

Living in a Glass House:

A Survey of Private Moments in the Home

Eun Kyoung Choe, University of Washington

Sunny Consolvo, Intel Labs Seattle

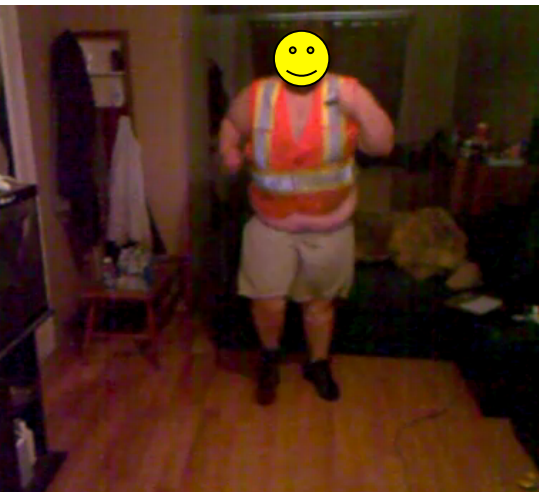
Jaeyeon Jung, Microsoft Research

Beverly Harrison, Lab126

Julie A. Kientz, University of Washington

Motivation

- Sensors and recording devices are being integrated into homes



Entertainment
(e.g., Kinect)



Energy Monitoring



Eldercare Application
(e.g., Fall Detection)



Home Security Monitor

Motivation

- Sensors and recording devices are being integrated into homes
- However,
 - Home is a private and intimate place
 - There are multiple stakeholders
 - Sensing and activity inference data captured in the home could be highly sensitive
 - Private activities can be inferred by eavesdropping

Goal

- Understand the privacy concerns around sensing and recording technologies *in the home*
- Focusing on
 - the *activities* that people do not want recorded
 - and *where* these activities take place
- So that we can be more mindful of the types of activities that need to remain private

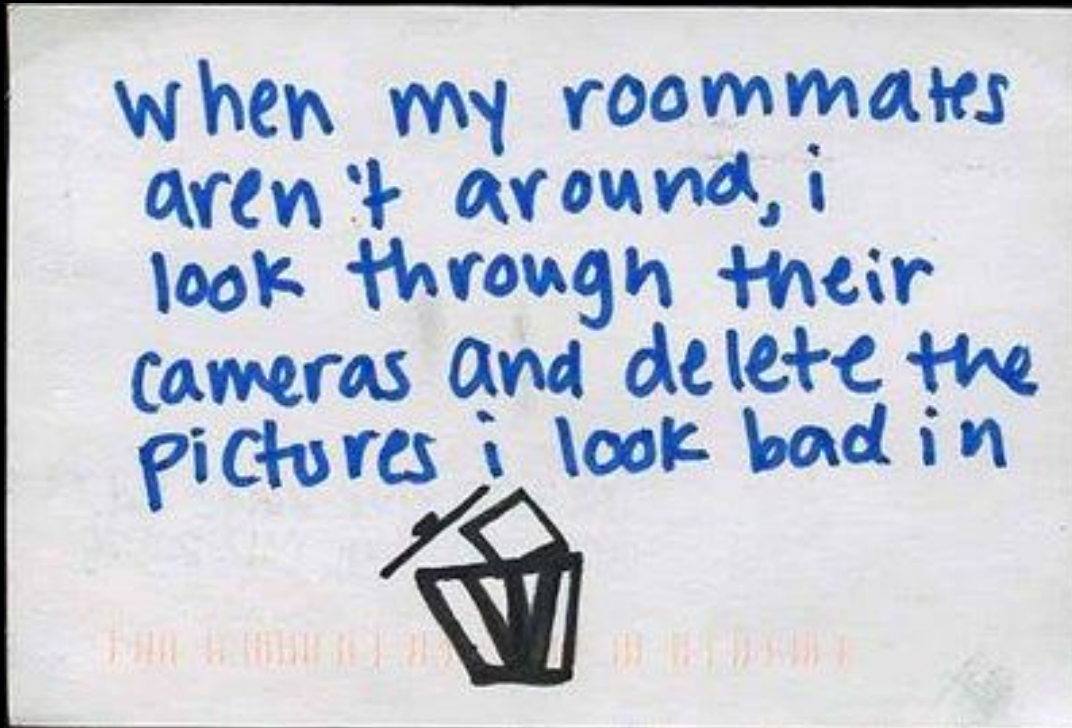
Challenges

- Studying privacy concerns of in-home sensing
 - depends on householders being willing to disclose sensitive information about their private lives
- People may not want to reveal this type of information to others (e.g., researchers) *in person*

Our inspiration

8/25/2007

Sunday Secrets



Sunday Secrets

Campus Events (Sept)

New PostSecret Book

 BOOKMARK 

 RSS FEED 

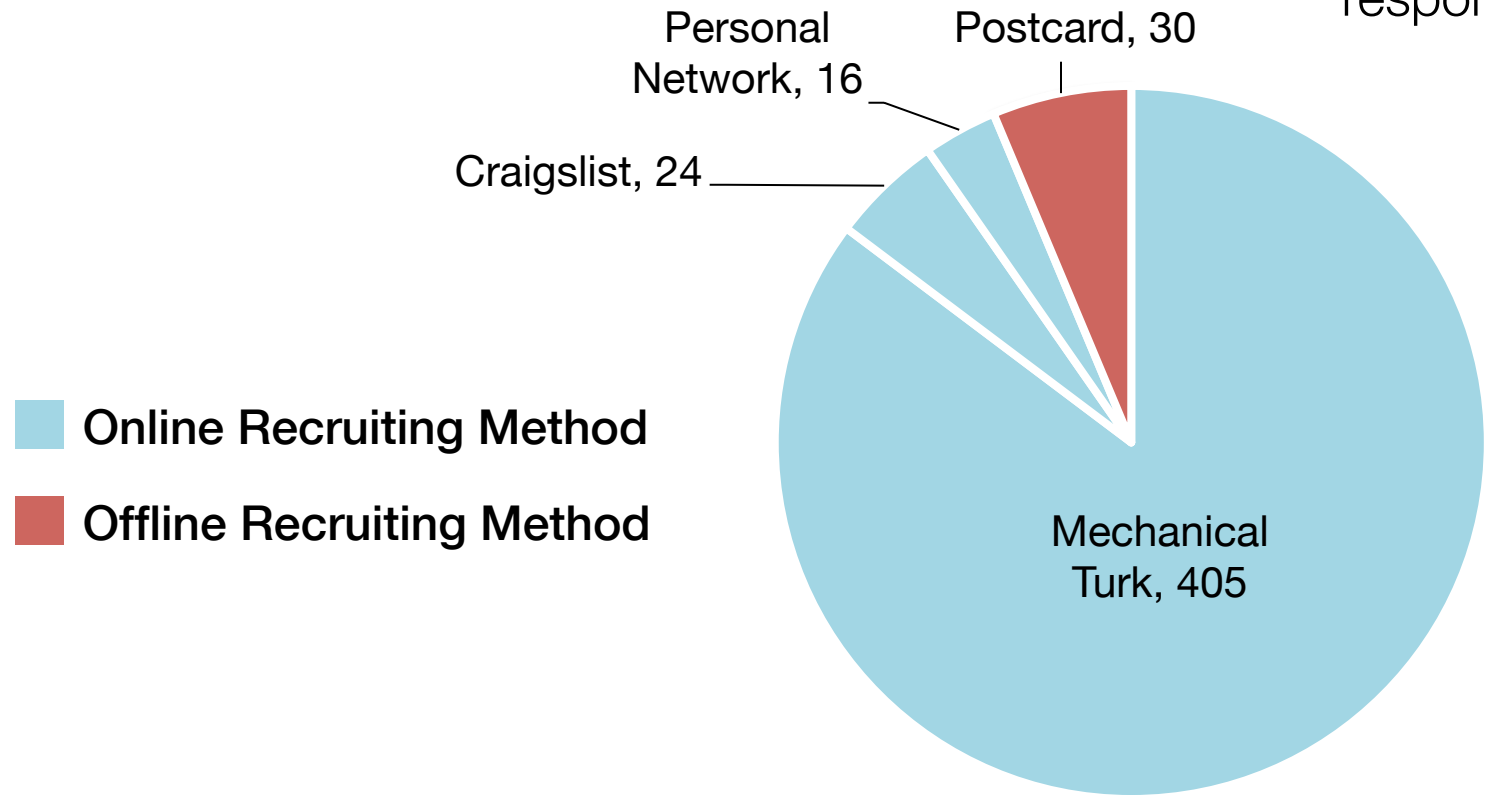
Join the Mailing List

← A homemade
postcard
containing secrets

Our approach: Anonymous survey

Recruiting Methods, Number of responses

Total # of
respondents
= **475**



Postcards



MY PRIVATE MOMENTS



<http://www.chookooloonks.com/blog/2011/1/26/seattle-jazz-trip-on-coffee-houseboats-and-nettle-town-cafe.html>

MY PRIVATE MOMENTS RESEARCH SURVEY

You are invited to anonymously contribute your private moments to a group of researchers.

What To Do

1. Take a postcard.
2. Complete the survey.
3. Seal the pre-paid postcard and put it in a mailbox.



Imagine a future where you live in a smart home in which **security cameras** and **microphones** are used to protect you, the other members of your household, and your household itself. These devices would be integrated into every room in your home **except for the bathroom(s)**. Note that no one other than the members of your household would have access to the recordings unless you give them permission (e.g., in the event of a fire or break in).

PLEASE FOLD ↓

Please describe at least **three regular habits** that you do in your home that you would not want to have recorded by these devices (e.g., putting clothes that I'm currently wearing in the washing machine and then walking from the laundry room to the shower, late night snacking in the kitchen). Please include **WHERE** in your home that you do the activities.

1. _____
2. _____
3. _____
4. (optional) _____
5. (optional) _____

Scenario & Questions



- “Imagine a future where you live in a home with **security cameras** and **microphones** that are used to protect you”
- Describe at least **three habits** that you do in your home that you would not want to have recorded by these devices.
- Include **WHERE** in your home that you do the activities.
 - ➡ Specific, less emotionally loaded, and generally understandable
 - ➡ Conducted 7 iterations with 114 pilot respondents using Mechanical Turk

Analysis

**1433 activity
descriptions from
475 respondents**

- Developed a category scheme using affinity diagramming
- Activity type: 19 high-level and 75 sub-categories
- The coded activities were also analyzed based on the location

Breakdown of activity types

	Self-appearance	Nudity, walking in underwear, no makeup
	Intimacy	Sex, masturbating, kissing
➡	Cooking & Eating	Eating, snacking, bingeing, cooking
	Media Use	Watching TV/movies/porn, computer use
	Oral Expression	Singing, conversation, phone calls, crying
	Socially Awkward Acts	Nose picking, scratching
	Personal Hygiene	Grooming, toileting, showering, weighing
	Physical Activity	Dancing, exercising, yoga
	Sleep	Sleeping, snoring, napping, staying up late
	Home Keeping	Being messy, cleaning, sniffing clothes
	Contentious Acts	Arguing, swearing, yelling, disciplining
	Bodily Functions	Passing gas, blowing nose, belching
	Alcohol & Tobacco Use	Drinking alcohol, smoking
	Unwinding	Lounging, relaxing, killing time
	Working	Working, writing, creating artwork
	Intentional Sneaky Acts	Sneaking into the kitchen, hiding, stealing
➡	Illegal Behavior	Illegal drug use
	Spirituality	Praying, reading bible

Example—Self-appearance

“I take off my clothes in the bathroom, but then really quick nip out around the corner and toss them in the washer. It is only a foot and a half to step around the corner to the washer in the hallway. Still, I don't want anybody looking at me.” —62, F, homemaker, lives with spouse & child(ren)

- ➡ **Self-appearance** category, 22.5%
(Nudity, walking in underwear, makeup-less face, getting dressed & undressed, etc.)
- ➡ **A specific path or sequence** category, 5.2%
(bathroom to laundry)

Example—Cooking & Eating

“If I am cooking in the kitchen and something falls on the floor, sometimes I will still use the food (though I rinse it off).” —53, F, faculty, lives with a spouse

- ➡ **Cooking & Eating** category, 9.3%
(Eating, snacking, binging, cooking)
- ➡ **Kitchen and/or Dining** area category, 11.1%
- ➡ **Sensitivity of an activity depends on subtle changes in context**

Example—Media Use

“Watching bad TV. I generally watch at least a couple hours a day of TV that I don’t want people to know about because they’ll mock me.” —21, F, student, lives with parents

- ➡ **Media Use** category, 8.3%
(Watching TV/movies/porn, computer use)
- ➡ **Male respondents were more likely to report activities in the Media Use category than female respondents (16.7% vs. 10.7%)**

Summary

- Anonymous survey is effective for collecting private data
- Many of these concerns are not being accounted for in current systems
- Seemingly ‘innocuous’ activities could suddenly become sensitive activities by subtle changes in context
- Designers of UbiComp systems need to be more mindful of the types of activities that need to remain private

Acknowledgments

Co-authors



Sunny Consolvo



Jaeyeon Jung

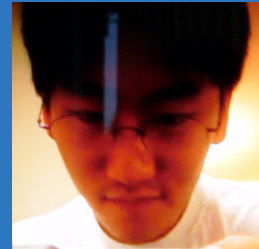


Beverly Harrison



Julie Kientz

Postcard distribution



David Cho

Questions: eunky@uw.edu

Appendix

Online survey

Mechanical Turk,
Personal Network, Craigslist

My Private Moments Research Survey

Page 3 of 5

Imagine a future where you live in a smart home in which security cameras and microphones are used to protect you, the other members of your household, and your household itself. These devices would be integrated into every room in your home **except for the bathroom(s)**. Note that no one other than the members of your household would have access to the recordings unless you give them permission (for example, in the event of a fire or break in).

Please describe at least **three regular habits** that you do in your home that you would not want to have recorded by these devices (e.g., putting clothes that I'm currently wearing in the washing machine and walking from the laundry room to the shower, late night snacking in the kitchen). Please include **WHERE** in your home that you do the activities.

Your description #1:

Your description #2

Your description #3

Postcards

Postcard with a dropbox

Prepaid



Mail to: Eun Kyung Choe
University of Washington
Sieg Hall Room 313
Box 352315
Seattle WA 98195-2315

PLEASE DON'T TELL US WHO YOU ARE. DON'T INCLUDE YOUR REAL NAME OR CONTACT INFORMATION

My country of residence is: _____
city / state: _____
My age is: _____
My gender is: _____
My occupation is: _____

I live in a (select one): ☐ Single Family Home
☐ Apartment / Condo ☐ Dormitory
☐ Townhouse ☐ Duplex
☐ Other (Which?) _____

I am a (select one): ☐ Renter ☐ Owner
☐ Other (Which?) _____

I live with my : ☐ Spouse / Partner ☐ Child(ren)
(select all that apply) ☐ Parent(s) ☐ Sibling(s)
☐ Roommate(s) ☐ I live by myself
☐ Dog(s) ☐ Cat(s) ☐ Housemate(s)
☐ Other(s) (Who?) _____

PLEASE FILL OUT THE QUESTIONNAIRE ON THE BACK

PLEASE PUT THE POSTCARD IN THE PURPLE DROPBOX

Eun Kyung Choe
University of Washington
Sieg Hall Room 313
Box 352315
Seattle WA 98195-2315

- Distributed 300
Received 30 (10%)

MY PRIVATE MOMENTS



This is for research purposes only



Mail to: Eun Kyung Choe
University of Washington
Sieg Hall Room 313
Box 352315
Seattle WA 98195-2315

Thank you!



Upon completion, seal the pre-paid postcard and put it in a mailbox

This is for research purposes only

PLEASE DON'T TELL US WHO YOU ARE. DON'T INCLUDE YOUR REAL NAME OR CONTACT INFORMATION

My country of residence is: _____

city / state: _____

My age is: _____

My gender is: _____

My occupation is: _____

I live in a (select one): ☐ Single Family Home
☐ Apartment / Condo ☐ Dormitory
☐ Townhouse ☐ Duplex
☐ Other (Which?) _____

I am a (select one): ☐ Renter ☐ Owner
☐ Other (Which?) _____

I live with my : ☐ Spouse / Partner ☐ Child(ren)
(select all that apply) ☐ Parent(s) ☐ Sibling(s)
☐ Roommate(s) ☐ I live by myself
☐ Dog(s) ☐ Cat(s) ☐ Housemate(s)
☐ Other(s) (Who?) _____

PLEASE FILL OUT THE QUESTIONNAIRE ON THE BACK



Eun Kyung Choe
University of Washington
Sieg Hall Room 313
Box 352315
Seattle WA 98195-2315

This is for research purposes only



MY PRIVATE MOMENTS

RESEARCH SURVEY

MY PRIVATE MOMENTS

YOU ARE INVITED TO ANONYMOUSLY CONTRIBUTE YOUR PRIVATE MOMENTS IN YOUR HOME TO A GROUP OF RESEARCHERS



1. TAKE A POSTCARD
2. COMPLETE THE SURVEY ON THE POSTCARD
3. PUT THE POSTCARD IN THE PURPLE DROPBOX

Distributing Postcards




Recruitment

	Methods	# of Responses	Cost
Offline	Postcard + drop box	Distributed— 150 Received— 15	Printing, enormous manual effort
	Pre-paid postcard	Distributed— 150 Received— 15	Printing, enormous manual effort, \$66
Online	Mechanical Turk	405	\$44
	Craigslist	24	0
	Personal network	16	0
Total		475	\$110 + α

Anonymous survey

- Offline
 - Prepaid postcards (15)
 - Postcards with a drop box (15)
- Online
 - Mechanical Turk (405)
 - Personal network (16)
 - Craigslist (24)



MY PRIVATE MOMENTS

This is only a preview of the survey. Responses will not be saved.

My Private Moments Research Survey


Page 1 of 5

Information Statement
This anonymous survey will help us understand the types of activities - even mundane - that people do at home that they wish to remain private. The aim of this work is to inform the design of technologies that respect the needs and concerns of household occupants. This is intended for research purposes only. We are not collecting any identifying information. To protect your anonymity, please do not include your name, or contact information in your answer.

Other Information
If you have any questions about this research, please contact Eun Kyoung Choe at (206) 712-1880 or eunky@uw.edu. Please note that we cannot guarantee the confidentiality of your email. If you have questions about your rights as a research subject, you can call the University of Washington Human Subjects Division at (206) 543-0098.

[Next >>](#)

Questions or Comments?
Contact EUN KYOUNG CHOE at eunky@uw.edu

 powered by WebQ

Public places (e.g., Café)



Recruitment

	Methods	# of Responses	Cost
Online	Mechanical Turk	405	\$44
	Craigslist	24	0
	Personal network	16	0
Offline	Postcard + drop box	15 / 150	Printing, enormous manual effort
	Pre-paid postcard	15 / 150 (as of 9/30)	Printing, enormous manual effort, \$66
Total		475	\$110 + α

Data collected

Response

Private moments with my husband

Changing clothes - bedroom

Writing--I don't like people watching me while I write. There are only two rooms in my house and I write in both of them.

walk around naked

pick my nose - bedroom

If I had to choose, one would be picking my nose. It is easier to pick it out than it is to flush it with water. I do this all over my house.

having sex - bedroom

I sit and watch too much TV, in the living room.

Obviously would not want my sexual life recorded.

intimate moments with husband

I dance very badly to 80's music in my living room.

Martial relations in bedroom (usually)

Showers- Bathroom

Getting dressed in my room.

Walk around naked; living room

Having sex with my husband. We have sex in the bedroom, and since we live with children and grandchildren I would not want them to have access to recordings of that.

I would not want sex recorded by the device. I would be extremely uncomfortable having any record of my intimate life. We have sex in the bedroom. Since there would be no camera in the bathroom, I might even shift my behavior into the bathroom.

Making love to my husband which normally takes place in the bedroom.

I pleasure myself in the bathroom.

have an intimate moment with my partner in the living room.

Singing while doing dishes in the kitchen

**1433 activity
descriptions from
475 respondents**

I sit in public
+ pretend to
READ
but I
eaves
on
Conv



I WISH YOU WERE AS GOOD AS A
HUSBAND TO ME AS YOU ARE
EMPLOYEE TO THEM.

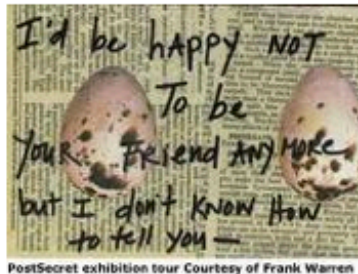
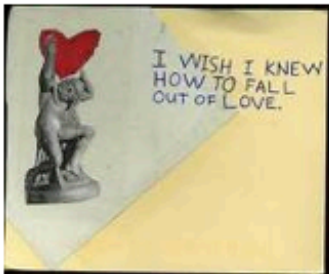
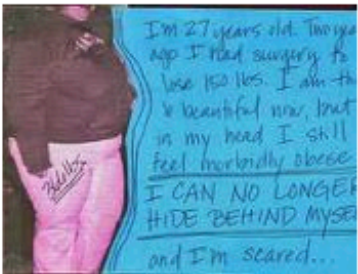
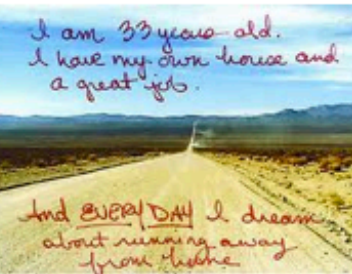


i wish that just for one day,
exactly what
d to say.



WISH I KNEW
HOW TO FALL
OUT OF LOVE.





PostSecret exhibition tour Courtesy of Frank Warren

