Healthy Cities Ambient Displays

Description

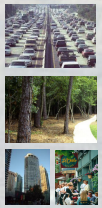
The Healthy Cities project:

- Provides a public display of city health factors that normally are difficult to access or interpret
- Empowers citizens to improve city health by making them feel like their actions are visible

Questions to consider:

- How do you influence your city's health?
- Do you have a sense of the resources your city uses?
- Would you take more responsibility for improving city health if you knew your actions were appreciated?

Motivation



- Increase public awareness of city health
- Explore challenges in designing for the general public
- Evaluate the use of ambient displays as a persuasive and community-building tool
- Explore use of distributed sensors for ambient displays

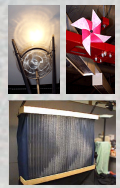
Background

What are Ambient Displays?

- Continuously monitor non-critical, potentially complex information
- Display information continuously and peripherally
- Present information in a simple, intuitive, aesthetic way, reducing cognitive load
- Ideal for city health displays, where people will be in display location only in passing

Non-technological examples:

- Windows give cues on time, weather, activity level
- Footprints or paths give a history of walking patterns



Prior Work:

- Natalie Jeremijenko: Dangling String – twitches with each packet sent over PARC network
- M.I.T. Media Lab[1]:
  - Water Lamp – shadows of water ripples
  - Pinwheels – movement and air flow
- Carnegie Mellon: Information Percolator – pixellated display, movement and noise of bubbles[2]
- Georgia Tech: Digital Family Portrait – awareness of remote family members by daily changing picture frame[3]
- Viktoria Institute: slow technology[4]

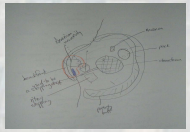
Interviews

Six open-ended interviews of people who live or work in Berkeley

- Purpose: explore conceptions of the city and of city health
- 3 Caucasian, 1 Lebanese, 1 Asian, 1 Latina; 2 male, 4 female; 20-55 yrs
- Recruited from flyers at grocery stores and from Craigslist.com
- Interviews followed up by four Culture Probe postcards[5] (example below)

Interview quotes – What is city health?

- "A healthy city is well-maintained - people actually try to better it - and it's complex and intriguing, to take you out of yourself."
- "Walking is necessary to feel connected to the community, and to get to know a city."
- "Give people clean air - reroute traffic, make places where people don't have to breathe exhaust."
- "Money from local businesses goes back into the community, and it reduces pollution and traffic."

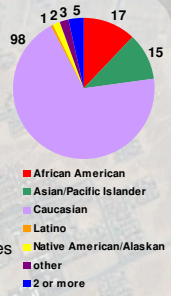


Survey Results

Survey questions inspired by open-ended interviews

- 33 Likert scale and yes/no questions, 10 written-response questions
- 8 groups of questions:

  Neighbors and neighborhood safety, diversity, environment and conservation, public events and neighborhood history, volunteerism, shopping and economics, schools, transportation, individual health

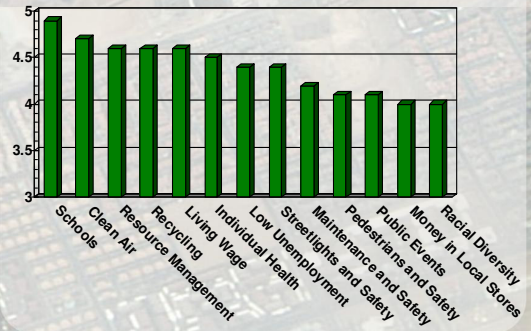


145 responses from Berkeley and nearby cities

- 52 male, 90 female
- Ethnic distribution similar to Berkeley's 2000 census data
- 95 recruited at post offices, 50 from Craigslist.com

Topics with means above 4.0 and mode of 5 listed below

- Some topics more appropriate for ambient displays:
  Quantitative, changes frequently, measured often, can be automatically collected
- Topics selected to investigate: recycling, resource management, clean air, public events, pedestrians and safety, streetlights and safety



Electricity Display

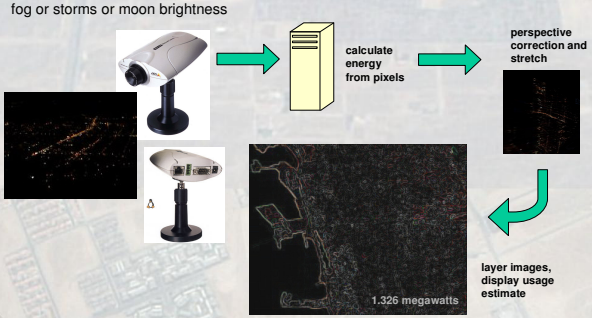
City energy usage is estimated by city light pollution

Design considerations:

- Compare nightly electricity usage on different time scales (days, weeks, months) for emerging trends
- Display time-lapse data
- Use an intuitive map-based display

Implementation:

- Capture pictures of Berkeley every minute during the night from two webcams in the Intel research lab, 13 stories above downtown Berkeley
- Calculate true pixel brightness from pixel's brightness in the picture, the interpolated distance, a watts/pixel scaling factor, and weather considerations
- Calibrate brightness of pixels with a "standard candle" pixel to account for dimming from fog or storms or moon brightness



Recycling Display

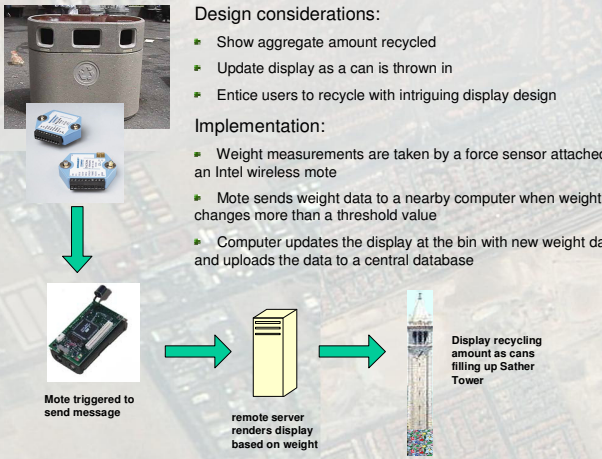
Increasing awareness of recycling in one aluminum bin

Design considerations:

- Show aggregate amount recycled
- Update display as a can is thrown in
- Entice users to recycle with intriguing display design

Implementation:

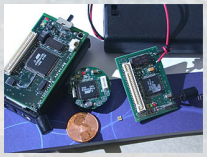
- Weight measurements are taken by a force sensor attached to an Intel wireless mote
- Mote sends weight data to a nearby computer when weight changes more than a threshold value
- Computer updates the display at the bin with new weight data and uploads the data to a central database

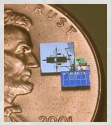


Technology

Input possibilities:

- City-wide sensing networks: Motes[6], Smart Dust[7], Picoradios[8]
- Light sensors: streetlights and safety
- Carbon Dioxide sensors: air quality measurements
- Webcam images: traffic, pedestrians, activity level





Comments

References:

1. Ishii, H. and B. Ullmer. "Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms." In *Proceedings of CHI 1997*, ACM.
2. Jeremy M. Heiner, Scott E. Hudson, Kenichiro Tanaka. "The Information Percolator: Ambient Information Display in a Decorative Object." *ACM Symposium on User Interface Software and Technology*, pp. 141-148, November 1999.
3. Mynatt, Elizabeth, Jim Rowan, Annie Jacobs and Sarah Craighill. "Digital Family Portraits: Supporting Peace of Mind for Extended Family Members." In *Proceedings of CHI 2001*, ACM.
4. PLAY group, Viktoria Institute, Slow Technology: http://www.playresearch.com/projects/slowtech
5. Gaver, W. and Dunne, T. "Cultural Probes." *Interactions*, January/February 1999.
6. Intel Research Motes: http://intel-research.net/berkeley/features/tiny_db.asp
7. UC Berkeley Smart Dust: http://robotics.eecs.berkeley.edu/~pister/SmartDust
8. UC Berkeley Picoradios: http://bwrc.eecs.berkeley.edu/Research/Pico_Radio

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