

MOBILE APPLICATIONS OVERVIEW

21w.789 CLASS 1

What is the class about?



- Investigating the interaction between people and mobile computing devices
- Creating compelling mobile applications and services
- Group project-based class
 - ▣ Design, build, and document a novel mobile application
 - ▣ Final conference-style paper
- Other small assignments along the way
 - ▣ Location exploration, network characterization
- Classes split into lecture and studio/sharing/review time
 - ▣ Attendance and participation expected!

The Syllabus

Date	Topic	Reading (before class!)	In Class Group Activity	Assignment (due next class)	Notes
2/1	Mobile Applications Overview/Generative Research Methods Overview of research areas in mobile computing. Discussion of the domains and structures of mobile applications. Discussion of how mobile technology is changing communication patterns. Overview of methods used to create new concepts based in field observations.	None	Share interests, begin to form project groups	Mobile observation study (10%)	
2/8	Qualitative Data Analysis / Android Fundamentals: Performing analysis of user data to generate concept ideas. Fundamentals of programming on Android devices. Differences from desktop Java. Small overview of iPhone programming. Outline for proposals.	Contextual Design	Affinity analysis of observation study, informal report on observations	Proposal (15%), HelloWorld on device (5%)	Written & oral proposals
2/15	Proposal Presentations: Students present proposals for semester projects.	Applying UCD to Mobile Application Development			
3/1	Mobile Design / Paper Prototyping: Going from requirements to an interaction model down to the design of screens. Rapid prototyping and evaluation. Discovering usability problems early.	Prototyping For Tiny Fingers References: [1] [2] [3] [4] [5]	3-4 screens prototyped	Complete paper prototype (10%)	
3/8	Usability / Paper Prototype Testing: Usability testing of paper prototypes.		Testing of paper prototypes. Discuss anticipated technological hurdles		
3/16	Mobile Location / Networking: Novel applications of location in social, media tagging, and public safety applications. Mobile location technology including GPS/CellID/Wifi localization. Networking capabilities of mobile devices. Best practices in writing mobile networking code.	ZoneTag, Place Its		Prepare poster/demo on current project state (15%, due 3/29), Location and networking assignments (10%, due 4/5)	
3/29	Poster/Demo session: Share current progress on project with the class. Guest lecture: Henriette Cramer from the Mobile Life Centre in Stockholm will visit the class to talk about TBD.		Present posters and demos.		
4/5	Mobile Persuasion / Urban Computing: Mobile applications that encourage positive behavior changes (exercise, diet, social, etc.). Systems that combine physical interaction in the world with mobile technology.	UbiFit Garden, Persuasive Games			
4/12	Large Scale Research / Distribution / Instrumentation: Launching research projects in app stores. Business models for mobile services. Instrumenting applications to collect analytics data..	None		Continue working on final project.	
4/26	Final Project Triage: Get help with any remaining issues for final projects.	None	Share latest progress.	Continue working on final project (25%)	
5/3, 5/10	Final Presentations	None	None	Final written report due Friday, May 13, noon in Ed Barrett's office (14N-336).	

Devices



- Develop on your own devices or borrow a Motorola Cliq (Android 2.1) from us. A very small number of Droid 1s may also be available. One phone per group.
- Class will focus mostly on non-platform specific topics, some examples will be given for Android and iPhone
- Assignments require data access – no textbook, so this is really the only cost for the class. T-Mobile/ Cricket/Boost have good pay-as-you-go data plans.

Mobile Computing is Everywhere

An Internet-connected computer in 3 billion pockets...



Why study mobile computing?



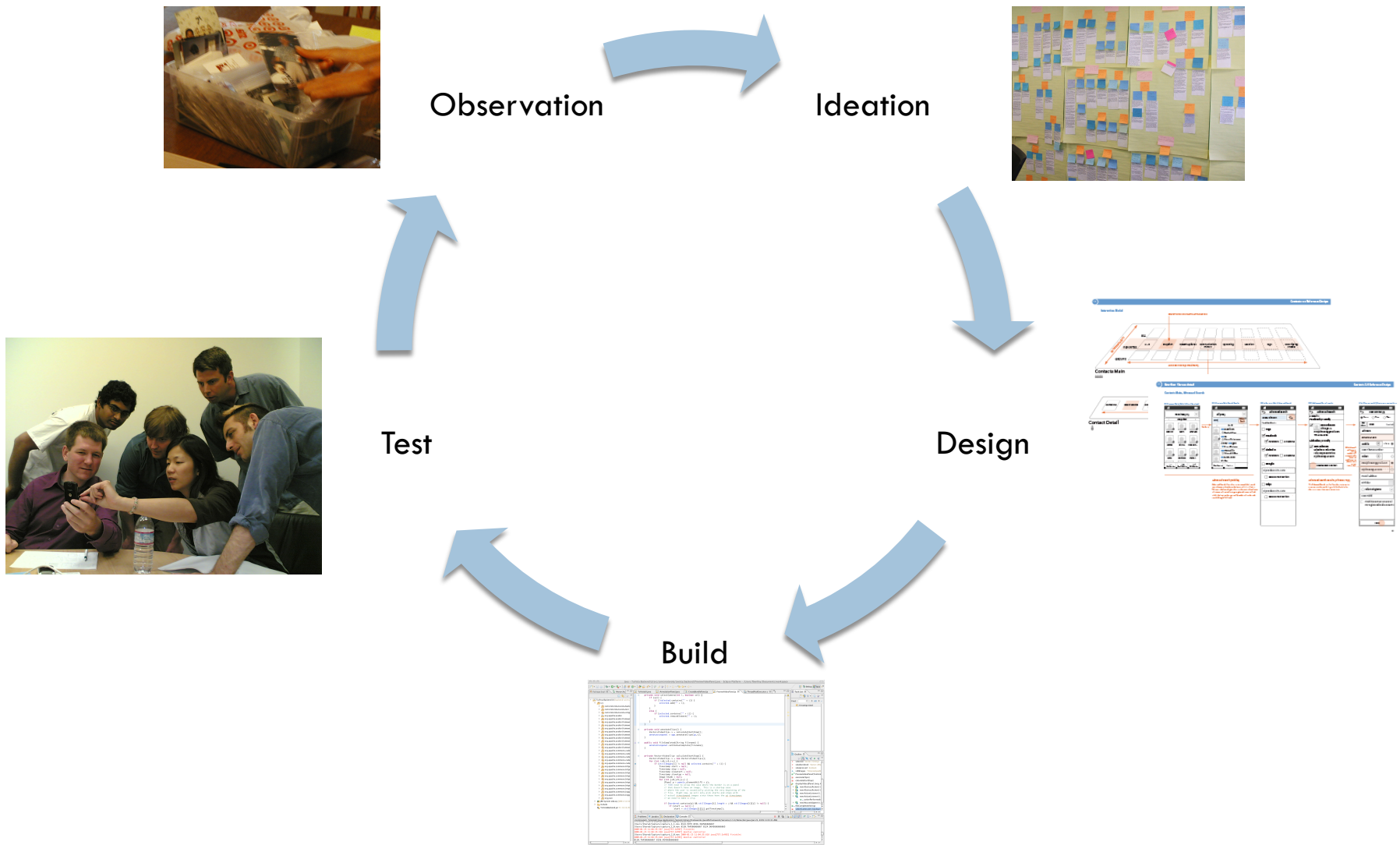
- Changing lives of many
 - Farm Prices
 - Microfinance
 - Live Media Sharing
 - Constant Access to Information
- Mobile Applications Becoming Ubiquitous
 - iPhone App Store
 - Android Marketplace
 - J2ME Portals from Carriers

What's unique about mobile?



- Media Capture
 - ▣ Ability to share your world with others
 - ▣ Document life for yourself, anywhere
- Sensing
 - ▣ Location, accelerometer, compass, body sensing
 - ▣ Get content you want, fast
 - ▣ Sense and track personal health
- Social Connectivity
 - ▣ Device tied to a person, almost always with them
 - ▣ Voice, text, email, chat, media sharing...

Much more than just writing the code



Inspiration for design

- Learning from people
- In-situ observations of related practices
- Grounding new designs in real-world behavior



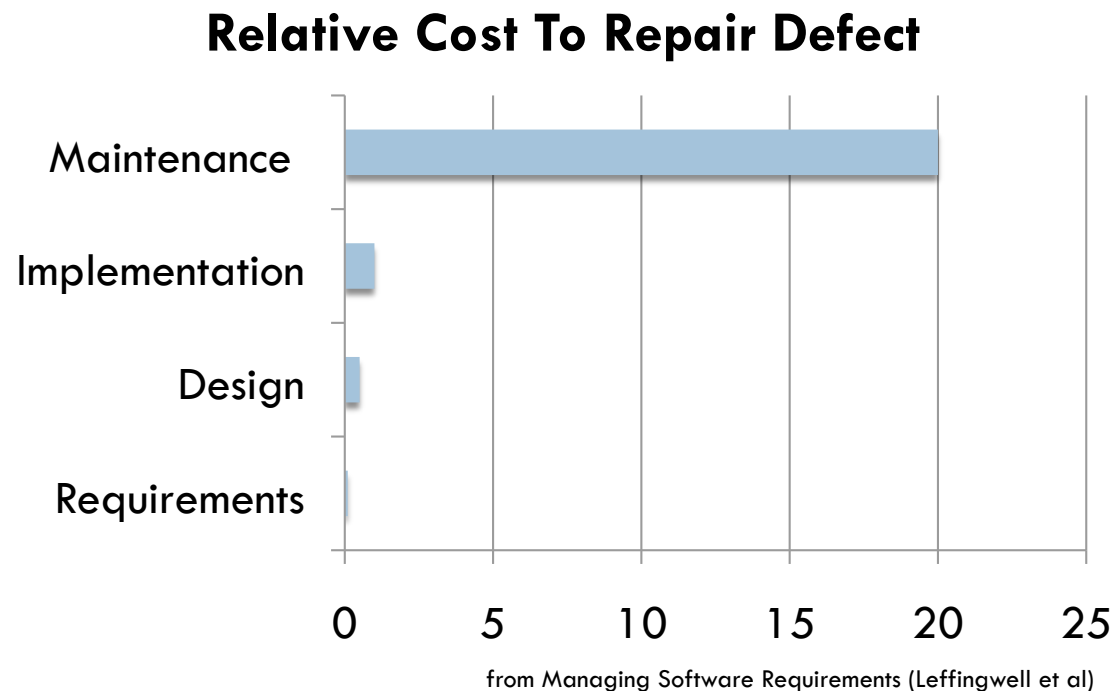
Coherent Design

- Design is a process from the beginning
- Ensure interaction flows for a user
- Especially important on a small-screen mobile device!



Building and Testing are Iterative

- Increasing fidelity with quick tests along the way
- From paper to working in the world
- Catch mistakes early when it's easy to change



Mobile Ecosystem

Web

- No installation
- Limited interaction with phone platform
- Rendering issues on different handsets
- Some reach to almost every device

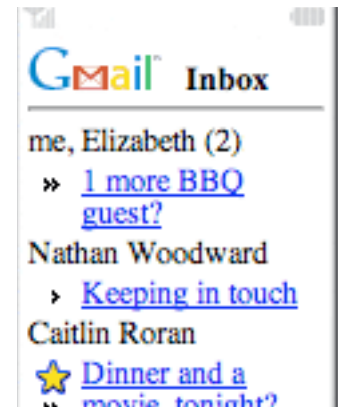
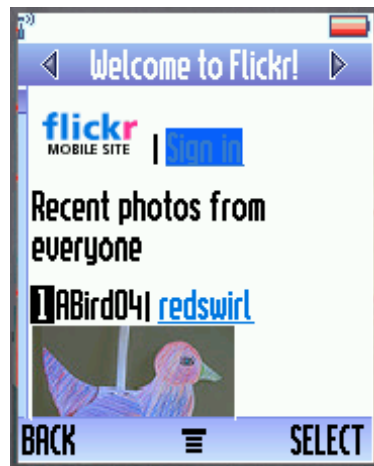
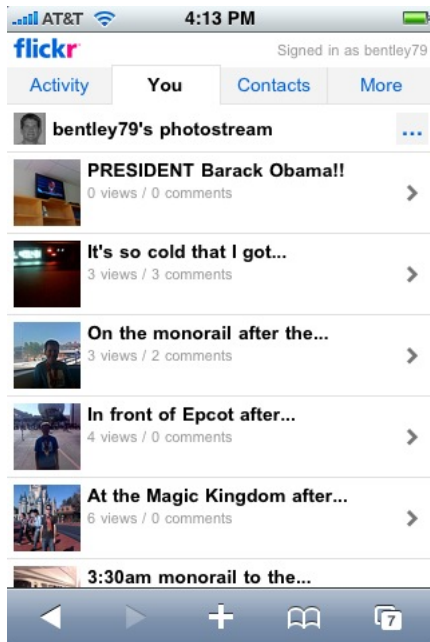
J2ME

- Works on most non-smart phones
- More interaction with phone platform
- Consistent Look and Feel
- Lifecycle limitations

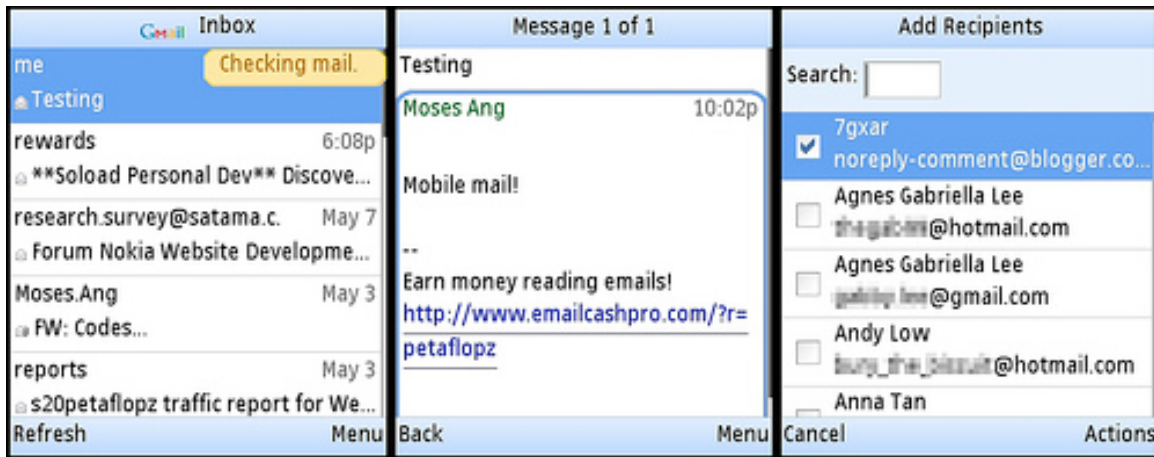
Native

- Written for a particular OS
- Deepest interaction with phone platform
- Background Processes
- More complex distribution/testing

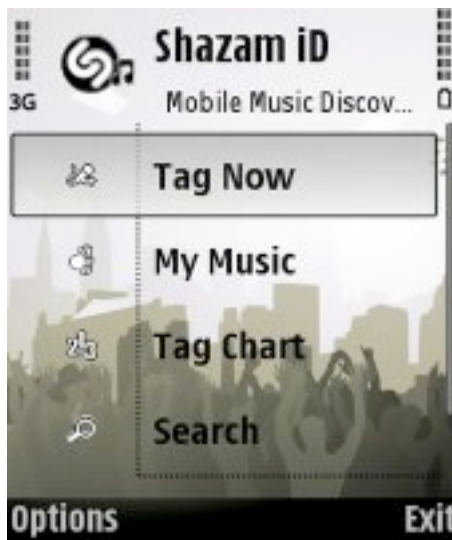
Mobile Web Applications



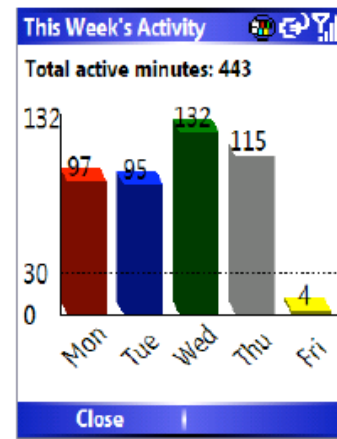
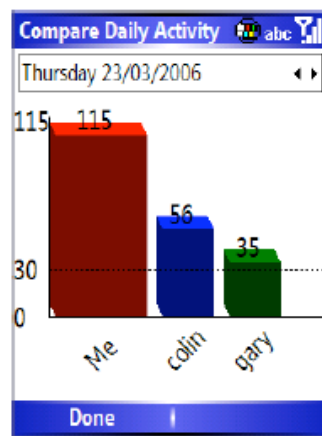
J2ME Applications



<http://www.flickr.com/photos/hasselblad/493225561/>



<http://2.bp.blogspot.com/>

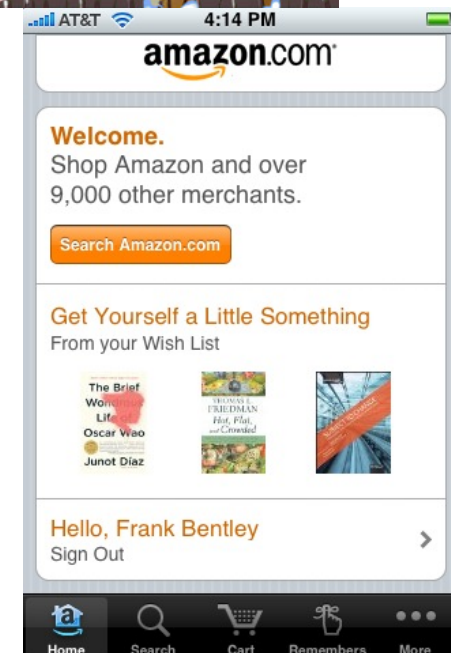
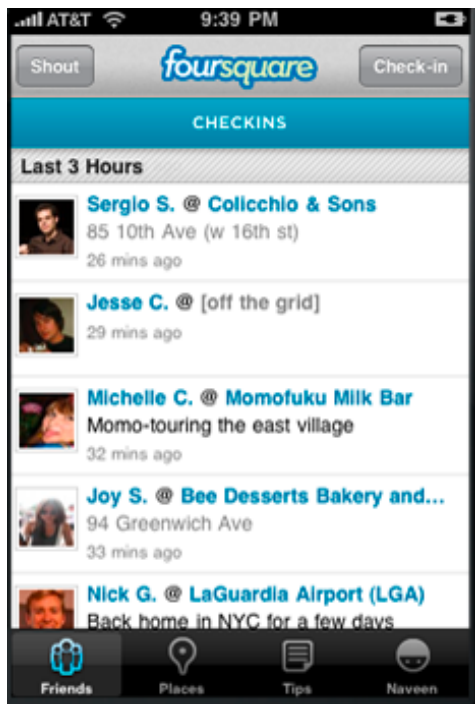


Shakra (Glasgow)



<http://operamini.com>

Native Applications



Path to consumer



- Web:
 - ▣ Go to a URL (but they must know/find that URL)
 - ▣ Instant and updatable totally from server side
- J2ME:
 - ▣ Carrier marketplace
 - ▣ No paths for updates unless it's a part of your app
- Native:
 - ▣ Platform App Store (Apple, Google, RIM)
 - ▣ Updates can be placed in app stores / users notified on some schedule, but not instantly

Current Mobile Research Areas



- Location-Based Mobile Computing
- Persuasive Applications
- Social Networking / Web 2.0
- Extending Experiences
- Personal Networks/Wearables
- Companion Devices
- Enterprise

Location-Aware Computing

- How can location help make any mobile task more efficient?
 - Finding restaurants
 - Getting movie tickets
 - Knowing which bus to take
 - Tagging photos
 - Finding friends
 - Know where to sell their crops
 - Mobile tour guide/games



REXplorer

Mobile Persuasion

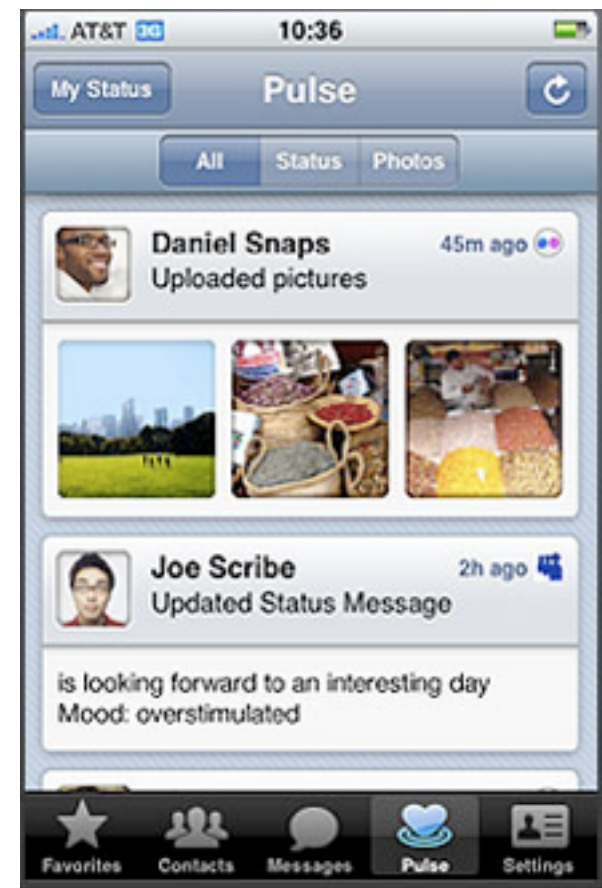
- How can mobile phones convince people to...
 - Eat healthy food
 - Work out
 - Use less energy
 - Help their friends and family
 - Volunteer
 - Be religious
 - Save the planet



Figure 1. UbiFit Garden's glanceable display. a) at the beginning of the week—small butterflies indicate recent goal attainments; the absence of flowers means no activity this week; b) a garden with workout variety; c) the display on a mobile phone—the large butterfly indicates this week's goal was met.

Social Networking / Web 2.0

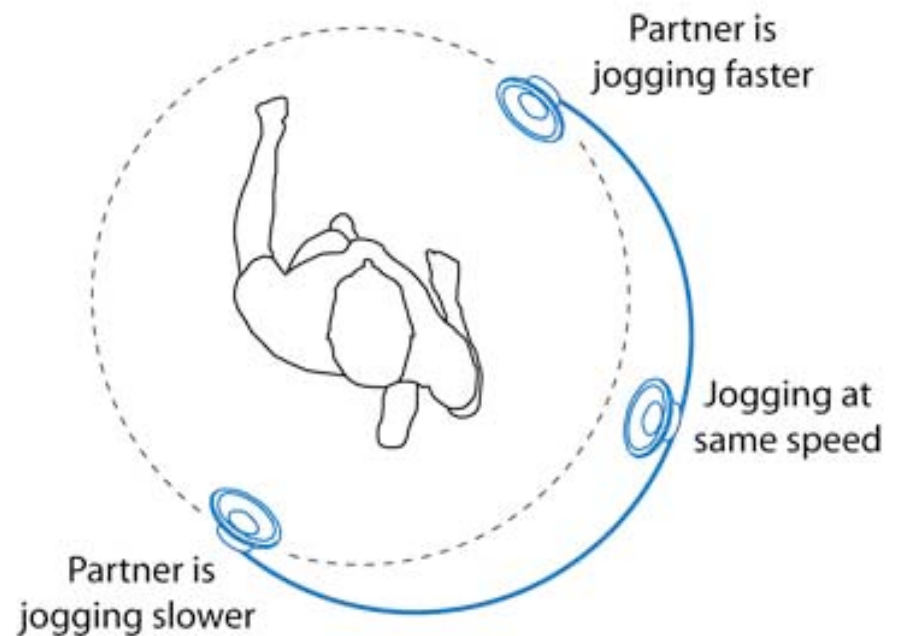
- How can phones link in data from online communities?
 - Status in contacts app
 - Micro-coordination (helping plan and meet up)
 - See photos from friends
 - Syncing online calendars
 - Selling goods/services
 - Managing group finances / microfinance



Yahoo! OneConnect

Extending Experiences

- How can an experience on a phone augment an in-person experience?
 - Sports – replays/stats on phone
 - Concerts/Festivals – see other people's photos/videos in real time
 - Working out – virtual workouts with others



Jogging the Distance

Personal Networks/Wearables

□ What can you do when you combine a phone with other sensors/actuators?

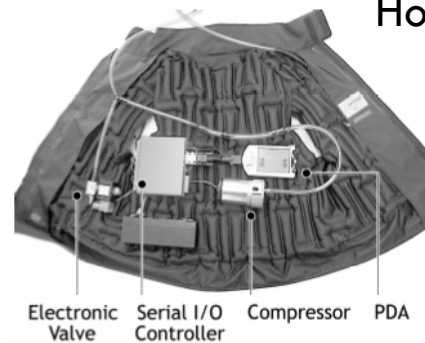
- Step Counters
- Pollution Sensors
- Actuated Hugs



Houston (Intel Research)



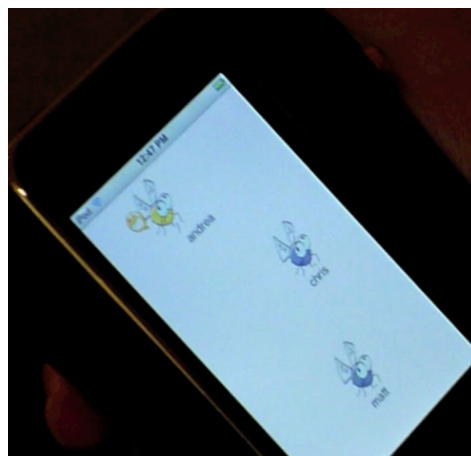
inAir (CMU)



Hug Over a Distance (Melbourne)

Companion Devices

- How can mobile devices be used to complement other screens (TV/Computer/Games)?
 - Displaying “private” information
 - Interactions off-screen to not disturb others
 - Different content for different people



BackTalk (Media Lab)



DIRECTV iPhone app

Enterprise

- How can mobile devices be used in a work context?
 - ▣ Routing people more efficiently
 - ▣ Getting additional information about products from web / checking inventory
 - ▣ Automatic check-in based on Bluetooth ID



RFID Reader



QR Code for Wikipedia

Now...

- Introduce yourselves, discuss mobile interests
- Short break

- Intro to ethnographic-style field methods...

Mobile is different



- Interactions happen in the world
- Interactions are generally private and not directly observable
- Interactions are short and spread throughout the day

Inspiration for Design



- Design of a new application/service should be grounded in daily realities
- Should work with how people think about each other, their environments, and the world
- Need to get out into the world to learn this...

Pick a topic area and explore...



- we have studied:
 - in-family communication (2002)
 - photo sharing (2003 & 2007)
 - music use (2005)
 - location sharing (2006)
 - social television (2007-2009)
 - trips to sporting events (2008)
 - intergenerational distance communication (2010)

Rapid UCD Process

1. ethnographic-style investigations in a new space of interest
2. concept generation and prioritization
3. initial prototype implementation (days or weeks)
4. field test of new system
5. iterate
6. product decision
7. work with marketing, design, engineering, and sales teams to create product version

Can stop work at any time if value is not shown

Steps to initial ethnographic-style research



- Define research questions
 - ▣ What do you need to know to create your new service / application?
 - ▣ Focus on understanding current practices
- Define methods
 - ▣ Observation, interviews, home tours, diary logging, etc.
- Recruit users
 - ▣ Generally 7-10 is sufficient, stop when you see repeat data
- Conduct Study
- Analyze Data
- Design!

Research Questions

Intergenerational Communication Over Distance

- How do participants communicate with remote family/closer relations? What tools do they use?
- What are the barriers to remote communication? What challenges do people face in maintaining or engaging in remote communication?
- What communication tensions and obligations exist surrounding remote communication for the elderly?
- What are differences between communication at a distance and communication when remote relatives visit?
- What artifacts in the home serve to promote remembrance of and communication with distant family?

Use of Location in Phone Calls

- During communications with others, what location and activity information is provided?
- Under what circumstances is this activity and location information disclosed?
- Why do people disclose location and activity information?
- How are disclosures of activity and location similar? Different?

Music Usage

- What breakdowns exist in today's music experience in both independent and co-located situations?
- What contextual (from the past and the present) metadata can be used to address the breakdowns in today's music experience as identified in previous question?
- How can this contextual information be used to enhance today's music experience?

Methods: Observation



- Watch how users interact with a space/object/each other
- Good for observing many people, findings patterns
- Good when interaction times/locations are predictable
- But only get what, not why

- Used by students for grocery store behaviors, wayfinding in public spaces, booking travel

Methods: Home Tours



- Visit a home or work setting and see particular places of interaction
- Good for tasks which are very context dependent / rely on physical objects
- Used in Elder Communication study, music study (CDs), photo study (photos on display, use of computers, etc.)

Methods: Diary Logging



- Have participants keep a log (paper, voicemail, voicenotes, etc.) when they do particular things of interest
- Get data at time event happens. MUCH more reliable than recall some time later
- Used in almost all of our studies: Elder Communication, Location Sharing, etc.

Methods: Interviews



- Interviews complement direct observation
- Should focus on understanding current practice
- NOT future concepts, “would you like ...,” etc.
- Generally semi-structured with probes that follow up in interesting areas of use

- Used in every study we’ve done

What to watch for...



- What do people enjoy...what part of a task makes them smile?
- Where do they get hung up/frustrated?
- What is currently easy/hard for them to do?
- How does their environment appear to play into their use?

Examples: Music Usage



- Home tours, Interviews, Contextual Inquiry
- 12 participants
- Explored how they searched for, selected, played, and acquired music
- Findings: Satisficing, Ruts + Kicks, More like this
- Designs: Metadata Knob, Playtree, Music Presence

Examples: Location Sharing



- 5 participants
- Recorded phone calls for 1 week
- Interviews + Statistical data analysis of calls

- Findings: People already share basic location context, transition times mostly unknown, confirmation of context confirms availability
- Designs: Motion Presence, Contacts 3.0/MotoBLUR

How to ask questions...



- ❑ Don't ask people what they usually do, how they would use/like a particular application/feature, or what they would do in a given situation
- ❑ Do ask about specific instances of use (“the last time” or “the time before that” work nicely)
- ❑ Do ask questions you have after observing someone, but wait until they are done with what they are doing
- ❑ Follow up when you want more information...keep them talking

Semi-Structured Observation



- Goal: To develop understanding of area of interest
 - inspire design ideas for new applications
- Process: Come up with a few research questions. Observe people performing activities in your area of interest. If possible ask questions about their use that help you understand answers to questions.
- Write exact quotes or observations on post-it notes
 - a single idea to a note
- Try to capture ~75 notes

Examples of notes...

- From a study on music use:
 - ▣ “Some of my CDs remind me of a time I had and I like to put it on and remember that time I had with it. Fall always gets me in the mood to play music I always listen to. Me and my sisters sitting on the porch and talking in our Nike sweatshirts. We used to play this song over and over when we went to her house”
 - ▣ “I often don’t like listening to the old stuff because...it sometimes takes me back to somewhere I don’t want to be...”
 - ▣ “She made this CD of music that related to them, she had this basket of CDs at the wedding and everyone took one and the bubbles...”
 - ▣ “Clock radio wakes me up as a routine every morning. I turn off my clock radio and turn on my stereo because it has better sound...”
 - ▣ Has CDs in a stack with no cases – sorts like playing cards

For next class...



- Bring in raw data on ~75 notecards, each observation on a card – do not start any analysis
- In class:
 - ▣ We'll be performing an affinity analysis based on your observations to help inspire new ideas, solutions based in real world problems
 - ▣ From analysis, we'll create design ideas for your semester project.

Questions?



- Let's talk now...
- Additional questions, please email us

- Available throughout week electronically

- Frank – bentley@mit.edu
- Ed – ebarrett@mit.edu
- Audubon – mckeown@mit.edu