# Location Deception and Ambiguity in Mobile Visualizations for Social Awareness

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## ABSTRACT

Mobile social awareness visualizations display an aggregation of data from one or more sources information pertaining to the current status, activities or context of those within a user's ego-centric social network, represented as awareness cues. In commercial and research-based location-based systems for social visualizations adopt only basic rules for tackling location deception – usually through a simple tracking on/off control. We show through analysis of a questionnaire deployed to heavy social network users that location deception is a common practice in existing communication channels, and argue the importance of applying this observation to future mobile social awareness system designs.

Our poster will succinctly illustrate guidelines for social visualizations with deception in mind through a concept design of a mobile user interface making use of the touch gestures.

## Categories and Subject Descriptors

H.1.2 [**User/Machine Systems**]: Human factors, H.5.m [**Information Interfaces and Presentation (e.g., HCI)**]: Miscellaneous

## General Terms

Design, Human Factors

## Keywords

Social awareness, deception, visualization, mobile, design guidelines

## 1. INTRODUCTION

One of the main problems that modern communications technology solves is the ability to instantly contact someone. Micro-coordination happens between friends in a fluid manner,

made possible by communications technology allowing people to socialize more spontaneously and converge more often.

Relatively newer services such as SMS, Facebook and Twitter have enabled us to become hyper-aware of our friends and family without the richness, and therefore interruptibility of other, more attention-demanding services. Location can be automatically detected, and is a relevant aspect of context. Some exciting projects – both commercial and in research – allow users to access locations of others with the ultimate goal of raising social awareness within friendship groups (*c.f.* Plazes, Bliin, Dodgeball and Helio's Mobile Buddy Beacon).

With location based services there is an immediately apparent issue of privacy. Barkhuus and Dey found in a comparison of location-tracking services that users had more privacy concerns with location *tracking* services than with position-aware service [1]. One suggested way of reducing this problem is by blurring the boundaries or reducing the granularity of the location awareness cues, based on the principle that our mental models may not be most aligned with accurate, map-based spatial models [6]. Oulasvirta et. al classify the utility of awareness 'cues' into three groups: for co-ordination (where are you?), for expression (portraying some emotional state), and for companionship (social presence) [4]. It has been suggested that in the context of a project with high-bandwidth visual communication for presence awareness that "[by] conveying information imprecisely, they suggest that hints or clues about other people's activities may be as effective, and more emotionally satisfying, than more complete information in evoking experiences of connection" [3, 5].

Location-based social technologies have a chance of breaking through socio-technical barriers only by consider existing social behavior and expectations with communications technology. From the evaluation of a buddy tracking application, authors of the Reno project stress the importance of supporting denial (rejection), deception (false locations) and evasion (busy/away) [5]. The authors write: "[the] adoption of Reno, or of any similar location disclosure application, will engender denial practices… understanding these denial and restraint strategies, and supporting them explicitly in new technologies, will be essential condition for the acceptance and, ultimately, the success of pervasive technologies".

## 2. Analysis

While much research effort has attempted to classify the limits of location privacy, they have ignored the issue of deception. The

systems only look at two options – disclose or not disclose, ignoring scenarios when users want to give *false* information. We argue that this model – that the more privacy issues someone has with location disclosure – the more they want to restrict disclosure – is over-simplistic.

Results from a questionnaire we deployed to active social network users (N=144) show that more people rely on social networking websites for family and friend communication, the more open to revealing location are (in a supporting computer system). However, there is the corresponding increase in deception frequency. Deception towards acquaintances happens most often, at 61.9% (occasionally) and 19.0% (very occasionally). This is understandable, given that people tend to be wary of the information we give away to people we do not feel should know the information. Results for family and friends are similar. Interestingly, only 38.9%, 45.2% and 19.0% specified themselves as never lying to family, friends and acquaintances respectively, meaning that 65.6% at least *occasionally* practices deception in location disclosure over traditional communications mediums. Participants report themselves to be more deceptive to acquaintances than friends and family, which is an important observation for mobile social awareness systems where buddies make up the majority of the user base.

Most existing friend tracking systems place emphasis on accurate location tracking in order to provide detailed location information to others. Access control restrictions are placed to control privacy (i.e. allowed if the requester is in the broadcaster's social network). Our results on the reasons why people choose to disclose or not show that the identity of the requester is still the most important factor (mean = 2.40, s.d = 0.93, range = -3.0~3.0). We suggest a supplement to this control model with a more ambiguous interface to the location data; that is, the locations do not have to be as accurate as the locative technology allows. The key point is that modifications of locations must be possible in a fluid manner to allow for deceptive practices.

Creating an ambiguous view makes sense due to the human tendency to communicate ambiguously. For example, if we were asked of our location we might wish to answer as vaguely as possible, considering variables such as our interpretation of what the information seeker wants, our current context, and ability to meet up due to distance. In response to one of our open-ended questions, one respondent said:

"*A good idea would be a map that shows your friends location in relative geographical terms. If you enter the city centre the map would give a rough picture of their location. This could be, say, friend A is situated in the Bullring [shopping centre] or Friend B is at New Street station. A map giving the exact location of each friend is a little creepy in my opinion*".

We asked respondents to provide on a Likert scale of 1~7 (strongly concerned – strongly unconcerned) their privacy perceptions of when their absolute pin-point location is made visible (to a controlled list of people), compared to relative, landmark-based, less detailed visualizations (means = 5.39, 4.80, s.ds = 1.65, 1.68), supporting this comment.

Research has shown that social visualizations should be interpretable and used in combination with other knowledge [2, 3]. In friend finding, presence and social awareness systems, designers have utilized spatial-based representations of locations, relying on the convenience of such representations. As people are

thought to create so-called cognitive maps built up over time by experiencing the environment [6]. The best way to visualize this may not be the strict and static map-based representations, but a more dynamic, ambiguous view that changes together with our social and place-based cognitive maps, reflecting on our mental representations. Placement of items would be situated roughly between landmarks, reflecting our cognitive maps.

Considering the social implications and privacy issues of location sharing we can illustrate the design of four types of location disclosure control in UIs:



**Figure 1. Three different UIs considering privacy of disclosure**

1) This method has been used often in locative systems [5], where when asked, users have to make a choice whether to disclose or not. 2) Disclosure depends on a set of rules laid out in advance by the user. **3) Suggested design**. Ambiguity of information is used to cloud the accuracy of information. The size of the outer circle represents the accuracy. Circles can be moved around and resized relative to predefined landmarks.

## 2.1 Guidelines
From this analysis we conclude with the following guidelines:

1) Enable explicitly in the UI, as a natural part, deceptive control over location. 2) Feed observations of existing real-world social behavior into systems. 3) Relative, abstract, landmark-based representations have less privacy issues compared absolute, map-based ones. 4) Drawing on cognitive map theories, transformed and distorted representations may actually be more intelligible.

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