Leveraging Time and Space Context in Mobile Phones
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Project Milestone #1

ABSTRACT

Our goal is to leverage the time and space context of a phone user to determine if/what types of tasks can be aided by location-and-time filtered information. We will focus on time & location sensitive areas such as train/bus/ferry schedules, places to eat, music/bar/club events, exercise/yoga/dance class schedules, garage sales, etc.

Owing to the unpredictable nature of life, there are many situations where the internet’s large body of geo-spatial information may be very useful but inconvenient or impossible to access.

We are further interested in examining areas where a phone may provide users with all-new (rather than improved) features such as spatial broadcasting and boredom-relief. For example, we may investigate the usefulness of sharing place specific point-of-view information such as locally relevant/created sound recordings (music, history, political commentary, general ranting, etc).

TASK ANALYSIS

Ultimately, all cell-phone users with web-enabled phones are included in the potential user group. However we believe the system will be most useful to users who are socially active, curious, and comfortable with spontaneous decision-making, such as, travelers, young urbanites & college students.

The system should have a low threshold to learn as it leverages pre-existing controls with which users are already familiar. The users will navigate through traditional device button input and will receive information both onscreen and by listening. Data will be related to the user in terms of its relevance to the present moment and can be sorted according to current time and location. If users choose to upload information or comments, communication occurs asynchronously and is mapped according to their location.
IDEATION

Initial Idea: Geo-spatial photo-blogging

Uses:
- Following people on trips (one of our contextual inquiries confirmed this as a good idea – the subject has a friend who posts text/media from places in Uganda)
- Finding cool places to go. Presumably, places with lots of pictures are more popular.

Benefits:
- Easy photo uploading and sharing (Contextual Inquiry has identified this as a slow and painful process at present)
- Filtering by geographical area -- it is generally harder to find non-text media than text making this aspect potentially intriguing.

Off-shoots:
1. Bar-code location finding. Bar-code stickers placed in specific locations give photo-capable phone users the ability to locate themselves on a soft-map. In addition, users can tag information & media to bar-code stickers which is then accessed when photos of bar-codes are uploaded and analyzed.
2. Geo-spatial confessionals. Combine the relative anonymity of leaving a message at a location with the thrill of broadcasting to people who may be at your location in the future (potentially allowing anonymous feedback). Interestingly, this turns out to be a potential use-case of the system that we have currently settled on.

Sketch:

The following two images show a storyboard of the initial idea.
#5 A photo-blog automatically built from a cameraphone

cameraphone ➔ snap ➔ [bridge]

cameraphone ➔ snap ➔ Transamerica building

pictures and geospatial location sent up to the server
Clicking on either #1 or #2 opens up the full-sized picture just like a regular photo album.

Uses:

1) No hassle uploading and album functionality
2) Potentially useful for tourists before they go somewhere
3) Fun for friends & family to virtually "follow along" a trip
Spark Idea: Add geo-spatial information to SMS/chat messages

Uses:
- Allow (opt-in) users to broadcast their general geo-spatial location to their friends at the beginning of their SMS/chat messages. This would be like Caller Id, but for location (and it could be used for phone calls too)

Benefits:
- Gives participants more context for the overall conversation.
- Saves time in the SMS/chat dialog by bypassing “where are you?” discussion.

Off-shoots:
1. Add a distance parameter to buddy-lists. This would give the user a general sense of how far their friends are away from them and also allow people to make ad hoc plans more easily (because they could limit the inquiry to those relatively close by). The system could also give the user an alert when a certain friend(s) is within a close range.
2. Message boards with geo-spatial context information. This would be analogous to the location listed at the front of most newspaper articles. This would give the reader more context for understanding a given post.
3. A hot/cold game for treasure hunts, etc.

Sketches: Augmenting chat with geo-spatial information (Spark Idea)
Geo-spatially aware buddy-list (Off-shoot Idea #1 above)

<table>
<thead>
<tr>
<th>Location based buddy-list (somewhat similar to Poodlebuddy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scott</td>
</tr>
<tr>
<td>Lening</td>
</tr>
</tbody>
</table>
Augmenting message boards with geo-spatial information (Off-shoot Idea #2 above)

For Moblogs (like traditional newspapers location at the very beginning)

Rome, Italy: Today we arrived with our 12 children and took them to the Vatican

Or on discussion boards....

Bellevue in St. Petersburg, Florida: The Iraq war was God's will!

Hungry in Warsaw: When do we get our contracts for rebuilding?

Chaos in Baghdad: This sucks!

*Spark Idea: Use a map interface to find events by location*

Uses:

- Someone trying to figure out what to do can easily/visually balance in the trade-off of what it is versus how far away it is.
- It can be used in aggregate to determine what neighborhoods “have a lot going on”, etc.
- Can be used to quickly/easily determine a route to various events for a day/evening.
Benefits:
- Generally the visual display of geographic information is much easier for people to process quickly.

Offshoots:
1. “Everything Map” that gets filtered by the user according to event type, time-frame, etc. This idea is similar in tone to our current goal with the primary differences being that it runs on a mobile device and it assumes “here and now” as the default context. Also, because of limitations of phones, we are more interested in what is useful than offering the user “everything”.
2. Travel planning system that offers a dynamic view of geography.
3. Geo-spatial archive. Similar to the confessional above, but this would be more focused on appreciators of a location to communicate asynchronously and (potentially) anonymously.

Sketches:

A quick description of the “Everything Map” that led to our current idea

```
Community-based events/casual/rides/housing => housingmaps.com

EverythingMap = geographical equivalent of keyword searching
Question: Do we focus on using geo-spatial only for recording
Time/Spat mobile browser, or also for access? Roughly on PC or phone
filter: user/group/category/time period
```

Current Idea: As described above, a mobile application that provides the user with highly relevant (in space and time) information and allows us to learn about how time and space can be important in information filtering.

“Can you aggregate community information a small device and make it meaningful?”

Here are the notes from our initial brainstorming around this idea.
In Place & Mobile

Let's look at how we can go about implementing an interface to handle a lot of information on a specific place.

- Categories
  - Cal Tray
  - Popular

- Area
  - In location specific uses, sharply games.

Time & Space

Tweak suggestions & user loaded

Integrate

Can you aggregate community information on a smaller device & make it meaningful.
From here, we independently sketched and described ideas around the approach and system that we are currently targeting. They are described and illustrated below.

**Partner #1 investigates some of the potentially communal aspects of HereNow that might occur asynchronously in a single location.**

Exploration of Purpose: What is an appropriate purpose? How does changing the purpose inform and guide the design of the system?

Community Event Browsing by Place: Event Cartographer: Post your event / Find nearby events a Craigslist of goings on for mobile devices.

Captions for a passing world: Download comments / annotations of a place as you go by – Time passing on the commuter train or a traveler's friend… captions for the train window.

Community tour guide: Post a tour of your neighborhood for visitors to check out when they arrive. Users browse tours by popularity of tour / shared interests with tour guide:

Boredom Alleviator listen to thoughts of other users, look at captions as the world goes by – don’t navigate, just browse the goings on and annotations related to a place:

Sociologists Tool: Place perception, collect and compile a database of thoughts on a place over time.

Message in a bottle: Send out an “SOS” or any little personal note and leave it in a place for others to discover – music, poetry, thoughts, facts, etc.
Virtual Confessional: share confessions about a place for others to discover on their visits or during their browsing.

Excerpts from Feature Investigations of [HereNow] Mobile Geo-spatial Data Browser:

Screen-space sketch analysis of current era mobile device:
Visualization of General Navigation Option Sets (theoretical, not interface specific) of [HereNow] Mobile Geo-spatial Data Browser:

In one incarnation, users can choose the scope of their search by changing the definition of HERE (by changing the size of the search radius) and NOW by changing the search time span. They have the flexibility (not by default) of searching other areas (THERE) and other times (THEN or LATER) in any of several combinations (HERE-NOW, THERE-NOW, HERE-LATER, THERE-LATER, HERE-THEN, THERE-THEN). The duration and radius can also be adjusted for these settings.

Partner #2 documents a wide collection of potentially relevant information and an investigation of how to efficiently break them down into top-level categories. An example of four categories “Go”, “Do”, “Eat”, “Hear” is investigated further into
10/27/2005 Personal Brainstorming

Big Question: How to group things?

For now, a list of things that might be geographically relevant:

- trains/bus/trains/bus
- moves
- music/bands
- lecture/tourist landmarks/information
- parties
- bar/club themes (trivia, 80s, etc)
- exercise/yoga/dance classes
- sporting events
- food: groceries, janitor juice, TV, coffee, restaurants
- audio (FM?) I don't think?

Maybe a top-level interface could be something like:

```
  go
  hear
  eat
  do
```

And it could default to the same list like Scott suggested:

```
<table>
<thead>
<tr>
<th>go</th>
<th>hear</th>
<th>eat</th>
<th>do</th>
</tr>
</thead>
<tbody>
<tr>
<td>gallery</td>
<td>history</td>
<td>library</td>
<td>sports</td>
</tr>
<tr>
<td>Steve</td>
<td>reading</td>
<td>restaurant</td>
<td>music</td>
</tr>
<tr>
<td>Big feast</td>
<td>dining</td>
<td>fast food</td>
<td>party</td>
</tr>
</tbody>
</table>
```
The following two images are a storyboard based on the sketch above. A user starts “HereNow” and selects the “I’m Bored” option. This takes them to a filtering menu where they select “Audio”. This takes them to the final choice where they choose “Suburbanites Samplers” a collection of music from a local band. Notice that “Hear” has changed to “I’m Bored” but otherwise the top-level categories have remained from the initial sketch.
Partner #3 investigates a potential HereNow top-level interface and illustrates a potential location-variant interaction in a time-critical context.
Example first screen: Use icons to represent top categories. Emphasis on **HereNow**.

Example screen for the “GO” category: A simple map to indicate where you can go from here. Different pattern of lines indicate different transportation methods. The two bars on the top allow user to change preference of time and distance to search.
When one location is selected, the map fades into background, and textual information of the selected location is overlaid on top the map.

Example screen of the “Do” category. The number of red dots indicates the number of events detected. Shapes of the dots indicate most popular event or whether some of your friends are here.
Example screen for “Parties” sub-category. It’s Halloween weekend, and there are a lot of parties going on. Users can scroll through thumbnails of photos along with a brief annotation of the event, such as address and distance.

Example screen for a particular photo being viewed. Menu of options are overlaid as text on the photo to maximize utilization of the screen space.

Partner #1 articulates a potential narrative to further examine the use of HereNow as a social entry-point into an unfamiliar city. (see below)
Lars arrives in SF with a backpack full of clothes, a cell phone and the bulk of Euro he has saved in his 21 short years on the planet. He’s come a long way and has been saving up for quite a while. He’s eager to have some fun experiences during his relatively short stay and wants to head home with lots of great stories for his friends.

The buildings are large and impressive. He’s a bit overwhelmed but is fascinated as well as he’s studying architecture back home in Norway.

The people are strange and intriguing. Lars wants to learn more but isn’t confident with his English.

He accesses HERENOW on his mobile phone. It knows his location via the gps information relayed by the device and shows him the current goings on in his immediate vicinity. He looks through posts by local residents and finds a cheap sushi place around the corner. Lars chats with the owner who suggests he check out the TransAmerica building.
Afterwards, he uses the tour function and reads a post by a prior visitor from Norway who compares the Transamerica tower to a mountain back home. Lars agrees and leaves his own comment on the post (the Norwegian woman who left the original post is notified.)

Lars loves to dance and finds a club where one of his favorite American Djs happens to be spinning tonight. He checks out some user-loaded pictures of nights passed to see if it’s a good venue. On his way over, he listens to a hilarious story posted by other visitors about a couple who brought their dog into the club last week.

Lars arrives at the club feeling comfortable and in a good mood. He shares some of his stories from the day with the people inside. He ends up meeting several like-minded people who share the same taste in beer and music and he is able to find a great place to stay based on their suggestions.
EVIDENCE

We believe the ongoing popularity of both grass-roots content (blogs, flickr, yafro, etc) and geo-spatially tagged information (sfstation, citysearch, mappr, google maps and its integrated apps, etc) offer a rich opportunity to explore the utility of in-context time and space filtering of information via already ubiquitous mobile phones.

Several tools have explored areas similar to this (411, Google Mobile/Local, Cingular Media Net, OnStar navigation, etc) but, as far as we know, none that have focused centrally on the user's context in *both* time and space using a device they already carry with them.

Via our contextual inquiries, we found that some people haul laptops around with them to maintain a level of "informational safety" in the event of changed plans, etc. Additionally, we found that several people are interested in spontaneous exploration. We consider these further indications that there is substantial utility in this area.

FURTHER EVIDENCE

For our first prototype iteration we will select representative functionality within broader areas to do in-context testing with potential users.

For example, our first prototype might include time and space relevant functionality for Caltrain, lectures on the Stanford campus, and Palo Alto restaurants. This would allow us to do in-context testing with people waiting for Caltrain, visitors to the Stanford campus, and hungry people waiting to eat.

Based on the results of this first iteration, we hope to gain insight into the broader areas where time and space filtering is especially useful.

EVALUATION PLAN

Evaluation will be based on in-context testing. We believe that out-of-context user testing (eg: in the lab) will not be representative enough of actual usage to gain valuable insight.

An interactive prototype of our design will be implemented and installed on a mobile phone for testing. Users will be selected based on their current activities (e.g. commuters waiting for Caltrain, visitors to the Stanford campus, and hungry people waiting to eat) and will be asked to engage in specific tasks. We will also encourage the users to further explore our application after they finish the assigned tasks.
Evaluation of the usefulness of our system will be based on our observation of the users and their comments and feedback. Specifically, we will observe how many features a user explores and any difficulties they encounter. We will also solicit feedback that indicates how the users feel about the application.

We may also ask users to compare our application to existing applications such as FoodFinder, Cingular Media Net or Google Mobile. The comparison can be done by designing a few tasks for users to perform on these systems, and asking them to comment on which system they prefer for which tasks.

**SELECTED WEBSITES CONSULTED**

**Websites consulted during the iterative process:**

Reinholdt, G (2004-2005) *directory to mobile art and locative media*,
Retrieved October 20, 2005, from netzwissenschaft.de
Web Site: http://www.netzwissenschaft.de/mob.htm

Web Site: http://www.shirky.com/

**Map-based Interfaces:**

Google Local
http://www.google.com/lochp?hl=en&tab=wl&q=
Found City
www.foundcity.net
Mappr
http://www.mappr.com/
Housing Maps
http://www.housingmaps.com/

**MoBlogging (Mobile Blogging)**

Yafro
http://www.yafro.com/

**Mobile-Device Interface Models**

Google SMS
http://www.google.com/sms/
Google Mobile Web
http://www.google.com/mobile/mobile_search.html
Cingular Media Net
https://www.cingular.com/media/media_net
Site Specific Blogging, Podcasting & Location Specific Media Annotations

MOMA: create your own audio tour
http://www.moma.org/visit_moma/createyourown.html
Grafedia: location-linked hypermedia
http://www.grafedia.net/about.php?
Yellow Arrow
http://global.yellowarrow.net/

Mobile Device Tour Guides

Walker Art Center Art on Call
http://newmedia.walkerart.org/aoc/index.wac
Bobject: Electric Vehicle / GPS navigated tour guides in Codova Spain
http://www.bobject.es/
City Naivgators.com
http://www.citynavigators.com/

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