

CSE 216

Ubiquitous Computing

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Oct 22, 2024

What is Ubiquitous computing?



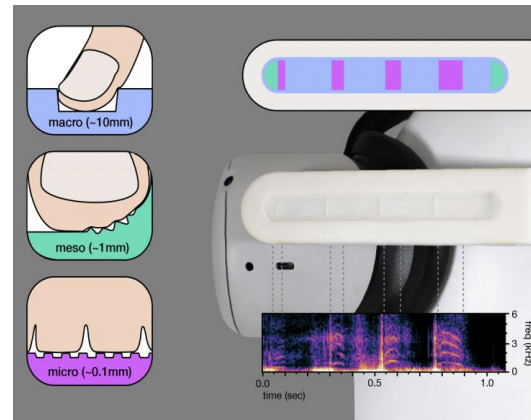
Examples



Skin input



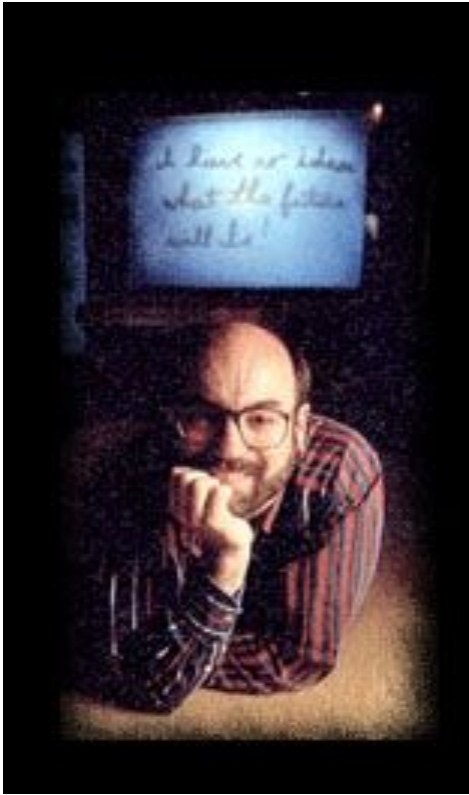
ukint



surface i/o

Yesterday's tomorrows: notes on ubiquitous computing's dominant vision

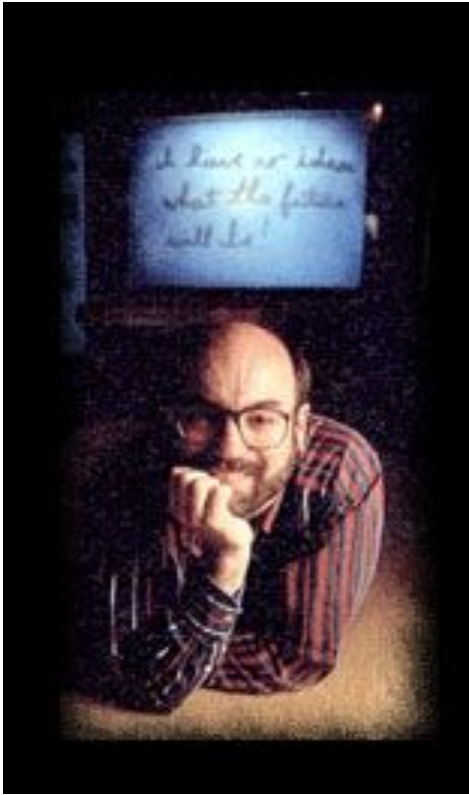
**Genevieve Bell and Paul Dourish in Personal
and ubiquitous computing, 2007**



Mark D. Weiser

Ubiquitous Computing Principles:

1. The purpose of a computer is to help you do something else.
2. The best computer is a quiet, invisible servant.
3. The more you can do by intuition the smarter you are; the computer should extend your unconscious.
4. Technology should create calm.



Mark D. Weiser

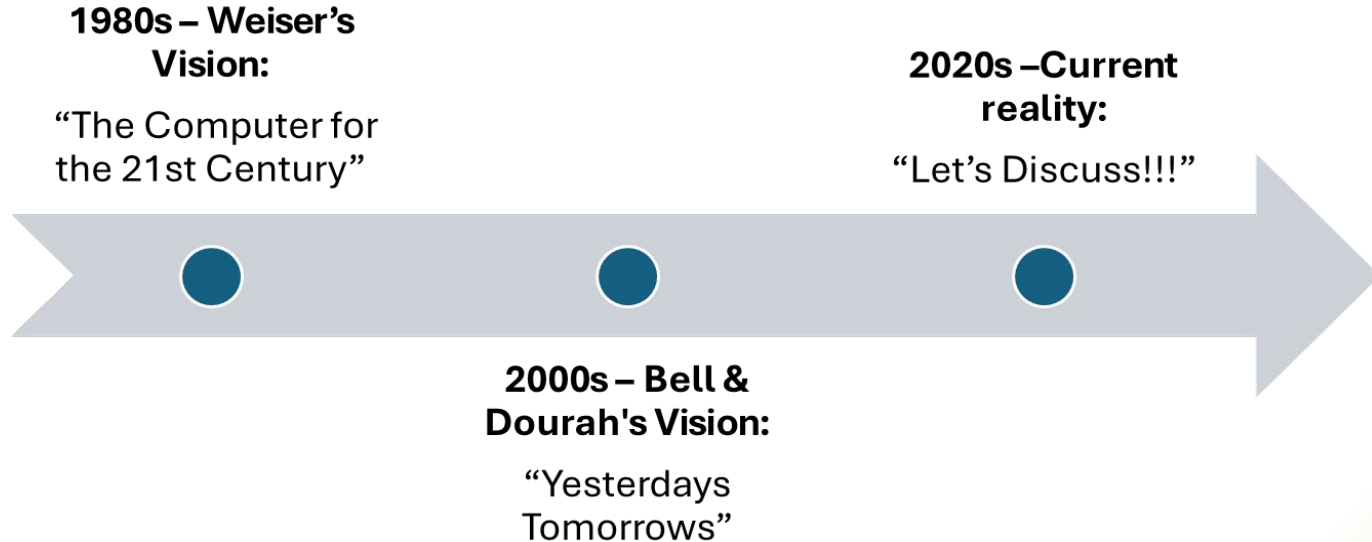
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Discussion Question

Why might it be important that technology create calm?

Timeline of Ubiquitous Computing Vision:



Proximate Future:

Ubicomp's recurring theme of always aiming at a near-future vision.

Bell and *Dourish* challenge the traditional vision of **ubiquitous computing**, stating that it focuses too much on an idealized future, ignoring the messy reality of present-day technology adoption.



Discussion Question

Considering Weiser's vision of technology as a “quiet, invisible servant” and Bell and Dourish's critique that this vision overlooks the “messy realities” of present-day technology do you think its possible for technology to be this “quiet, invisible servant” without overlooking the messy reality of current technology?

Can you explain and possibly provide examples as to why or why this isn't possible?

Disconnect Between Vision and Reality:

Ubicomp technologies are already here, but they have taken unexpected forms.

Ubiquitous computing environments developed differently, shaped by social, political, and cultural factors.

- Singapore's smart nation initiatives
- Korea's digital infrastructure

Disconnect Between Vision and Reality:

Ubicomp technologies are already here, but they have taken unexpected forms.

social apps, phones, content creators, and what else?

Ubiquitous computing environments developed differently, shaped by social, political, and cultural factors.

- Singapore's smart nation initiatives
- Korea's digital infrastructure

Discussion Question

Do you think some technologies would have failed if they were designed without considering cultural differences? Are there notable examples where a lack of cultural consideration led to the failure of a technology? Provide examples.

How do different cultural contexts shape the adoption and adaptation of technology?

Messiness of Infrastructure:

Infrastructures are inherently **messy**.

This messiness is important.

The dream of seamless technology ignores the real-world complexity of integration

Discussion Question

How do you feel about the argument that infrastructure will always be “messy”?

What are your thoughts on the claim that technological infrastructure will always be 'messy' due to integrating real world complexity?

Can you provide examples from your own experience or observations that either support or challenge this view?

Discussion Question

What are your thoughts on the claim that technological infrastructure will always be 'messy' due to integrating real world complexity?

Can you provide examples from your own experience or observations that either support or challenge this view?

network disruptions, incompatible standards, battery limitations, etc.

Present vs. Future :

The future is already here ;

It's just not very evenly distributed.

“The ubicomp world was meant to be clean and orderly; it turns out instead to be a messy one. ”

Discussion Question

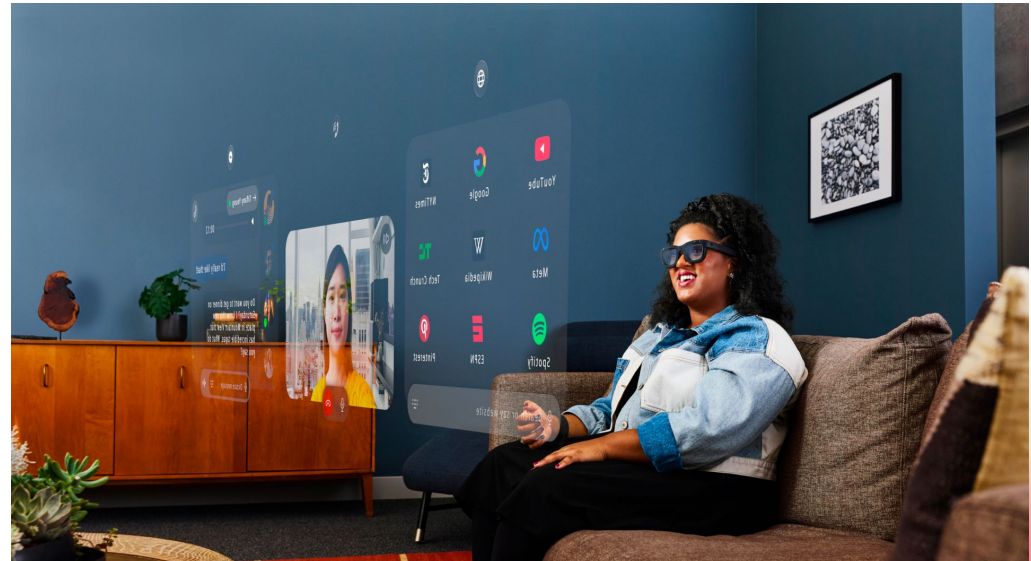
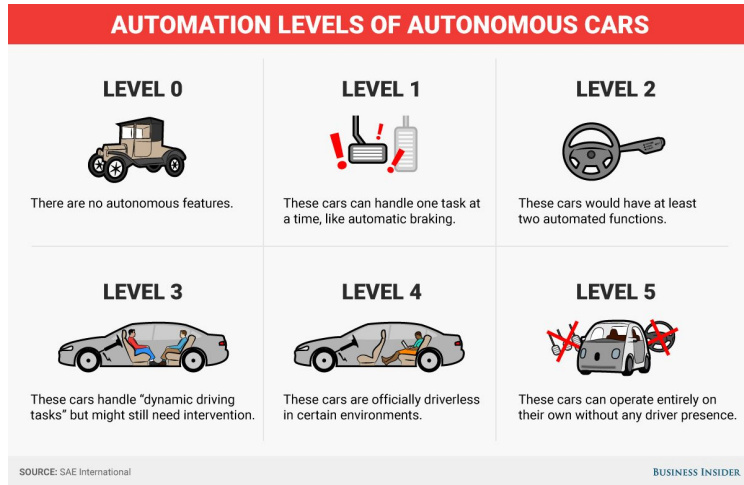
What do you think the next big step in ubiquitous computing should be?

Should we aim for better integration of current technologies, or pursue entirely new visions?

Discussion Question

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Reflections & Takeaways

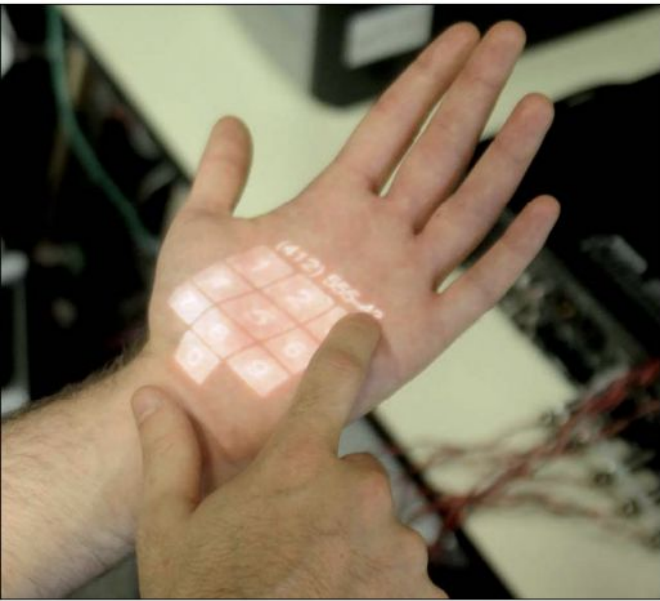
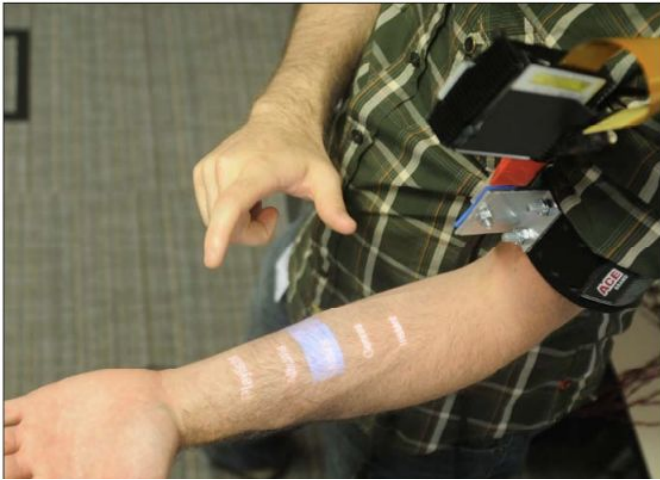
Skininput: Appropriating the Body as an Input Surface

**Chris Harrison, Desney Tan, and Dan Morris.
CHI 2010**

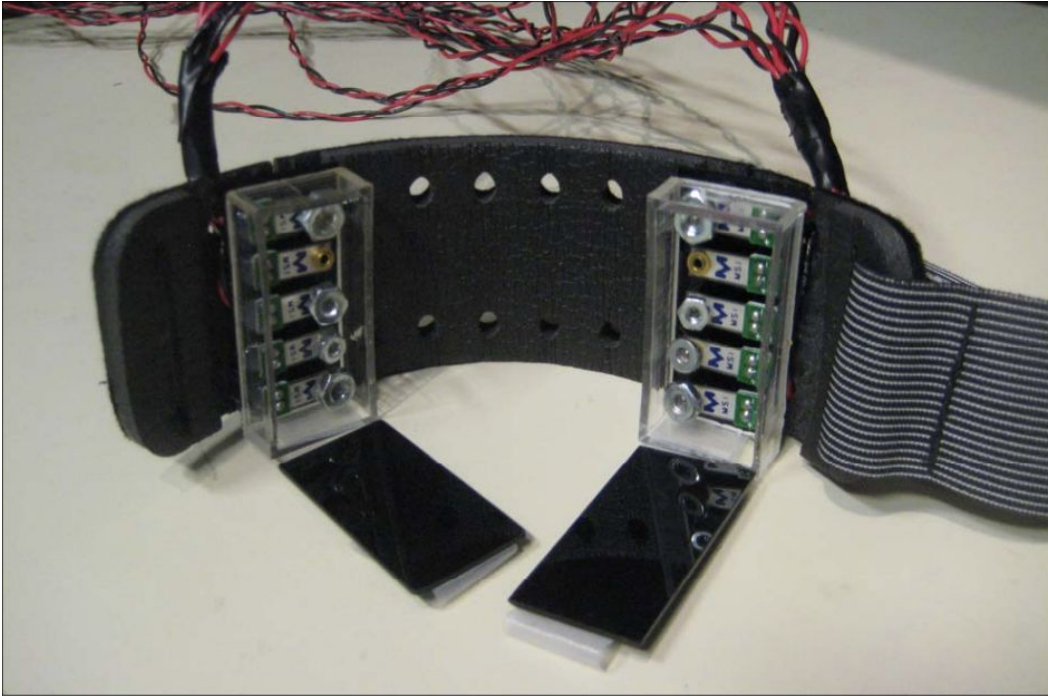


Summary

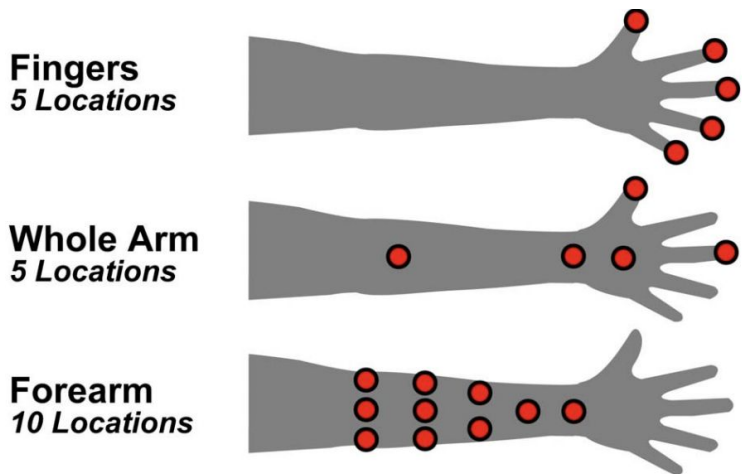
- design a novel, wearable sensor for **bio-acoustic signal acquisition**
- describe an analysis approach that enables our system to resolve the location of finger taps on the body.
- assess the robustness and limitations of this system through a user study.
- explore the broader space of bio-acoustic input through prototype applications and additional experimentation.



How does it work?



User study



Experiment procedure:

During the subsequent testing phase, we presented participants with simple text stimuli which instructed them where to tap. The order of stimuli was randomized, with each location appearing ten times in total.

Supplemental experiments

- walking and jogging
- single hand gestures
- Surface and Object Recognition
- Identification of Finger Tap Type
- Segmenting Finger Input

Discussion Question

Are you convinced by its user study?
what other aspect could also impact the
user study and how can we design a
experiments to test it?

Discussion Questions

Do you think this is an important work? What scenario in our current daily life or in our future life do you think we will be using something like skininput?

Do you see any social or ethical challenges that there might be if we were to use it in our everyday lives in the future?

Do you see any technical challenges? detecting and differentiating taps on different parts of the arm and hand?

Reflections & Takeaways

Supporting Ethnographic Studies of Ubiquitous Computing in the Wild

**Andy Crabtree, Steve Benford, Chris
Greenhalgh, Paul Tennent, Matthew Chalmers,
Barry Brown, DIS 06**

Ethnography

Writing Culture

SAMPLING BIAS.

See
Record
Analyze
Cite

Qualitative Research

New Challenges

Discussion Question

Do you think devices like skininput could face any challenges when we take ethnography into consideration?

New Challenges

- Users of ubiquitous systems are often mobile.
- Interaction often involves the use of small displays,
- Users often interact with invisible sensing systems
- Interaction is distributed across different applications and devices.

New Challenges

Previous work: exploited the logs from electronic guidebooks and sensors to thicken ethnographic and conversation analytic descriptions of interaction.

Ubiquitous computing: beyond system logs, record elements of social interaction and collaboration conducted and achieved through the use of ubiquitous applications as well. E.g., audio and text messages are logged alongside machine states and other events.

Aim: highlight emerging practice and to raise requirements for future tools to support ethnographic study in this challenging domain.

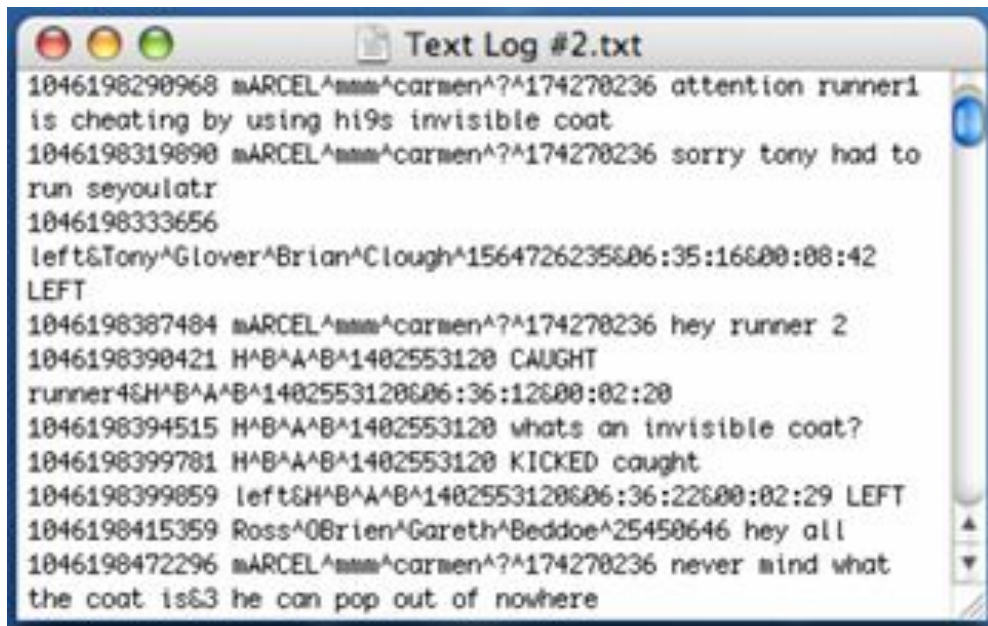
Experiences

1. Can you see me now
<https://www.blasttheory.co.uk/projects/can-you-see-me-now/>
2. Uncle Roy all around you:
<https://www.blasttheory.co.uk/projects/uncle-roy-all-around-you/>



experience 1

Can You See Me Now



1046198290968 mARCEL^mmm^carmen^?^174270236 attention runner1
is cheating by using hi9s invisible coat
1046198319890 mARCEL^mmm^carmen^?^174270236 sorry tony had to
run seyoulatr
1046198333656
left&Tony^Glover^Brian^Clough^1564726235&06:35:16&00:08:42
LEFT
1046198387484 mARCEL^mmm^carmen^?^174270236 hey runner 2
1046198390421 H^B^A^B^1402553120 CAUGHT
runner4&H^B^A^B^1402553120&06:36:12&00:02:20
1046198394515 H^B^A^B^1402553120 whats an invisible coat?
1046198399781 H^B^A^B^1402553120 KICKED caught
1046198399859 left&H^B^A^B^1402553120&06:36:22&00:02:29 LEFT
1046198415359 Ross^OBrien^Gareth^Beddoe^25450646 hey all
1046198472296 mARCEL^mmm^carmen^?^174270236 never mind what
the coat is&3 he can pop out of nowhere

Figure 1. The raw text log from CYSMN.

experience 1

Challenge: the highly distributed and mobile nature of the participants.

Materials:

video of performers' activities on the street, system logs (time stamped), text messages, game events, GPS data

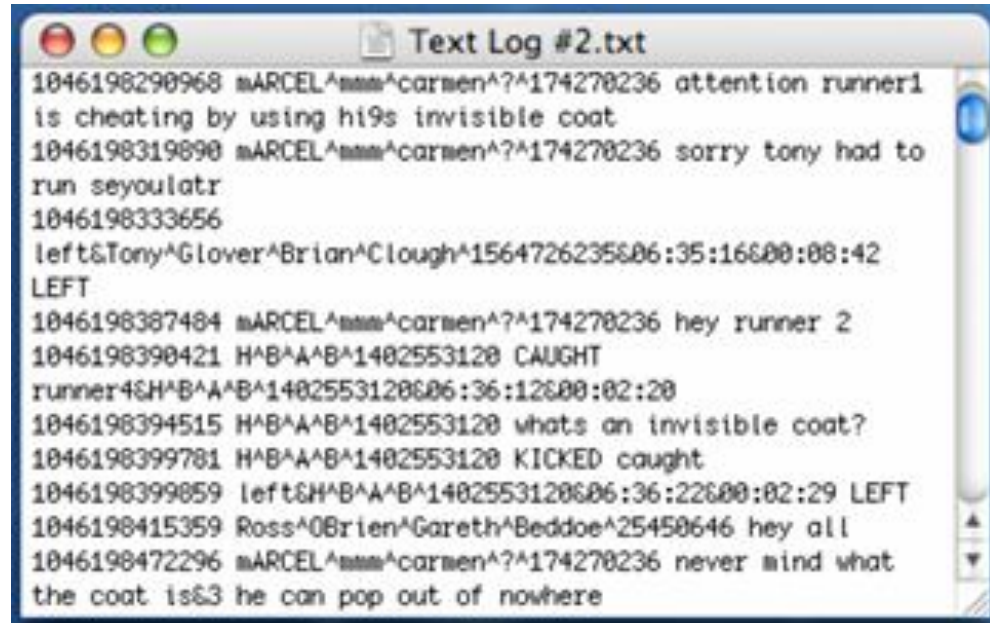


Figure 1. The raw text log from CYSMN.

experience 1

Issue:

Given a lack of video data for online players, the ethnographer needed to analyze the text message logs, which are hard to read

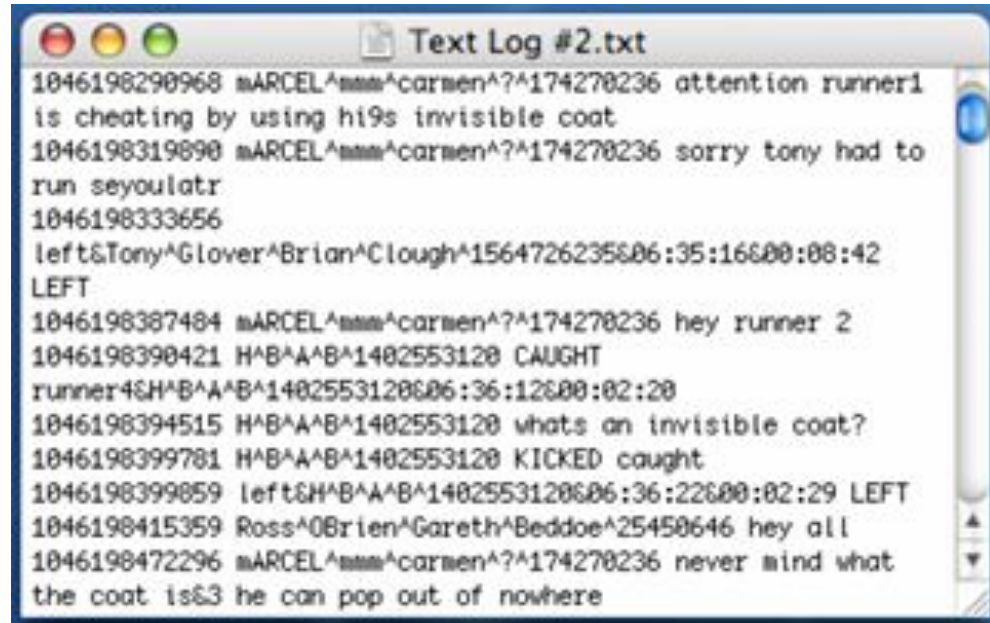


Figure 1. The raw text log from CYSMN.

experience 2

Uncle Roy

All Around

You



	A	D	E	F	G	H	I
5523	MOVEMENT	383	428	0	0		
5524	PRIVATE_CHAT	TC_40	what is your status				
5525	PRIVATE_CHAT	Nicole_20	huh...um someone from my past...				
5526	PRIVATE_CHAT	dave_31	ok mate we im waiting for directions				
5527	AUDIO	audio_id-82537_time-1083871209640.mp3					
5528	PRIVATE_CHAT	Nicole_20	is it a riddle				
5529	MOVEMENT	332	424	0	0		
5530	ROY	<p><n>local</n><t>2</t><m>Road Closed: like a red rag to a bull					
5531	MOVEMENT	293	381	0	0		
5532	ROY	<p><n>local</n><t>2</t><m>Where are you? Press ACTIONS the					
5533	PRIVATE_CHAT	Nicole_20	ok my best friend royce. he is so grea				
5534	AUDIO	audio_id-82537_time-1083871245828.mp3					
5535	MOVEMENT	245	417	0	0		
5536	ROY	<p><n>loc out straight through here. (17 minutes remaining)</m>					
5537	MOVEMENT	245	417	0	0		
5538	PRIVATE_CHAT	Nicole_20	and has always stuck by me				
5539	MOVEMENT	495	456	0	0		
5540	ROY	<p><n>local</n><t>2</t><m>An ambulance stopped here. It look					
5541	MOVEMENT	495	456	0	0		
5542	PRIVATE_CHAT	Nicole_20	ok				
5543	PRIVATE_CHAT	dave_31	head toward subway on portland street				
5544	PRIVATE_CHAT	Nicole_20	ireal sorry im confusam i doing the right thing				

Figure 2. The raw log from URAY.

experience 2

Video recordings: twelve street players, from over two hundred who took part in the first experience, and consisted of following their journey through the city and recording their interactions.

System logs: all interactions as seen by the central server including self-declared positions, game events, text messages, and audio messages



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experience 2

Issues:

system logs in URAY enable the ethnographer to go beyond separate analyses of interaction on the streets and interaction online to examine the relationship between the two.

demonstrated the need to be able to focus on particular threads within the overall experience, such as a particular street player, and the varying online players with whom they interact as the experience unfolds.



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Figure 2. The raw log from URAY.

Discussion Questions

What are the limitations of system logs in capturing human behavior?

Both of the two experiences exploit text messages for ethnographic analysis, do you have any suggestions on how to design texting apps to better support ethnographic research?

experience 3

Savannah



Figure 3. Exploiting video and system replay to understand interaction in Savannah.

experience 3

Savannah

Video recordings: two cameras located just off the field of play

system logs: all game actions



Figure 3. Exploiting video and system replay to understand interaction in Savannah.

experience 3

Savannah

Issues:

- the clocks on the video cameras were not synchronized
- no checkpoints



Figure 3. Exploiting video and system replay to understand interaction in Savannah.

experience 4

Treasure

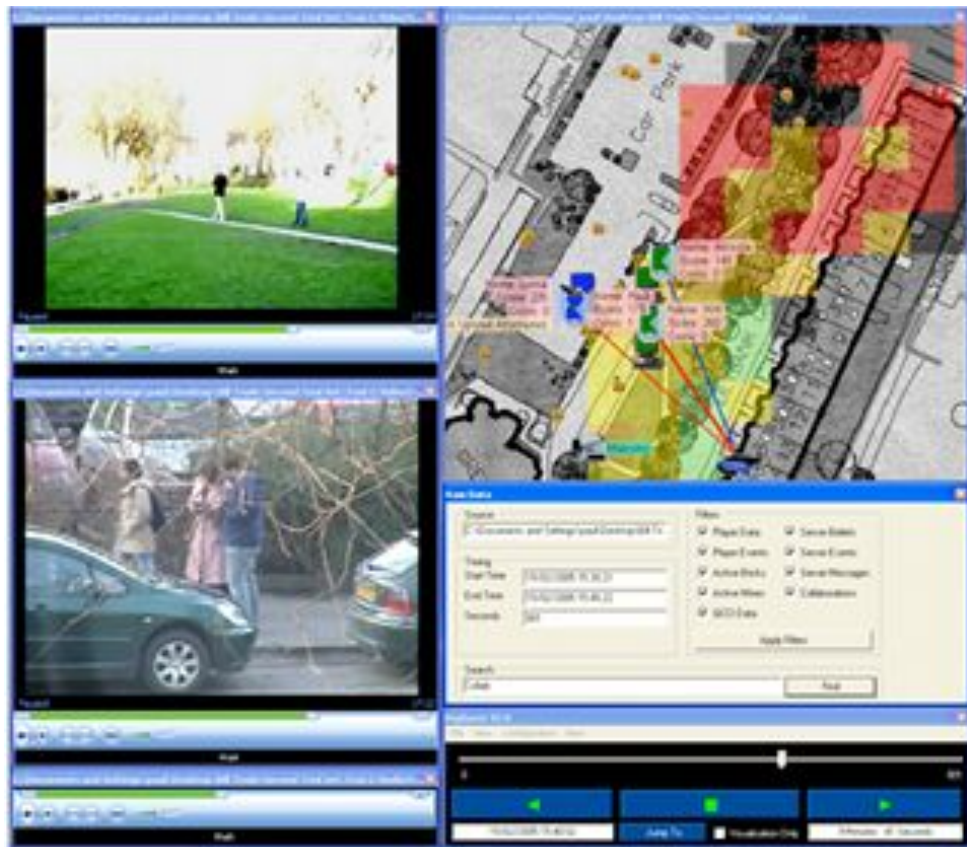


Figure 4. The *Replayer* interface integrating video replay and system log visualization and searching from *Treasure*

experience 4

Treasure

Challenges: connection and disconnection

Materials:
videos, system logs, text messages,
GPS data

Additional tool: handheld computing
running an in-house tool called QCCI

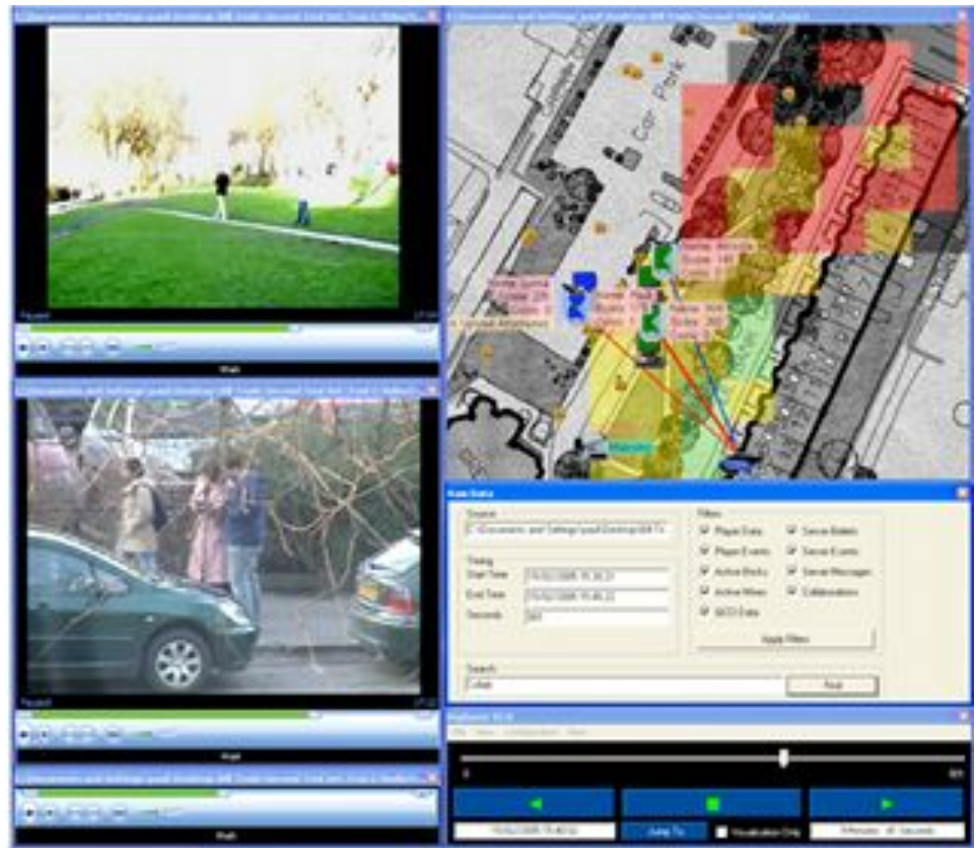


Figure 4. The *Replayer* interface integrating video replay and system log visualization and searching from Treasure

experience 4

Treasure

Additional tools:

- handheld computing running an in-house tool called QCCI
- replayer

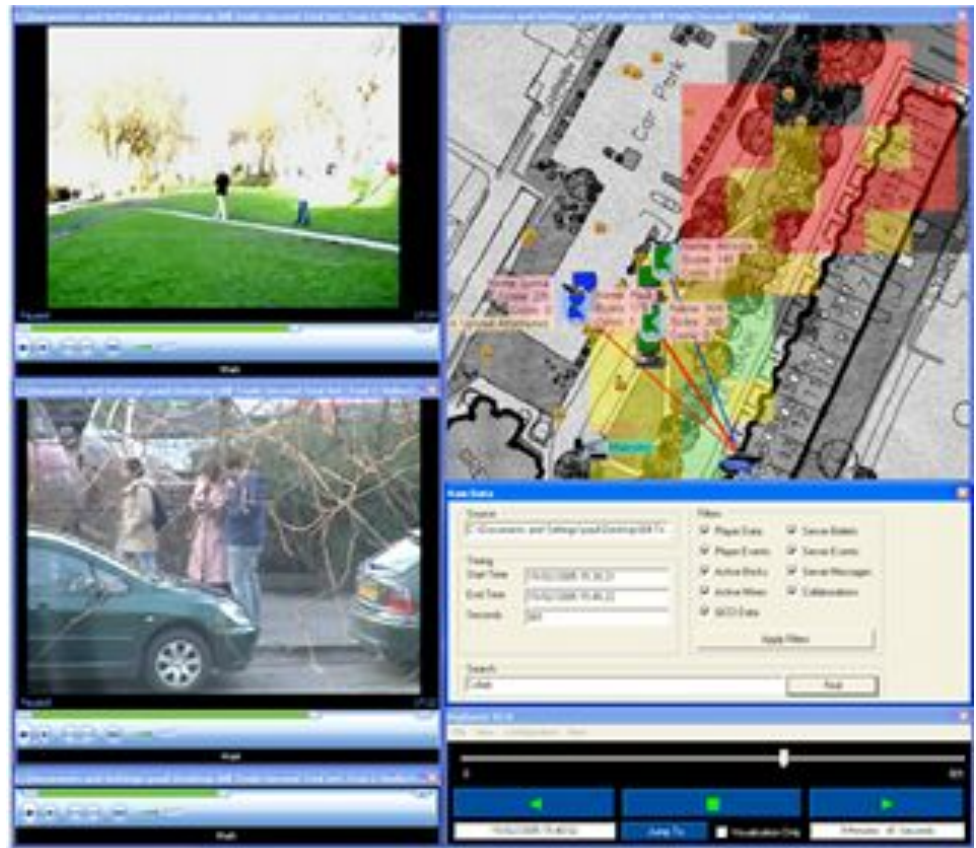


Figure 4. The *Replayer* interface integrating video replay and system log visualization and searching from *Treasure*

experience 4

Treasure

Issues:

Video analysis tools often only allow temporal navigation.

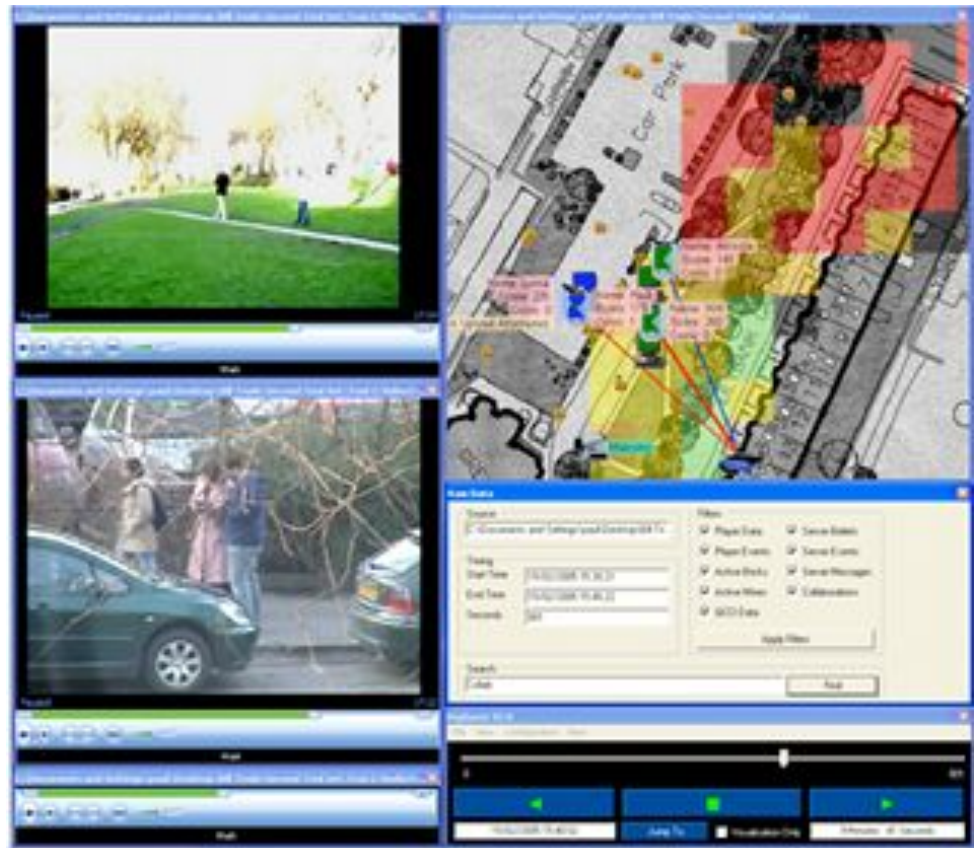


Figure 4. The *Replayer* interface integrating video replay and system log visualization and searching from *Treasure*

Discussion Questions

Both of the two experiences discussed video recording for ethnographic analysis, do you have any suggestions on how to design video recording to better support ethnographic research?

Future Tools

- Distributed Logging and the Canonical System View
- Dealing with Larger Sets of Systems Logs and Video Recordings
- Designing for Ethnographic Practice

Discussion Questions

How can
ethnographer
effectively study
distributed
interactions?

Can any other tools
replace traditional
observation in
ethnography?

Do you think there's any aspect
that's important to consider but is
missing in this paper? Or is there
any followup that you would like to
see?

Reflections & Takeaways

**Thank you for
participation!**