

# The Value of Location Information

## (Transcript of Discussion)

Vashek Matyas

Masaryk University, Brno

**Bruno Crispo:** Was the usual behaviour of the participants affected by the experiment, did they have to do anything specific?

**Reply:** No, they didn't have to do anything except if they are used to switching off their mobile for the night they were told that they have to have their mobile on all the time, that might be the case for a few of them, other than that, nothing.

**Bruno Crispo:** The conditions of presenting the experiment were exactly the same in all the different sites?

**Reply:** Yes.

**Tuomas Aura:** Did you ask how much students would pay in order to be allowed to participate?

**Reply:** No, we didn't ask that, and I believe that we would get 10% or 15% of people even giving us money to be able to participate.

**Marios Andreou:** Are you going to reveal to the participants at the end?

**Reply:** Oh yes, we wouldn't get clearing through the management or ethical committees if we didn't promise to reveal the nature of the experiment. This is a fair approach, used in many experiments in Social Sciences apparently, and I was told that there are even approaches that are considerably worse than this one.

**Ross Anderson:** Some of our psychologists suggested that it was a wicked thing to do to promise money and not pay any, because in psychology they're paying money to experimental subjects all the time.

**Reply:** We had that discussion. They accepted finally the logic that since the people are actually not selected for the experiment, they don't have to get the money. When we review the details about the true nature of the experiment, we could mail them to ask them, why did they take part. I believe that it might be a fruitful approach, definitely structuring the questions will be of a very tricky nature.

**Frank Stajano:** If you've already hacked them off by not giving them any money, and telling them, aha, they might not. [Laughter]

**Tuomas Aura:** It's like you're sent this marketing survey, and you're told that after filling this you might have the opportunity of winning some gifts.

**Reply:** No. Here, it would be like this kind of survey, but before you get that you would get the first form where they would ask, we want to send you this four page form, how much would you charge us. I believe that this is the nature of the experiment, not getting the four page form immediately in the first instance.

**Tuomas Aura:** But it's where their expectations might lead, especially those who ask you to pay 100 euros.

**Reply:** Oh no, they knew that it's an auction, and they knew that the budget was limited. Sorry, I didn't put this forward at the start. They knew that we will select only a subset of the parties who are interested, and we will pay them the bid that comes lowest from those who will not be taken in, so it was based on the normal auction principles. Many people put in money that would buy you a couple of beers, or it would basically reward you for the hassle of filling the form, and maybe not switching the mobile off for the night. When they were told that there might be a commercial use of the data, many of them obviously thought, OK, we will charge more. The data that we have shows that they are doubling the price basically. Why they are not putting ten-fold, I don't know. I am not an economist.

**Ross Anderson:** When we did the initial experiment we left a period of time, I think it was a few days or maybe a week, between first asking them whether they would participate in the experiment for research, and then asking them whether they would be prepared to put in a revised bid for commercial use. Did you leave a gap, or did you just ask them the next day?

**Reply:** No, there was no gap here, the questions were coming one after another. They could have split the answers, because they had the access password, and their email was used as a login, but I don't think many of them used this, I think that most of the people filled the answers immediately after another.

**Tyler Moore:** Well you might get a correlation there. With the commercial use, juxtaposed right next to it, they're going to automatically assume, this just has to be worth more otherwise they wouldn't be asking me this question.

**Reply:** There are both arguments against this and for this, I agree. As you will see the results show there is no difference.

**Mike Bond:** There may be a difference between how people would react to selling their location privacy to a party they have an existing relationship with,

versus to a party they have a new relationship with. Maybe if they're already your students at your University, then you've got the existing relationship.

**Reply:** It was worded in such a way that the relationship here was of a nature something in-between, it was not entirely a new relationship, because this was a commercial partner of your operator that was in contract with the partner at the time when you filled in the data. So if you trusted your mobile phone operator to sign up to reasonable contracts only, then you would probably believe that this was acceptable commercial use. It was not just anyone coming for the data.

**Mike Bond:** It would just interest me how it would affect the price of bids if you smack a familiar logo on it.

**Ross Anderson:** I suspect that the significant price points might be whether the data can be resold.

**Reply:** Then it comes to the issue of not only who will use the data, but in what kind of usage, if it's a usage where you will do statistical analysis only, or where you can track individual people.

**Ross Anderson:** This is perhaps one of the things people have to explore in the economics of privacy, the extent to which you can make a complete contract. One of the problems with people anticipating privacy abuses of the data, is that they've no idea what the thing will be used for; the average person has no idea, for example, of the secondary uses made of their medical records, and no idea of the extent to which commercial data, things like loyalty card information, is traded between companies that do profiling. Now if you start getting into a world where all this stuff is for sale, then the unforeseeability, from the point of view of the individual who's trying to make a privacy contract, makes the contract more difficult, and either might result in people giving up, or it might result in the prices being high.

**Tuomas Aura:** But I think it might go the other way, that people stop caring, so in the future you might actually establish that a Tesco loyalty card gets them some cheaper insurance.

**Ross Anderson:** That's certainly the way it happens with the credit reference agencies.

**Tuomas Aura:** In the US, kids are told that when they are 18 you have to get a credit card and use it, because you establish a credit record, even if you don't need any credit.

**Bruce Christianson:** You don't need it now, but. . .

**Tuomas Aura:** I think mobile phones would be another possibility, the phone operator gave you free minutes, or free text messages, how many free text messages do they have to give you, for allowing them to check your location and use the data for whatever they want to use it.

**Frank Stajano:** But they can basically do that because there's so much fine print that you don't know if your contract doesn't already say that: we have to have your location because otherwise we can't route calls to your phone, and they can do what they like.

**Ross Anderson:** The privacy scare in America yesterday<sup>1</sup>, was about the plans of Google, Microsoft, and others, to wire up American cities for free wifi access. The deal there is, that Mr Google will give you free wifi access with a low bit rate throughout San Francisco, you can give him twenty bucks a month, or whatever the subscription is, you get hi-speed wifi access, but presumably the small print says that if you take this free low-speed wifi access, he gets your location history.

Now we're about to see a very large-scale social experiment of precisely the subject matter of your paper, and I wouldn't be surprised if the people at Google start looking at your work once you've published.

**Frank Stajano:** Even if they give you £20 a month, or whatever, they're still getting locations-data right, so there's no difference to you.

**Ross Anderson:** Well the interesting thing is, what can Google get from providing free wifi access? Now if I use search all the time to go back to the Lab to get my emails, he's not going to get my content, but he can obviously get my location information.

**Frank Stajano:** But he would whether you're paying the £20 or not.

**Ross Anderson:** Well, so is there a market for somebody to provide software that makes your laptop into an address at Java device that changes your MAC address every six hours, or whatever. You could actually sell that for money.

**Bruce Christianson:** Something like Hedy Lamarr's frequency hopping<sup>2</sup>, but with address hopping.

**Michael Roe:** There's a strange economic inversion here. If you're paying money for the service, then to identify your subscription, you've got to be known to the service provider. But if there's a scheme where anybody can get access for free, then you would better to pretend to be lots of pseudonyms. So it's exactly the wrong way round, by not paying for the service you get more privacy than if you pay for it.

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<sup>1</sup> See <http://www.forbes.com/feeds/afx/2006/04/06/afx2653226.html>

<sup>2</sup> See <http://w2.eff.org/awards/pioneer/1997.php>

**Ross Anderson:** In that case the hardware project is to build a device that makes one laptop look like twenty, with constantly changing addresses, so that you get the high bandwidth access, and the privacy, at the same time.

**Frank Stajano:** Except if all twenty are moving at the same time then it is discovered, this cluster is your laptop.

**Steven Murdoch:** You don't need to be a MAC address in software. Only for the data packets the association uses the hardware MAC address.

**Bruce Christianson:** That would be the outcome, gangs of roving youths.

**Steven Murdoch:** Well all the protocols I've looked at for an association stage, you can't spoof the packets.

**Matt Blaze:** If Ross is coming back to a specific site with his spoof MAC address, the movement of the laptop user with unfamiliar MAC addresses tunnelling back to Ross' home is still going to reveal the same thing as his MAC address would.

**Ross Anderson:** Well there's a wonderful PhD project for someone to do a proper implementation with a peer-to-peer system of address-agile laptops in San Francisco with a privacy overlay, and all the other engineering that you'd need.

**Reply:** Yes, you have to keep warning the addresses not to use the constant share of twenty that you would use. Anyway, these are the possible approaches that we thought of how to separate out the group of people who would be in for the money.

**Srijith Nair:** Isn't it possible to just tell them, we have run out of funding, and we can't pay you anything, but can we still use your data? The people who respond yes will be people who are there for fun, not people who are in for the research projects.

**Ross Anderson:** But then you'd have to own up afterwards, and deceive them as well?

**Reply:** But it might be an option.

**Peter Ryan:** So how do you sleep at night?

**Reply:** A couple of beers is always a help. When we compare our data that we got to the basic findings of the Cambridge experiment, the valuations are roughly the same. If you compare the basic academic or research use, and the possible commercial use, they are doubling. There was an indication that travelling and

movement for the Cambridge experiment was a sensitive issue due to the fact that (as I was kindly informed yesterday, having studied in Cambridge for four years in the past and not known about it) the students are not supposed to travel much out of the town, which is not the deal in countries where we undertook the experiment<sup>3</sup>.

We would be definitely interested in suggestions, how to get the real perceived value, how to filter out those people who would be in just for the fun, or just being able to take part in this research. Any suggestions to the experimental design are also welcome.

**Tuomas Aura:** Following Srijith's ideas, you could now send a letter or an email, I suppose, to the participants, and say, well we've used our budget, but if you'd still like to take part without any payment, you can do that.

**Reply:** Yes, OK. That's even better, yes, good one.

**Mike Bond:** Then you can spot the people who are only in it for the money, because they won't take part in that second stage, so you could identify the people who are just beyond the highest bid.

**Reply:** If the people who respond say, no, then this would be the indication that these are the people who were in for the money, and these are the people who we would be interested in. If we do it along the lines that Tuomas just suggested, then this filters out the people who are in just for the fun, because these would say, yes, I will take part anyway.

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<sup>3</sup> PRECINCTS OF THE UNIVERSITY AND RESIDENCE, pp180-1 in chapter II of the Ordinances of the University of Cambridge (available on-line at <http://www.admin.cam.ac.uk/univ/so/pdfs>)