Location-Sharing Technologies: Privacy Risks and Controls

Janice Y. Tsai, Patrick Gage Kelley, Lorrie F. Cranor, Norman Sadeh
Location-Sharing Applications
Google Latitude Spurs Privacy Backlash

A consumer-advocacy group already sees five scenarios in which the Google Maps add-on could be abused.

By Thomas Claburn
InformationWeek
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Google's new Latitude location-sharing service "could be a gift to stalkers, prying employers, jealous partners, and obsessive friends," Privacy International warned Thursday.

Google introduced Latitude on Wednesday. It's a new Google Maps feature that lets users share location data with friends, using either a mobile phone or Google Gears-equipped computer.

Google knows well that it has a privacy problem, exemplified by
Motivation

- What exactly are people’s privacy concerns?
- Are these location-sharing applications addressing these concerns?
Objectives

- Conduct a risk/benefit survey
  - Determine user’s specific concerns
- Evaluated existing location-sharing applications
  - Evaluate privacy controls
Outline

- Locating Technologies
- Location Risk/Benefit Survey
- Location-Sharing Applications
- Addressing Perceived Risks
- Conclusion
Locating Technologies
Global Positioning System
WiFi Positioning
Cellular Triangulation
IP Location

Location of my IP address 72.204.154.191:
New Orleans in United States.
Click for big IP address image.
Locating Technologies

- Platforms
  - Laptop computers
  - Mobile phones

- Applications
  - Advertising/Marketing
  - Information services
  - Friend-finding
Industry Guidelines

- CTIA Best Practices
  - User Notice:
    - Information use, disclosure, protection
  - Consent:
    - Choice of information disclosure to third parties
Location Risk/Benefit Survey
Method

- Conducted April 2008, $n = 587$
- Provided list of use scenarios
  - Rate the likelihood of scenario
  - Rate the magnitude of harm or benefits
- Ranked each risk/benefit

Expected Utility = Likelihood * Magnitude
Location-Sharing Applications

- Not very useful
- People are concerned about their privacy
- Risks outweigh benefits
Benefit Scenarios

Perceived Benefits

- Finding New People
- Having Fun
- Recruit for Activities
- Finding Coworkers
- Self Tracking
- Finding Visiting Friends
- Carpooling
- Coordinating Family Activities
- Finding Friends Nearby
- Tracking Relatives
- Okayness Checking
- Finding Information
- Tracking Children
- Finding Others in Emergencies
Risk Scenarios

Perceived Risks

Being Judged
Revealing Activities
Spyed On by Boss
Bothered by Ads
Tracked by Govt
Bothered when Alone
Found when avoiding
Intruded upon
Being Stalked
Revealing Home
Location-Sharing Applications
Location-Sharing Applications

- Reviewed 89 Applications
  - Date of Launch
  - Privacy Policy
  - Privacy Controls
  - Immediately Accessible Privacy Settings
LOCACCINO

Your location

online

Search for a friend

Eran Toch

Jay Springfield

Joe Locaccino

Lorrie Cranor

Lujo Bauer

Patrick Kelley

Paul Drielsma

Tony Poor

Show all on map | Clear map

Janice Tsai

Near: Carnegie Mellon
University, 100 Smith Hall
At: 11:00 AM
Privacy Overview

- Types of Applications
  - Open: Requested by anyone (52)
  - Closed: Requested by friends only (29)

<table>
<thead>
<tr>
<th>Category</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privacy Policy</td>
<td>66%</td>
<td>34%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Privacy Controls</td>
<td>76%</td>
<td>17%</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Accessible Privacy Settings</td>
<td>17%</td>
<td>75%</td>
<td>2%</td>
<td>6%</td>
</tr>
</tbody>
</table>
Types of Restrictions

- Friends Only (49.4%)
- Granularity (11.2%)
- Blacklist (15.7%)
- Invisible (33.7%)
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% of applications
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Janice Tsai
Near: Carnegie Mellon University, 100 Smith Hall
At: 11:00 AM
Rule Editing

Rule name

Who  Who can see my location?

New Locaccino Friend List  Click for all lists and networks  Show all

This rule applies to all my friends

When  When can they see my location?

- I can be seen all the time
- I can be seen part of the time

Where  Where can they see my location?

e.g. my friends can see my location only when I'm in the Carnegie-Mellon University campus

- I can be seen in all locations
- I can be seen in these locations
**Rule Editing**

**Who**  Who can see my location?

This rule applies to all my friends

**When**  When can they see my location?

- [ ] I can be seen all the time
- [ ] I can be seen part of the time...

**Where**  Where can they see my location?

- [ ] I can be seen in all locations
- [ ] I can be seen in these locations...

E.g. my friends can see my location only when I'm in the Carnegie-Mellon University campus
**Who:** Who can see my location?

**When:** When can they see my location?

**Where:** Where can they see my location?

- I can be seen all the time
- I can be seen part of the time...
- I can be seen in all locations
- I can be seen in these locations...

Note: This rule applies to all my friends.

e.g. My friends can see my location only when I'm in the Carnegie-Mellon University campus.
My Rules

Rule Editing

[Image of Facebook Locaccino Privacy Settings]

Who: Who can see my location?

When: When can they see my location?

Where: Where can they see my location?
Types of Restrictions

- Per-Request (2.25%)
- Time-Expiring (2.25%)
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Most Frequent Controls

- Friends Only (49.4%)
- Invisible (33.7%)

% of applications
Privacy Controls

- Frequency of Restrictions

![Restrictions Per Application Chart]

- Restrictions Per Application

- # Applications vs. # Rules

- 0 rules: 23 applications
- 1 rule: 29 applications
- 2 rules: 16 applications
- 3 rules: 8 applications
- 4 rules: 4 applications
- 5 rules: 1 application
Addressing Perceived Risks
Privacy Controls

- Best mitigate the greatest expected risks
  - Blacklist (16%)
  - Granularity (12%)
  - Group-based rules (12%)
  - Location-based rules (1%)
  - Time-based rules (1%)

% of applications
Conclusions

- Industry guidelines do not address privacy concerns
- Systems lack expressive privacy controls
- No one application fully addresses the largest risks
Recommendations

- Providing expressive controls could reduce concerns
- Developers must balance expressiveness and user burden
CMU Usable Privacy and Security Laboratory

http://cups.cs.cmu.edu/