid reifying a particular set of ideas, yet this very decision is an act of promoting one mode of expression over another. However, this is intentional. PlaceMark is a system for provocation, and by subverting traditional design, we are hoping to inspire a reconsideration among designers regarding the relationship between platial media applications and place itself.

3.5 Implementation

For purposes of maximizing portability between platforms, PlaceMark was implemented as a Java application. To facilitate network coordination between machines, PlaceMark relies heavily on the tuple spaces programming paradigm.

3.5.1 Tuple Spaces

The tuple spaces paradigm was originally developed as a language for coordinating large distributed systems in which multiple computers would work together to perform intensive computational tasks (Gelernter and Carriero, 1992; Gelernter, 1985). In the most general terms it is a model for distributed, associative memory. It consists of a shared network space into which client programs, such as PlaceMark, can place digital objects to be read or consumed by any other programs accessing the space (e.g., other instances of PlaceMark operating on different users' computers). PlaceMark uses this model to represent activities and to share entries and tags.

While no user is directly exposed to the programming layer of PlaceMark, benefits of incorporating tuple spaces to design coordination software do, however, percolate up to the user interface through the program's behavior. Thus, as described by Roschelle et al. and Tatar et al., tuple spaces provide several distinct advantages for constructing user coordination systems, including a high level of expressiveness in the data written to the spaces, a data template matching feature which provides a database-like functionality, and decoupling between producers and consumers of data (2007; 2008). The third feature, decoupling, has particularly important implications for the user experience in terms of network connectivity between users.

Decoupling in this sense can be described by a short example. When a student uses PlaceMark to publish an entry for the other users, her computer does not communicate directly with any of the other users' computers on the network. Instead, entries are distributed through a central server, creating a level of decoupling between users. Thus, multiple computers running PlaceMark can coordinate without directly communicating with each other, or even having any knowledge of each other.

Thus, decoupling between producers and consumers of data using tuple spaces affects issues of software usability, robustness, and administration. This has the advantage that users may join and leave PlaceMark activities as they choose—there is no notion of "inviting" or "permitting" a student to join the activity like in a chat room, for instance. Furthermore, in the unstable wireless network context in which the system operates, computers which lose their network connection can easily rejoin activities upon re-establishing a connection to the network. This added robustness provided by the tuple spaces platform also means that despite any network issues or software failures on individual computers, the work of the other users of the system may continue unhindered (Johanson and Fox, 2004).

PlaceMark uses an implementation of the tuple spaces platform from IBM called TSpaces (Wyckoff et al., 1998). TSpaces provides the tuple spaces server functionality, but requires

little administrative overhead. The software can typically be started with little or no configuration, and simply needs to be running on any computer on the network for students to begin using PlaceMark.

While configuring the PlaceMark software environment is relatively simple, the serious difficulties in running PlaceMark in the field stem from network connectivity.

3.5.2 Network Infrastructure

In an ideal situation, designers of multi-user software systems would not have to be concerned about issues of network connectivity and infrastructure. However, this luxury is not afforded to designers of ubiquitous mobile systems. Furthermore, limits on connectivity impact user experience, and, in the present project, users' reflections on place.

The implementation of tuples spaces used for PlaceMark required a central server directly accessible by all of the client machines. Because the campus Wi-Fi signal does not extend out to the field and trail site, we had to provide our own network infrastructure. While using mobile phone data connections might have been a suitable alternative, due to budget restrictions we were limited to standard Wi-Fi solutions. In an initial attempt to minimize infrastructure, we configured all of the machines using the software to form an ad-hoc network connection. (Such an architecture allows our machines to connect to the server *directly* without going through a router.) However, the ad-hoc architecture solution proved to provide inadequate coverage on the site. Thus, we ultimately had to construct a standard Wi-Fi network, complete with routers, antennae, and Wi-Fi repeaters. While this solution has complicated on-site setup it has proved to cover much of the site, allowing client machines to remain connected to the server as long as users do not wander too far off the trail or field.

The effectiveness and performance of the wireless network is critical in the user experience because without maintaining a connection to the server, users can neither share nor receive entries and tags. The area of network coverage, in turn, restricts where users are likely to work. This, consequently, may impact their reflections on the place and their readings of the landscape.

3.6 Chapter Summary

PlaceMark is a multi-user, collaborative authoring system with lightweight features for augmenting users' reflections on place. As a part of a multidisciplinary collaboration between the fields of human-computer interaction and new media, it is designed for outdoor writing activities in an historically-rich environment. Working within the conceptual notion of an activity, users create and share entries, view these entries in a shared collection, and create tags to embed into the entries.

As a software system, PlaceMark is unique in terms of collaborative properties and how it integrates location information with the user experience. While the system's designers have particular goals for users in mind during its development, it was not clear exactly how users would engage with the software and the writing activity in reality. Toward this end

of understanding, we engaged several groups of students in field sessions with the software. These studies and the analysis of these sessions is covered in the next chapter.

Chapter 4

Enacting the Cultural Probes

Over the process of a year, five user sessions were conducted with PlaceMark as cultural probes into the collaborative narrative genre and place writing activity. Each of these sessions included unique sets of participants. One was conducted as an after-school activity at a local middle school, while the other four were conducted on the field and trail site at Hollins University with Hollins students.

4.1 Designer Expectations

To understand the semantic differences that are important outcomes of cultural probes, we must understand the designers' expectations. Like all designers, we came to the field exercises with a set of assumptions and expectations both about the process with which the students would write and the topics they would write about.

4.1.1 Authoring Process

As designers, we imagined the writing process as a joint activity of building a narrative. Though each author would be writing on their own in private spaces, and they were not instructed to produce something literally cohesive, we nonetheless anticipated that authors would *build off of one-another*. The process of sharing in a public space was not intended just for reading, but for provocation in each author's own writing. Consequently, we anticipated an implicit semi-cyclical authoring process in which students reflect and write, and either during the authoring process or in-between writing entries, they would pause to investigate the writing of their fellow students (figure 4.1). The work of their peers, in turn, would influence the students in their own writing and reflection (either by redirecting their attention toward new topics, alternative styles of writing, or insights on objects or places which differ from others).

Ultimately, we expected the sets of textual contributions from the entire group as not simply a collection of independent items, but rather a collection of *interdependent* reflections on experience, composed individually, but influenced by numerous voices—the shared

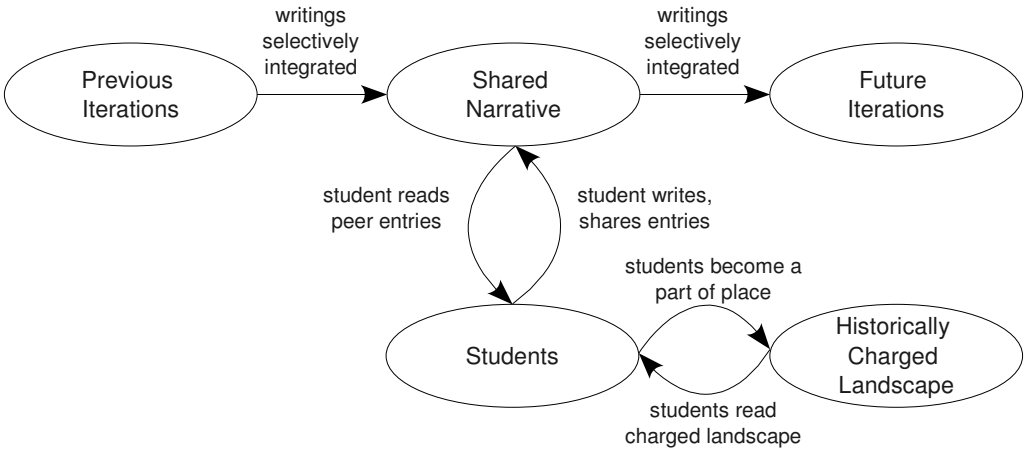

Figure 4.1: Model for shared narrative formation

narrative.

Topics

Instead of passively digesting official narratives of the place, we expected PlaceMark users to engage in creating unofficial narratives of their embodied experiences. They were encouraged to notice places and engage with them creatively. The results of this engagement and the processes that bring them about are the output of *their* cultural probe. In turn, *our* cultural probe is insight into how users interpreted the space and the embodied activity. What did they find significant about the places they encountered? How did they incorporate sharing into the authoring process?

The HCP is site-specific. The trail and field site is considered significant because it is historically-charged, though covered in layers over time in which the space has been repeatedly repurposed and its history hidden from the casual eye. Thus, a strong component of building a narrative of this place is delving into its history and uncovering those layers (or at least speculating about them). This becomes a process of imagination and of projection—attempting to understand the past of a place through positioning one's self into the contexts of others: *What was it like to have to carry laundry down to the creek in the cold? The trail is muddy; did the servants have to worry about their personal presentation after walking this trail day in and day out? How did they cope?* As designers, we anticipated that these issues would be central in the participants' experience of the site. Although we certainly did not expect these students to produce great literature, we might have anticipated an attempt to weave together elements of experience:

> Downtown D.C. is vacant this time of night. Like that of the Lincoln Administration, this is a time of war. Back then, Union soldiers camped out on the Mall. Nowadays, ever since the attack on the Pentagon in 2001, the capital has been clamped down. How is this manifested? Giant planters blocking government buildings.... Theoretically, the concrete flowerpots are solid enough to fend off a truck bomb. And yet the effect is ridiculous... (Vowell, 2005, p. 23–24).

Additionally, we anticipated that entries would build on topics from extant author contributions. This is implied in the semi-cyclical authoring process (figure 4.1). Not only would students build on the contributions of their peers or respond to them, but they would implicitly build on the topics they introduced.

4.2 User Sessions Overview

Each session enacting the cultural probe followed roughly the same procedure. We spent a short period of time explaining the software and the authoring activity to the participants, encouraging them to explore and write about the places they encounter at their respective sites. The prompting provided for the students varied slightly over the course of the sessions. Typically they were urged to wander about the site, to notice objects and places, and to write as ideas occurred to them. Some questions they could address included *Where are you?*, *What is special about this place?*, and *What makes it a place?* Additionally, they were encouraged to use the software to see what others had written about the places they identified.

They were then each given a laptop computer, a pocket-sized GPS device, and in the last two sessions, a standard physical compass to carry during the authoring activity.[1] When possible, discussions were conducted with the participant groups after the activity to inquire about their experiences and reactions. In each study, the data collected included video of the authoring process and the subsequent discussion, participant feedback via a post-activity questionnaire, and the written entries created during the authoring process.

4.3 Middle School Session

The first user session with PlaceMark was conducted in a middle school setting.[2] The purpose of the pilot session was three-fold. First, we wanted to test the technology in the field to identify any major issues prior to deploying the software in higher stakes circumstances at Hollins. Second, we wanted to get a sense of how young students would respond to the software and the associated tasks. Third, we wanted to know whether the software was

[1] The compass was only given to the last two groups since the Virtual Compass feature had not been implemented prior to those sessions.

[2] This study is the primary subject of an article by the author and others (Schaefer et al., 2008). The article provides more details about the procedure and results of the study than described here.

enjoyable in circumstances that were more likely to produce untrammeled answers than working with the classes of one of the professors on the project. Would they enjoy using it? What difficulties would they encounter? What features would they use heavily, and which would they ignore? Finally, how would they interpret the activity as a whole? We wanted to get a sense for the kinds of entries they would generate, and the novel behaviors they would exhibit within the context of the activity.

The eight participants came from an after-school game club at a K–8 school in southwest Virginia; they consisted of three females and five males, ages 11–13 years old, in grades 6–8. The study was conducted during the club's normal meeting time. During the session, the students were first introduced to PlaceMark by one of the investigators via a graphical paper handout describing the system's user interface.

The students then received verbal instructions for their task: they were asked to walk around the playground and to use the software to mark and write about the different places they found. To provide more direction, the students were asked to address questions such as *What makes you think of this area as a place?*, *What happens there?*, or *Does the place have a name?* They were encouraged to use the software to look at the entries made by their fellow students and to talk with one another while out in the yard, but were told that their writing should be their own.

Following these instructions, the students were separated into two groups of four. Each group spent approximately twenty minutes outdoors performing the exercise, carrying laptops running PlaceMark. During this time, the investigators observed the students, videotaped their locations throughout the yard, and assisted with any technical difficulties they encountered. After finishing the activity, each participant completed a short questionnaire regarding the experience.

Last, after both groups had finished the exercise, the participants took part in a short discussion led by one of the investigators. This discussion addressed students' reactions to the activity, and the entries they generated.

4.3.1 Results

Across the two twenty-minute exercises, the eight students produced a total of 72 entries. The first group generated 45 entries, while the second created 27. On average, each student created nine entries. Within these 72 entries, the students marked 59 of them with location stamps, and three with time stamps.

Analysis of these entries demonstrated that the students formed several difference conceptions of place in their writings. These conceptions of place in their school yard included physical description, socially-meaningful names, the co-presence of others, and rules of behavior (table 4.1) (Schaefer et al., 2008). Additionally, we analyzed video of the session to roughly identify the locations from which the entries were written. By doing this, we were able to compare the ways in which the students understood place in the same location. Table 4.2 provides an example of four entries created under or next to a stone patio, covered by a sparse wooden structure (commonly known as the "outdoor classroom"). This place is

Table 4.1: Middle school session examples of different conceptions of place from written entries (with original spelling and grammar)

Category	Example
Physical description	"The place that I am sitting in right now is in a hill shape. Behind me there is a circular sandbox filled with white, soft sand. In front of me there is a grassy plain. Straight in front of me there is a tree with no leves that is still growing"
Name	"This is the new [school's] Fairy town this is [where] the little kids play a lot"
Co-presence	"this is where ben is temporarily standing while i write this."
Rules of behavior	"This is where mounds of grass are that you are forbidden to go on during reccess."

conveyed in the entries as a physical environment, by its name, by recurring activities in the environment, its boundaries, and, in the last sample, the student is cleverly playing with the notion of location, time and place. He is using the history of the laptop in relation to the structure to build a description.

While the students in the middle school session did not have much scaffolding for the reflections on the places in their playground, they were able to write about a variety of ideas, demonstrating the capability of the system to amalgamate different perspectives for sharing with others. Given more time and further scaffolding, we believed that PlaceMark could have become a powerful tool for sharing these different perspectives.

In this early session, the participants avoided leveraging the tool by responding to or engaging with the writings of their peers during the activity. Our hope was that bringing the system and the activity to a more mature set of users might yield a different result.

4.4 Hollins Sessions

Following the instructive middle school session, four sessions were conducted at the field and trail site at Hollins with Hollins students from a wide variety of academic majors. Table 4.3 provides a brief overview of the demographic breakdown for each session at Hollins. While the participants in the first two sessions were not recruited as a part of any particular group, the last two sessions were conducted within two different courses in new media. Session 3 was conducted with a first-year seminar, and session 4 with an upper-level course. As there were more students in the field during the fourth session than in any other and because its participants came from an advanced course, the subsequent reporting of results and

Table 4.2: Middle school session entries from the same location in the playground (with original spelling and grammar)

Entry Samples
"IN front of me stands the [school] building. A wooden outdoor classroom surrounds me and a wooden roof hovers over top of me. I am sitting on a pile of cement blocks and behing me is a pile of mud. In the mud plants are growing."
"this is the outdoor class room. it is made of stone with a wooden cealing and suports. we also use it for pictures."
"This is the outdoor classrooom. Many people play on it. We have had a few classes out here. It is made of large and small brickes. There is are two ramps leading up two it. the boundries are where the bricks end."
"the location that i pressed the button on the mac of is about 8 feet from the ground. It is a wooden structure that you can see from the place with the view."

Table 4.3: Hollins sessions demographic overview. The third session was divided into two groups, hence the two different lengths of writing time.

Session	Participants	Length	Academic Levels	From a Class
1	3	25 min.	First-year to graduate	No
2	5	45 min.	Third-year to graduate	No
3	11	20, 15 min.	First-year	Yes
4	13	35 min.	First-year to fourth-year	Yes

corresponding analyses focus primarily on the fourth session. However, evidence from the first three sessions is introduced at various points to either augment or contrast results from the fourth session.

These sessions generally followed the common procedure described above. Students were given an introduction to the activity and the software prior to beginning the authoring session. Their writing prompts regarding place were open-ended. In addition to asking about places and places generally, the researchers directed participants to consider the boundaries of Hollins itself: *When did you leave Hollins [after entering the trail]?* and *Where are the boundaries between Hollins and this space, or do you not notice them?*

Also, during the last three sessions, participants were reminded that they were working "collectively" toward a "collective narrative," that they should "think about the entries in the context of [their] own narrative," and to be mindful of the two authoring spaces in PlaceMark—the private authoring space and the developing narrative in the public space.

Because the participants in the last two sessions were in new media courses led by one of

Table 4.4: Hollins user session written output. Columns indicate *mean* number of entries, location stamps, time stamps, and entry length per participant for each session. Entry length is in characters (including stamps).

Session	Entries	Location Stamps	Time Stamps	Entry Length
1	2.67 (SD=1.53)	5.00	3.33	542 (SD=296)
2	7.40 (SD=4.28)	4.60	3.60	377 (SD=272)
3	1.45 (SD=0.82)	0.73	1.00	1060 (SD=735)
4	8.38 (SD=4.29)	2.54	3.85	141 (SD=135)

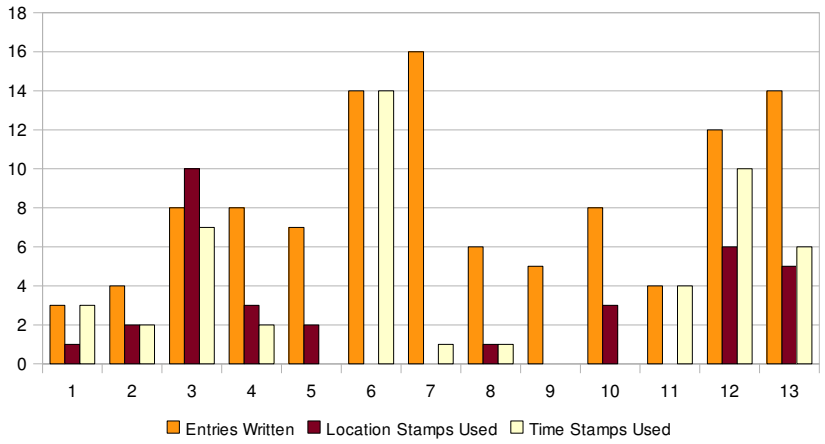

Figure 4.2: Hollins session 4 written output overview. Number of entries written, location and time stamps used (y-axis), according to user (x-axis).

this project's collaborators at Hollins, those students received more background information about the HCP than those from the first two sessions. Prior to this experience, the session 4 students had read an article written by their professor which provided a high-level overview of the HCP and the role of the narratives the students would be generating (Boyle and Crandell, 2009). Thus, they had some knowledge regarding the site's history and the evolving relationship between the university and the Hollins Community.

In effort to integrate the students' writings with existing narratives of the Hollins Community during the authoring phase, the professor inserted a handful of contributions into the public space from previous authoring sessions and from a book that inspired the HCP (Smith, 2000). This text recounted the history of the Hollins Community through interviews and narratives from past and present community members.

(a) Location stamps **(b)** Submission locations

Figure 4.3: Hollins session 4 location stamps and submission location mappings. The markers in (a) indicate the locations where students created location stamps, and in (b) where they submitted individual entries. The southern tip of the Hollins Community can be seen in the top-left of the images; the north end of the field site can be seen in the bottom-right. Trails run between the Hollins Community, the field, and the northern edge of campus (off the image to the lower-left). (Satellite images copyright 2009, Commonwealth of Virginia; retrieved with Google Earth.)

4.4.1 Results

In the fourth Hollins session, the thirteen participants generated 109 entries over a thirty-five minute authoring period (mean=8.38, SD=4.29). Figure 4.2 provides a quick view of how many entries were created by each participant, as well as how many times each used either a location or time stamp within their entries. Number of entries did not appear to be tied to entry length. On the average, each entry was 141 characters long—approximately the length of two short sentences; the longest was 768 characters long—a medium-length paragraph. Compared to the output generated by participants in other sessions, these entries were relatively short; though, comparatively, the students in this session created on average more entries than those in the previous groups. (See table 4.4 for an overview of written output from each session.)

Based on first-hand observations and mapping data, participants in session 4 worked mostly on the north end of the trail. This is the part of the site farthest from campus and closest to the Hollins community. Few students wandered down to the field site or the southern trail. Figure 4.3 shows two maps of the site with markers indicating the locations where students created location stamps and where they shared their entries, respectively. Clearly the students created far fewer location stamps than entries (table 4.4), but from this we might be able to speculate about their movement while writing. From this particular

Table 4.5: Hollins session 4 entry themes. Number of entries corresponding to frequently recurring themes (of 118 entries).

Theme	Corresponding Entries
Activity Commentary	18
Artifacts	21
Associations	20
Environment	16
History	15
Natural, Tech. vs. Nature, Tech. vs. People	10, 8, 9

data, there is no way of knowing which location stamps in image (a) are associated with the entries indicated by the markers in image (b), but based on the corresponding outliers off of the main marker clusters, it would seem the authors submitted entries in many of the same locations where they created location stamps. This might suggest that they wrote while stationary (at least within individual entries), as opposed to writing, moving, then writing more within the same entry but at a different location.

In trying to understand how the participants experienced the places they encountered, we analyzed the contents of the written entries. We employed two methods to characterize the texts from session 4. First, we coded for recurring themes. Second, we used categories from Harrison and Tatar's framework of place as a semantic tangle of *people*, *events*, and *loci* (Harrison and Tatar, 2008).

Themes

A handful of overlapping, dominant themes emerged. Table 4.5 lists these recurring themes and the frequency with which they appeared in the entries. The *activity commentary* theme includes any mentioning of the authoring activity itself ("*This was awesome*," or "*my arm is getting tired from holding this laptop! but it's very peaceful out here*"). Entries including the artifacts theme noted physical objects of human origin in the environment. *Associations* were quite prevalent; these include anything the authors experienced which triggered the recollection of something else—memories, other places, or other experiences. The *environment* theme indicates description of the authors' physical environment (trees, sunlight, mud, etc.). The *history* theme indicates speculation or thought about personal history, or previous events or states in the university, the trail/field site, or the Hollins Community.

The last three themes in table 4.5, *natural*, *technology vs. nature*, and *technology vs. people*, are tightly interrelated. The natural theme indicates reflections on what it means for something to be considered *natural*, or *of nature*. *Technology vs. nature*, on the other hand, indicates some kind of noted contrast (or continuity) between human technology (not limited to digital technology) and what the author considers nature. Last, the *technology vs. people* category indicates conversation about humans and their relationship with the artifacts and

technologies they create. These three are included together together in the table because of their overlapping semantics.

Student reactions to the field differed. Some students perceived the trail and field sites as places of nature, despite their rough knowledge of the site's past, and the clear evidence of human involvement (the litter, tire tracks, and the existence of the trail itself). These students made comments such as "*I'm out here in all this nature, staring at the sky through the tree limbs and all I can think is I wish I had someone to share it with.*"

Others interpreted the place through association: "*This trail reminds me of the trail that led to Treblinka. Something unimaginable happened there. . . .*" Associations were prominent in the first three Hollins sessions as well. One student from the second session wrote, "*Being back here reminds me of when I decided to explore the abandoned house by the library. I wouldn't go upstairs because I was afraid the house would fall. . . .*" The emphasis is not the present place but instead what the present place *evokes*. The participants wrote of childhood memories, regular practices or experiences, other areas or activities on campus, or pets they used to own, for example.

Yet others speculated about what it means to be natural, asking rhetorically, "*We leave a piece of our presence behind, whether it is through litter, our tracks, or even the grass we step on. . . What role does this play?*" Implicit questions emerged about what "fits," what is appropriate, and what belongs. This kind of reflecting on what fits in the "natural" environment of the site was actually far more prevalent in previous sessions (and particularly true in regard to the laptops they were using). During session 3, students overwhelmingly lamented over the *tension* they perceive between being in and writing in a "natural" wooded space and using laptops. They tended to dwell romantically on a seeming loss of something intangible when introducing computational technology into these spaces, as if the computer is the ultimate antithesis of the woods (see table 4.6 for examples).

In discussion after the first session, the participants noted feeling awkward working with a laptop in the outdoor setting. One participant said she felt "out of place," and that the technology and the space "didn't mesh." When asked if this awkwardness created the need to filter what she wrote, she said that initially she felt a need to screen her writing because of the "technology barrier" between the system and the place, but then resisted this hesitation and deliberately tried to write as if she were using a paper notebook. The laptops embodied a stark juxtaposition in the outdoor context.

Yet, there were contradictions. In post-activity discussion from earlier sessions and in a couple written entries in the fourth session, participants asserted continuity between the site's "naturalness" and the use of digital devices *other* than laptops, such as cameras or mobile phones. Together with the decision that most students made to omit mention of the large amount of trash, this raises questions about how certain the students' were of the behavioral framing made appropriate by the site, the task and PlaceMark (Harrison and Tatar, 2008).

Moreover, some students described the woods as *generic*, implying that they detected or experienced nothing unique about the site. For example, one wrote,

> *. . . From the scenery, perhaps, we could be anywhere. I know that we have*

Table 4.6: Entry samples considering technology in nature (with original spelling and grammar)

Entry Samples
"being here i wonder about our world, or our place, interacting with this place. not a mile away is a house and beyond that a campus with wifi internet, cable television, and every student probably has an ipod. when you think woods and you don't relate servers and networking. you think trees and plants, and possibly some animals. i'm watching a bug crawl on my screen and wondering if it is right for us to mix these two worlds."
"... Holding a computer for paper, I wonder what the world is coming to..."

> *not traveled from the familiar view of Hollins campus, but this is the classic woods... What makes this place so different from any other?....*

In a more bold tone, another noted, "*This is another trail on another campus in another state.... Woods are woods.*" These readings of the site were surprising, and seem to indicate a kind of irreverence for the platial experience. Perhaps there is little visually unique about the site on the surface, yet we did not anticipate that it would take much effort to engage with its particulars (the human artifacts, the connection to campus, or the trail itself), even with only a little knowledge of its history.

Prior to the writing exercise, we anticipated that students would respond to the provocation of the historically-charged landscape through projection, or imagining themselves in the places they encountered in other contexts, particularly since this was the first set of users who had some degree of knowledge of the history between the university and the Hollins Community. One student approached this kind of projection when she wrote, "*Sitting here I wonder how many footsteps have crossed this path. The mud is imprinted with tire treads and shoe tracks, but how many hidden steps are there in all?*" Likewise, another speculated about the trail's history: "*I wish I could go back 100yrs and see how alive this place used to be; see who walked it and where they were headed. <37°21.4907'N, 79°56.3202'W> <Time: 2009/04/08 13:05:14>.*" Although the history theme was present, with a few exceptions, we did not see the kind of projection we were anticipating. Most instances of history were in regard to the natural history of the environment—changes brought on by the weather and by seasons.

This is the case even more so in the first three Hollins sessions. However, in these cases it is less surprising, given their relative lack of knowledge regarding the Hollins Community and the history of slavery on the campus.

History was also mentioned in the context of *associations* between the participants' current experiences and those from their past. They wrote of other places they have been or wished to visit, people of whom they were reminded, and events past and anticipated. These topics were broached in the form of personal narrative as in a diary.

People, Events, and Loci (PEL)

The authoring activity is about place. The participants were asked to engage with questions like, *What are these places? What is important about them, and what do you notice?* To understand how the students characterized place, we inspected each entry from all four Hollins sessions in terms of people, events, and loci (Harrison and Tatar, 2008). These codes were independent of the categories developed in the previous section. The operating definitions of the PEL codes follow.

The *people* code refers to entries which make any mention of people (real or imagined), including explicit mentioning of the narrator (e.g., "*I saw a bug and wanted to kill it for being there, even though I'm the intruder. This is not my home*"). The *people* code indicates that within the entry, place is described or constructed in terms of the people who are there, who have been there, or who are significant. However, not all entries that are in the first person construct place. Therefore, "*I can't believe that Hollins was founded as a seminary. Today we are lucky if two people come to weekly worship services*" was not coded as *people*, but "*I really want to jump in this puddle*" was coded as such.

The second code, *events*, refers to activity conducted by people or nature, including mental events such as noticing, historical events, and actions like walking. The brief note, "*I saw a bug and wanted to kill it for being there*" describes an event presumably significant for the author. Generally speaking, entries which use events as components of place refer to the loci implicitly. Events need not be externally significant to constitute place.

The final PEL category, *loci*, is used to characterize entries which note focusing objects or bounded spaces (e.g., "*Barbed wire. Litter. I wonder what was being kept out*"). These objects may be temporary or unidentifiable. In particular, we classified uses of time or location stamps as instances of loci within entries. In this sense, the GPS location coordinate becomes a kind of focusing object, like referring to a place by a landmark or some defining physical feature. In marking an entry with a location coordinate, it is as if the author is saying, "*Whatever I write is associated with here.*" That particular coordinate becomes the referential marker for the experience of place.

Given the broadness of these codes, entries can, of course, fall into none, some, or all PEL categories. Furthermore, there are many cases in which identifying one or more codes with a particular entry is debatable. However, in assigning these codes within the PEL framework, we can gain at least a broad sketch of how the participants read the places they encountered on the site.

Table 4.7 describes the number of entries in each PEL category. Interestingly, in sessions three and four, far fewer entries could be characterized by the *events* code than either *people* or loci. One possible reason for this is that most (if not all) of the students have very limited exposure to the site. Consequently, their experience of the place may be more defined by the objects they encounter in the present and less defined by the activities which they, or others, engage in there. In session 4, of the 97 remarks that could be tagged as having a voice, 73 were written from the perspective of a first-person narrator. Six remarks were in the second person and 18 were in the third person. Others include song lyrics and time or location stamps. This distribution again suggests that many students conceived of this activity as a

Table 4.7: Totals for Hollins sessions PEL coding

Session	People	Events	Loci	(No Category)
1	5	5	8	0
2	20	18	26	6
3	13	6	15	0
4	52	21	64	16

diary-writing process.

The participants in session 2 were the only other group to produce a sizable number of entries of which many fell into the *events* category. This is largely because many entries in the the second session were written about events happening to the author—that is, they read like log entries. For example, "*I am back on the main road and notice that there are tire tracks among the horse-shoe prints. I also notice my shoe-prints among the impressions. And dog prints as well.*" Similarly, another wrote, "*It was hard to find a place shady enough to see the screen. I am sitting in a patch of ramps (wild garlic) and there is a pile of beer cans behind me.*" As in session 4, it appeared as though many of the participants from session two interpreted the writing activity genre like that of writing in a diary.

Some entries did not fit within the PEL categories. One participant created entries in which she quoted poetry or song lyrics. Examples of others that did not fit into any of the platial categories include, "*I just realized I don't really know how to use a compass. . . which would probably be helpful to find locations. . .*," and "*I would love to sit but I'm to* [sic] *girly and hate being dirty. I need to go to the gym. Or maybe I just need the taste of dirt under my fingernails.*" While these thoughts were prompted by experiences in the place, we could not, without inserting our own assumptions about what the author was thinking, derive connections between what they were writing and the context in which they were writing.

Authoring Processes

On one hand, during debriefing in the fourth session, several students mentioned that they spent a long time reading other people's entries during the writing session. One student said that reading was as much a part of the activity as writing; she claimed to read the entire set of entries every time she shared one of her own. On the other hand, we found no evidence that participants built off of one another while writing. Furthermore, when asked on the questionnaire how much seeing other students' entries contributed to their own insights, the group responded with a mean value of 5 (N=14, SD=1.00) on a seven-point Likert scale (1=Contributions of others detracted from insights, 7=Others' contributions were essential to my insights). In fact, this response rating is higher than reported by all sessions prior; sessions 1–3 reported mean values of 3.67 (N=3, SD=0.58), 4.80 (N=5, SD=0.84), and 4.82 (N=11, SD=0.87), respectively.

Unexpectedly, the participants in session 1 reported being resistant to letting others'

writing affect them. In discussion, one noted, "I was trying not to let other people's responses have too much an impact on what I was doing [while] at the same time observing [their responses]." Another echoed, "[I was thinking that] I just want to get this out of my head and I don't want anything to distract me or influence me." In fact, all three participants shared in this view. The third said, "looking at other peoples' entries... made me want to change my own... so I kind of avoided doing that."

Despite researchers' stronger encouragement in the second session to be mindful of the larger public narrative, participants in that group did not warm up to the the idea of responding to or engaging with others' text. During the discussion, two of the participants acknowledged that they responded to a "few" of the entries, though one added that she largely wrote "independently" of the existing entries.

Initially, we had imagined the shared narrative authoring process as a collaborative, cyclical process in which the participants would build off the work of one-another toward a shared or explicitly contrastive embodied experience of place. What appears to have emerged instead is a process akin to the *parallel play* that occurs when two young children play side-by-side without overt coordination, yet one's actions influence the other. Our authors did not necessarily work collaboratively (maintaining a joint-activity toward a common goal), but rather worked independently while being influenced by their peers. They claimed that reading the entries of others made them aware of their own writing style or voice; one commented in the post-survey that the software "made [her] more mindful of [her] relationship with other writers and of communal spaces." One student mentioned that she consciously avoided responding directly to any entry, even though she claimed to have spent more time reading than writing. Consequently, their entries appear to be independent and scattered in subject matter, depth, and perspective.

Sharing had other effects too. One from session 4 noted, "I never felt alone but I felt I had space... it's like a perfect mix of community and independence." (This particular student spent much of the activity in one location, sitting alone off of the trail and largely hidden from view, listening to an iPod). Because of the sharing aspect of the activity, another student noted that she "felt a real sense of immediacy" in her connection with others, and a "responsibility" in sharing her entries with them. On the post-activity survey, the participants were asked very broadly, "How did the software affect you?" In both the previous and present sessions, several students volunteered that they enjoyed the activity because of the sharing, that this feature was "*interesting*," and that it "made me more aware of my classmates and their experiences, [and] made me look at the trail through different perspectives."

Anonymity and Sharing

Based on post-activity discussions and surveys, maintaining author anonymity is significant to the participants. While it is not clear exactly what effect this feature has on the authoring process, several participants noted that they appreciated the anonymity. "It allowed me to evaluate [and] admit things about myself that I've never discussed," wrote one.

From the discussion following session 2, it was not entirely clear how participants reacted to the anonymity of shared entries. Two admitted to speculating as to the authorship of several of the entries. One of the two playfully suggested that she wanted the names of the authors attached to all of the entries but her own, and claimed that she probably would have written differently if her name had been attached to her work. One participant noted in the questionnaire that the software "helped the self-conscious writer in me feel more comfortable to know that others were having [the] same feelings." While this is the kind of effect for which we were hoping, we do not know how many others shared this view. Ultimately, it was clear that anonymity had some impact on the activity, though it was not possible from the discussion or the questionnaire to determine whether this impact was positive or negative.

Prior to the sessions, we speculated that anonymity might downplay a sense of ownership of individual entries. The student who wanted other authors' names on their entries recalled moments when she would read some of the public entries and initially forgot that she had written some of them. Another described a "disembodied kind of experience" in which she felt the entries she read on her machine were in no way connected to the individuals working around her in locations within her proximity.

Stamping

During the design process, it was unclear how the students would interpret and use the location and time stamps that they could optionally embed into the text entries. While we envisioned them as a kind of quantified expression of an aspect of place, the students seemed to interpret them more mechanistically. For example, in the first session, one student used the location stamps to mark where she was located while she followed a bird moving between trees. One can interpret this as using the location stamps to create a kind of *traceable record* of movement.

This idea of stamping as record keeping is echoed in the session 2 discussion. Participants reported minimal use of the location and time stamps, and the use they did make of them was meant more for archival purposes than communicating their experience. One reported using the stamps like one would put a date on a letter or an email. Another felt "conscientious" about the project itself, and used location stamps so the locations of her thought development could be traced by others in the future. Generally, it appears that location stamps lacked meaning for these students, and therefore, lacked utility as well.

There were, however, instances in which students used the stamps in ways different from those above. For example, in session 4, one student in particular created a set of entries comprised entirely of time and location stamps. While there is no direct indication of what was intended by this, it indicates a creative twist to an otherwise mechanistic tendency to apply stamps as records.

Tagging and the Virtual Compass

In terms of the authoring process, the we considered tagging and Virtual Compass features as secondary in the experience. Developed part-way through the period over which the

Table 4.8: Hollins session 4 tag samples (with original spelling and grammar)

Tag Samples
"go knock on the door an see!"
"please don't feed or tease the wild life"
"I wish my grandfather was alive to see this."
"Where do I fit into all of this?"

sessions were conducted, these features were only available to the third and fourth groups. Unfortunately, the results of their use was relatively underwhelming. Despite the interesting experiential possibilities in the VC, most students in both the third and fourth sessions reported not using it. For many, this was because they were unfamiliar with using a regular compass. (The quick overview prior to the writing exercise was apparently insufficient.) Others declined using the VC because they felt no need for it, and wanted to spend their efforts reading and writing. One, however, indicated that she would be interested in using it if she had more time. In retrospect, we suspected that the Virtual Compass might be difficult to use, particularly with little time to practice using it. Given that they were already carrying laptops, having to juggle an additional object (the compass) might have been enough to discourage its use as well.

Likewise, few students used the shared tagging feature. At the beginning of the exercise, one of the researchers anonymously posted a small set of shared tags. The participants embedded a couple of these tags into entries, created a couple of their own and embedded them as well ("*boundary*" and "*time*"), but overall use was lacking. One student who did use tagging reported positively, "I connected mine with others! It helped me see how similar our words were." This is a positive remark, and perhaps with more time to work, others might have joined in on tagging entries.

In the fourth session, a few more students (seven) used tags; in all, this group produced 23 unique tags. (Though most of the tags were created by two participants). Based on the survey, it seems that there was some confusion in this group regarding this feature. Some confused it with embedding location stamps while another claimed to use tagging when she "couldn't figure out the entries." However, one noted in the survey that she made tags as notes for later. Some examples of these tags are included in table 4.8.

4.5 Probe Lessons

If we are to consider the site-specific authoring activity and new media installation using PlaceMark a cultural probe about (a) the construction of place and (b) collaborative writing

in general, we must ask what it is that the probe revealed.

4.5.1 Collaborative Narrative Genre

In the authoring activities with PlaceMark, the participants generated a set of texts covering a wide range of topics, written in different styles—some conversational, some descriptive, many self-referential. In most cases, the individual entries do not stand on their own as final pieces of work. Instead, they are short reflections, seemingly spur-of-the-moment and incomplete. In this way, the output is akin to that of micro-blogging sites such as Twitter.[3]

However, there are key differences between the user experience in the present activity and micro-blogging as generally enacted. The present activity is *site-specific* and *contrastive*. These are not mechanical differences from micro-blogging, but rather significant differences in user orientation. The authors in the present case are working toward a shared experience in parallel. The authored output is explicitly included in a linear, re-orderable collection and can be examined for intentional relationships; each entry becomes a part of the collective whole of the constructed experience of the place, whether fragmented or unified. While micro-blog posts are distributed and consumed by connected social networks, blogging is *broadcast*. The "consumers" in the present context are a part of a cohesive group of individuals, all engaged in the same collaborative activity.

4.5.2 Confronting Places in Place

The hypothesis to be explored in the cultural probe about writing was that place writing would evoke responses specific to places and that a genre identifying and differentiating the place would be developed. This was true to a limited extent. The work as produced might be characterized as a site-specific literary work that unfolded over the course of the writing session. Most interesting are the ways in which it was not true.

By-and-large, the writers may be divided into three categories:

1. Those that observed particular sensory input and used that as the basis for association, as in "*Barbed wire. Litter. I wonder what was being kept out*"

2. Those that described their own experience in a place through the lens of the self: "*I'm out here in all this nature, staring at the sky through the tree limbs and all I can think is I wish I had someone to share it with*"

3. Those that attempted to see others or the experience of others in the place: "*Sitting here I wonder how many footsteps have crossed this path. . . .*", "*This is like the trail to Treblinka*"

Comments in the first category are specific to the place. Those in the second are less specific, but both are most often externalizations of immediate internal states, expressed

[3] `http://twitter.com`

in the first person. Few evoke the essence of the particular places described. Instead the entries are a *shadow* of the writer in the sense that the writer has picked out her experience standing in the place, rather than the place, to report. In this sense, the place is used to delineate or define the writer rather than the writer defining the place. The specifics of the site behind Hollins University are seen through the *filter of the self*.

The attempts to grapple with the history of the site are also notable for the absence of particulars of either people or locations. Even the comparison to Treblinka, presumably an empathetic attempt to compare the horrors of the death camps to the horrors of slavery, is more shocking than platial. What particulars of this trail, walked many times everyday by slaves who actually lived there, are particularly similar to the trail followed by people on their way to the death camps. Or are all trails the trail to Treblinka at a sufficiently symbolic level?

The framing of the writers in conducting the writing may be influenced by many factors. It may be a characteristic of the setting of a creative writing class. It may be a consequence of the age of the students, the amount of time spent on the site, or the particulars of the PlaceMark software. The pastoral and dramatic qualities ("*all this nature*") may have to do with the idea that the sites represent nature and either the romantic notion that nature should evoke emotion or a modern rejection of pastoral emotion ("*I want a root beer float*" is a contrastive example). But a strong hypothesis is that the students are not sure how to frame their behavior in terms of the site and, rather than grappling with it, say little and risk little.

Chapter 5

Conclusion

5.1 Review

In review, PlaceMark is a multi-user, collaborative authoring system in which users compose textual entries in a private work space and anonymously publish them to shared collections within the groups purview. It is designed to support the creation of shared narratives, with strong support for sharing experiences of embodied reflections of place and places. It was born out of a collaboration between researchers in human-computer interaction and new media in conjunction with the Hollins Community Project.

As a tool for provocation, PlaceMark takes a markedly distinct stance from previous work in the way it advocates a user-generated approach to place-based content and directly elevates user narrative over GPS location information in representing place. In conjunction with its corresponding collaborative authoring activity, we ask users *What is place?* instead of implicitly signifying places for them by privileging some locations over others by connecting them with pre-constructed media. Significant places emerge from the activity through narrative development and exchange among peers.

Using the perspective of this activity as a cultural probe into the construction and perception of place and the novel authoring activity, there are several outcomes.

Based on the contents of the written contributions, the post-activity discussions and surveys from the user sessions, we characterize the collaborative authoring process as a form of *parallel play*—independent action influenced by interaction. While participants acknowledged that sharing was a significant aspect of the activity, they also maintained deliberate distance from others. This is possibly a better outcome than envisioned, given that collaborative writing is not necessarily about consensus, clustering of ideas, or the joint production of a single authored work, but is about seeing the work in relationship to what others are doing when confronted with the same situation.

Further development as writers might enable the students to confront place in a way more similar to that which was imagined by the designers. It is also possible that place is such a powerful concept, that, in all but the most unusual minds, it is a medium rather than something that can be written about. Last, it is possible that PlaceMark, our cultural

probe, or the collaborative nature of the writing, distracted the students from the essence of the task.

5.2 Future Work

5.2.1 Iterative Activity

In terms of future work, it would seem beneficial to work with a single set of participants over a longer period of time, allowing them to use perform the writing activities in the field iteratively. Many of the students who participated in the user sessions reported here were visiting the field and trail site for the first time. It would be interesting to see how their perspectives change after several visits to the site. What else would they notice? What would become significant to them? Would repeated visits give them a better chance to develop places of their own in the space? Multiple visits to the site might allow the students to build a personal history with the places there.

In addition to re-visiting the site, these students could also confront some of their writings repeatedly. During the last few user sessions, some of the researchers secretly inserted entries from previous sessions into the mix of those constructed by that day's participants. This process could be repeated, allowing students to see some of their own work re-inserted into the developing narrative. How would they confront their previous writings after some time of distance from them? How would it affect their writing in the moment and their reaction to the exercise overall?

It is safe to assume that their use of the software would develop over iterative use as well. In particular, students may be more interested in exploring tagging and the Virtual Compass feature. Few students seemed to "play" with the location and time stamps or utilize them in creative ways. More time and familiarity with the software could afford chances to explore and experiment.

5.2.2 Changes to PlaceMark

Virtual Compass

In addition to iterative user studies, there are several aspects of PlaceMark that need reconsideration or at least exploration. The Virtual Compass feature was developed in response to comments made by the students suggesting they wanted a mechanism by which to physically navigate to locations referenced by entries. In considering the design alternatives, the Virtual Compass was chosen because it played with the interaction between a complex digital tool (the software) and a simple, standard tool (the compass). We avoided a map feature to downplay geographical notions of place typically privileged in Western culture.

As alternatives to the Virtual Compass we considered other methods like shading entry backgrounds depending on their proximity to the user, a "getting warmer/getting colder" feature which would periodically tell the user if she was moving closer to or farther from a

desired location (without actually providing directions), or various two-dimensional representations playing on the relationships between the entries, tags, and locations associated with them. One question to consider is the actual value for providing this feature. To what degree would abstract representations of entry locations provide fodder for creativity while filling a functional role of allowing students to navigate to particular locations—the original reason for creating the VC.

Disconnected Operation and Tuple Spaces Architecture

In a particularly fruitful discussion following Hollins session 2, the participants expressed frustration with having to be mindful of the Wi-Fi coverage area of the server, citing a regular problem of having to move to regain server connectivity. One participant felt that having to stay in the coverage area was "stifling" and claimed that she probably would have gone farther off the trail if she could have maintained a connection. Another believed that dealing with the server interrupted her process of writing; she often had to move from the location she was writing just to submit her entries. This notion was seconded by another participant who described the process of moving to find the Wi-Fi coverage area, returning to where she was, and trying to regain the original "mental state" as "jarring."

In response to these frustrations about weak network coverage, we expanded the network range using battery-powered wireless routers and repeaters. While this did allow the students to remain connected while working on the trail and most of the field, there is always a point at which a student may wander out of range. Currently, PlaceMark does not support sharing through *disconnected operation*.[1] Under disconnected operation, users would be able to "share" entries without those entries actually being sent to the server; instead they would be queued on the user's machine until a server connection could be established. Disconnected operation would allow the student to share an entry and continue writing, even if she was outside of the Wi-Fi coverage area.

Similarly, the underlying tuple space architecture could be modified to behave in a more distributed fashion. Currently, the tuple space implementation requires a *central* server on which tuple objects are stored and exchanged. However, other, more decentralized tuple space models exist. (For example, see the LIME tuple spaces system (Murphy and Picco, 2004; Murphy et al., 2001).) Such models could allow students to "pick up" tuples from one another as they came into network range of one-another. The current centralized space could be simulated on such a model, but it could theoretically extend the network's coverage by linking students in a kind of mesh network.

With either disconnected operation or a more decentralized tuple model, it is unclear how changing the constraints of the network would affect students' reflections on the site as a place. Currently, however, a centralized model without disconnected operation is quite restrictive and confining for such an open-ended and exploratory experience.

Furthermore, there may be some potential to strategically integrate *seamful* design into

[1]This term is borrowed from the network file system research community (e.g., Kistler and Satyanarayanan, 1992).

the PlaceMark system. According to Broll and Benford, seams in ubiquitous systems are the "deviations in actual use from a notional ideal of technological continuity or uniformity including discontinuities in technologies themselves and discontinuity between what actually happens and what the system observes" (2005, p. 157). Instead of simply ceasing to function fully when disconnected from the server, perhaps there are ways in which we could purposefully leverage the wireless coverage area in interesting ways to spark further reflection from the users.

Alternative Platforms

The decision was made early in the design process to design PlaceMark for use on laptops. As opposed to using a mobile phone or tablet PC, this choice was based on the idea that students would find it easier to write semi-long narratives using a laptop keyboard. However, as more individuals use new forms of mobile devices such as the Apple iPhone to compose email and participate in micro-blogging activities, it seems that moving toward a more mobile platform is more feasible than previously thought. Furthermore, it is likely that moving to such a device would also eliminate the need for participants to carry separate GPS devices as well, as most new mobile phones include GPS capability.

5.3 Concluding Remarks

In this study, it appears that students had difficulty and uncertainty in articulating their experiences with the places they encountered, at least in the writing activity and software platform provided. If our lives are deeply intertwined with the places we encounter, yet our understanding of them (or mere *noticing* of them) is limited, then the CSCW and HCI communities should be careful when proceeding with developing tools which transcend and augment our places, reinforce ill-crafted representations of place, or otherwise communicate place superficially. Instead, we must understand and deeply consider how to preserve that which is important to us about our places prior to moving beyond what we have established slowly over time in our communities, our practices, and our environment.

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