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# Privacy in a networked world: effects of reciprocity and imitation on location sharing

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**Abstract**

This position paper argues that location sharing has dramatically changed in recent years, becoming yet one more shareable aspect of people's online profiles. As a result, multiple effects from the social network may now be influencing people's decisions on if and how to share their location. Here we identify two important issues, reciprocity and imitation, which we argue are crucial in shaping people's location sharing behaviour. Finally, the paper outlines an ongoing study aiming to systematically vary these and tease apart their effects on location-sharing behaviour.

**Keywords**

Privacy, social network, reciprocity, imitation.

**ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**General Terms**

Position paper, privacy, location sharing

## Introduction

Location sharing, or the ability to inform others of one's real time location, is an activity that has long been technologically possible. Some of the earliest Ubiquitous systems, such as the active badge [Want et al., 1992], entailed systems that were capable of locating people in real time. In the last decade, projects such as the ContextPhone [Raento et al., 2005] enabled location sharing using everyday smartphone technology, by incorporating GPS as well as WiFi and GPRS triangulation.

More recently, location sharing has made a transition from standalone purpose-built systems to becoming integrated with online social networking systems such as Facebook. While this transition was technically straight-forward, it did signal an important realization: whereas one's location was previously a stand-alone piece of information that people controlled and shared using purpose-built systems, now location has become yet one more shareable aspect on one's "profile".

One's real-time location has now joined the ranks of "favorite movie", "current thoughts", "birthday" in becoming an everyday commodity that users can construct and share amongst their network of friends and contacts. One's real-time location can now be exchanged amongst users and friends, used to implicitly and explicitly signal others, and also used to obtain improved services and information. We refer to this new status quo of location sharing as the "socialization" of location sharing.

A substantial body of knowledge regarding location sharing is still drawn from studies conducted on standalone systems that are now becoming obsolete.

Since the socialization of location sharing is a relatively recent phenomenon, this leads us to question our assumptions and understandings about how and why people share their location with others in the context of online social media. While previous work has conducted ethnographic studies on this, mostly collecting qualitative data from users of standalone systems, little work has considered the network effects that may be responsible for shaping people's behavior.

Understanding people's motivations for sharing their location is crucial for a number of reasons. Motivations lead to actions, and therefore understanding people's motivations leads us to a better understanding of their actions. This, in turn, helps us to understand better people's use of our systems, and ultimately to design systems that cater better to their needs.

## Network effects in location sharing

There is some evidence suggesting that social network effects may be responsible for shaping our location-sharing behaviour. In our own studies we have found that people share more details about their location with stronger ties, while they tend to obfuscate their location more when sharing with ties of weaker strength. In addition, many studies have shown that network structures do affect many aspects of behaviour of individuals, such as the adoption of a drug by physicians [Coleman et al., 1996].

This paper suggests that in the context of social media, further network effects may be influencing people's decision to share or not to share their location. Two important concepts that have been shown to substantially shape people's behaviour in general are **reciprocity** and **imitation**. These concepts have been

long-studied in social network analysis, and we argue that they most likely effect people's location-sharing behaviour directly.

### **Reciprocity and imitation for location sharing**

Reciprocity can be described as behaviour that is a direct response to someone else's behaviour in one's social network. For instance, if someone invites you to dinner, you are likely to invite them to dinner at some point in the future out of reciprocity. On the other hand, imitation can be described as the copying of behaviour observed in one's social network. For instance, if many of your friends tend to dress up in costume during Halloween, then you are likely to adopt that behaviour. In terms of location sharing, reciprocity and imitation are quite distinct motivators. Location sharing out of reciprocity amounts to this behaviour for the purpose of maintaining balanced relationships with others in the network. On the other hand, location sharing due to imitation amounts to people sharing their location because "everyone else is doing it".

These phenomena have direct implications on location privacy. Altman theorizes privacy as a "boundary regulation process" in which people attempt to regulate their accessibility depending on context [Altman, 1975]. Reciprocity and imitation directly affect this process of boundary regulation. The norm of reciprocity pushes individuals towards sharing their whereabouts with a contact in a similar manner as the contact shares with them. Similarly, the tendency to imitate constantly re-defines an individual's disclosure boundaries between the need to be visible and the need to limit accessibility.

In addition, reciprocity and imitation can drive people towards safe or unsafe location sharing practices. As an example, a malicious party attempting to spy on an acquaintance may share his location with the her, who in turn might feel obliged to reciprocate by sharing her location. Given the sensitive nature of an individual's location, we argue that it is important to understand the effects of these two social phenomena on the location sharing behaviour of users of such applications. This understanding can help us design safer systems. For example, this might help us design techniques that nudge users towards safe behaviour.

Even though these two distinct motivators can have a similar outcome – a person sharing their location – the ultimate cause and objective of that behaviour may be substantially different. Designing for these differences is important, and empirical data on this issue is not abundant. An important reason for this is due to the nature of the task under consideration. Techniques such as experience sampling are too intrusive, and most researchers rely on qualitative data collected retrospectively. On the other hand the difficulty with using real world data from location sharing applications – in addition to the difficulty for an average researcher to gain access to such data - is that the cause for an instance of the act of location sharing by an individual is not always obvious to the observer studying such data. There can be many factors for the individual's action, such as the mood of the individual and various circumstances external to the online location sharing social network. Even after taking these into account, one can never be certain from real world location sharing data whether it was imitation or reciprocity that caused the individual to share his location.

We argue that a more controlled study is needed to more systematically map the differences in users' motivations, more specifically the different effects of imitation and reciprocity.

### **Ongoing study**

It is methodologically challenging to tease apart the effects of reciprocity and imitation on location sharing behaviour. We are currently designing a study that attempts to systematically vary these two variables, and measure the effect on people's location-sharing behaviour.

To this end, we plan to recruit participants to measure their response of sharing their location with various ties given the location sharing behaviour of those ties. We aim to study the effect on the response of the participant of factors such as such as tie strength, similarity and social status of the individual being potentially imitated or reciprocated. These factors pertain to the various individuals in the immediate social network of the participant.

In addition, it would be imperative to consider the nature of the location sharing behaviour being imitated or reciprocated. For example, sharing one's location when in a red-light district is qualitatively different from sharing one's location from an airport, and so is the imitation of such an act. Such a study would have to account for these differences.

### **Conclusion**

This paper argues that location sharing has dramatically changed in recent years, since its "socialization" has made it yet one more shareable aspect of people's online profiles. As a result, multiple

network effects may now be affecting people's decisions as to if and how to share their location with other people in their social network. Here we present two important issues, reciprocity and imitation, which we argue are crucial in shaping people's behaviour. Finally, the paper outlines an ongoing study aiming to systematically vary these and tease apart their effects on location-sharing behaviour. This, in turn, helps us to understand better people's use of our systems, and ultimately to design systems that cater better to their needs. This is crucial, especially given the sensitive nature of location sharing, and its potential for impeding on people's privacy.

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