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 periodically
- 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 – switches with each packet sent over PASTE network
- M.I.T. Media Lab: Water Lamp – shadows of water ripples
- Pinwheels – movement and air flow
- Carnegie Mellon: Information Percolator
- Georgia Tech: Digital Family Portrait – awareness of remote family members by daily changing picture frame
- Viktoria Institute: slow technology

**Interviews**
Six open-ended interviews of people who live or work in Berkeley City
- 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
- Interviewed followed up by four Culture Probe postcards (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, volunteering, 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
  - 96 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
- Display time-lapse data
- 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:
  - Motes6, Smart Dust7, Picoradios8
- Light sensors: streetlights and safety
- Carbon Dioxide sensors: air quality measurements
- Webcam images: traffic, pedestrians, activity level

**Comments**

**References:**
3. Natalie Jeremijenko: Dangling String – switches with each packet sent over PASTE network
6. Georgia Tech: Digital Family Portrait – awareness of remote family members by daily changing picture frame
7. Viktoria Institute: slow technology
8. UC Berkeley Smart Dust: http://bwrc.eecs.berkeley.edu/Research/Pico_Radio

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