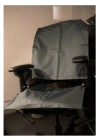
Case Studies

Smart Everyday Objects

- Bionic Running Shoes (Adidas)
- Posture Chair (MIT media lab)
- Moving Portrait (MIT media lab)


Smart Objects

- History table cloth (EU Equator)
- Emotional Décor (NYU)
- I/O Brush (MIT)

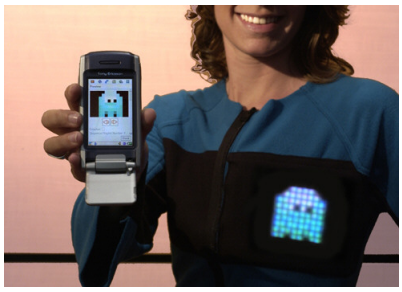


KUs: crying surrogates

Smart Mugs

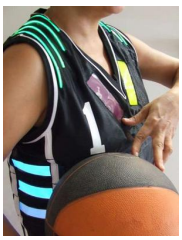
- Chameleon Mug
  - LCDs, bimetal strips, thermoresisters and thermochromic ink as sensors
  - A vessel which changes color, displays safety messages and/or springs a handle to demonstrate whether the fluid in it is hot or cold.
  - various sensors could detect the concentration of sugar or lactose in a beverage, warn of bad milk or mix the fluids ultrasonically.
- MediaCup

LED Display Cloth



A Wearable Display for Team Sports

(U. of Sydney)



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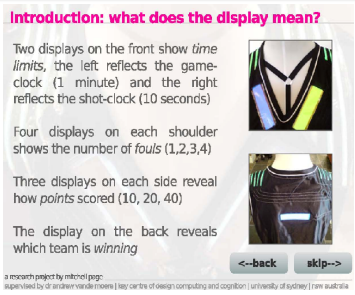


Topobo (MIT)

http://www.youtube.com/watch?v=50JdK_K2NWk&feature=player_embedded#

Blendie (MIT)

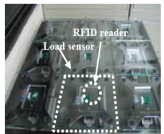
- A "sensitive" blender that can express emotion.

http://www.youtube.com/watch?v=6DDkwdPaYmk

Diet-aware Dining Table

Detect what and how much you eat from the table

- Sensing to recognize behavior
  - Combine weight sensor and RFID sensors to track food transfer among containers
- Interaction
  - Natural user eating behaviors become system input (no need to operate any devices).
  - How do you design a user interface without affecting one's appetite?



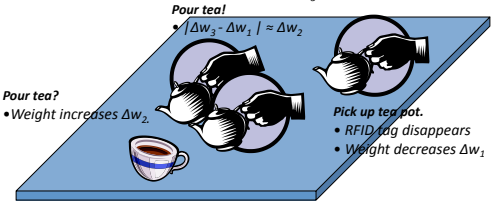
Diet-Aware Dining Table: Single Interaction Example

- Bob pours tea from the tea pot to personal cup, and drinks it

Put on tea pot.
•RFID tag appears
•Weight increases Δw_3
Pour tea!
• $|\Delta w_3 - \Delta w_1| \approx \Delta w_2$

Pour tea?
•Weight increases Δw_2

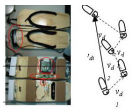
Pick up tea pot.
• RFID tag disappears
• Weight decreases Δw_1

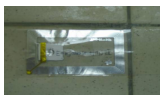


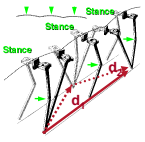
Geta Sandals

Shoes (Slippers) that track where you walk

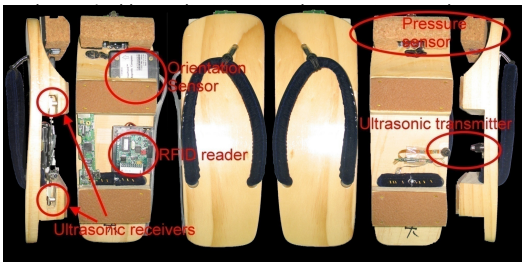
- Track people's locations with minimal infrastructure in the deployed environment
- Footstep-based localization
  - Error accumulation (1~10%)
  - Location-aware RFID tags







Geta Sandals



http://mll.csie.ntu.edu.tw/video/geta_short.wmv

Object Locator Ring (Watch)

Track locations of everyday things

- Where did I put these everyday things?
  - Glasses, cell phones, wallets, keys, remote controls, …
- Track locations of everyday things
  - RFID reader on ring
  - RFID tags on everyday objects
  - Ultrasonic Indoor location systems (MIT Cricket)




How does it work?

- Assumption:
  - Most objects are moved by hands
- Picking up phone:
  - Phone presence (RFID tag) detected by the ring antenna
- Carrying the phone:
  - Continuous presence (on-hand)
  - Non-presence (pocket-it)
- Dropping the phone:
  - Phone presence (RFID tag) no detected by ring antenna
- Location of the object?

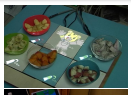

More Examples

- Baby Think It Over
- Textrix VR Bike
- Smart Tachograph

Playful Tray

Encourage good eating habits in young children

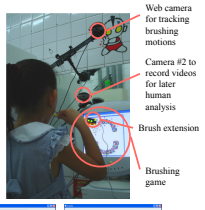
- Sense to recognize behavior
  - Weight sensor underneath the tray to sense eating actions
  - Eating actions as game input
- Play to engage behavior change
  - Interactive games: coloring cartoon character or penguin fishing
- User study on 4 children (autistic)



Playful Toothbrush

Encourage proper and thorough brushing in young children

- Bad teeth in young children with cognitive impairments
- Sense to recognize behavior
  - Webcam to detect brushing motions
  - Brushing actions are game inputs
- Play to engage behavior change
  - Start with a mirror image of dirty teeth
  - Physical brushing maps to virtual plaque removal
- User study on 13 kindergarten children



Mug-Tree

Encourage healthy habits (staying hydrated)

- Sense to recognize behavior
  - Tilt sensor to detect drinking actions
  - Drinking actions are game inputs
- Play to engage behavior change
  - Game metaphor: hydrating body -> watering a tree





Nutrition-aware Kitchen

Raise awareness of nutritional facts

- Sense to recognize behavior
  - Combine weight and camera sensors to detect cooking actions (change food ingredients)
  - Voice input for food ingredient label
  - Food ingredients -> meal calories
- Play to engage behavioral change
  - Too many calories -> overweight family member
  - Imbalanced seesaw board -> big boulder sliding down






Nutrition-aware Kitchen

Raise awareness of nutritional facts

- Awareness
- User study on 3 cooks

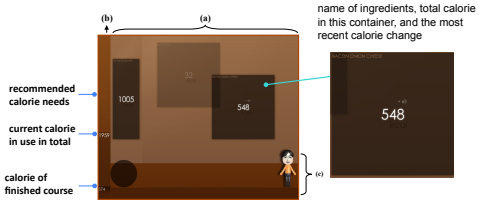


Figure 7. User interface of Calorie-aware Kitchen, including (a) overview of calorie in the system; (b) recommended calorie needs and current used calories; (c) a calorie-aware game with a beloved family member to bring enjoyment of calorie control

http://mll.csie.ntu.edu.tw/video/calorieAwareKitchen_interaction.mov

Clean-your-room poster

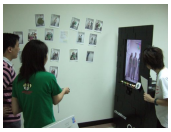
Persuade children to put things back where they belong after using them

- Sense to recognize behavior
  - RFID sensors to check if things were put back on the shelf
- Play to engage behavioral change
  - Misplaced things -> trash in the virtual world
  - Using child's sympathy for an animal to persuade the child to put things back where they belong

ChroMirror

Persuade people to explore more colorful clothes

- Sense to recognize clothes & colors
  - Camera and Computer Vision
- Play to trigger behavioral change
  - Easily and playfully explore & experiment with how different colors look on people



Mug-Forest

- Use social pressure to encourage staying hydrated

Mug-Forest

Use social pressure for persuasion

- Sense to recognize drinking action
  - Accelerometer (in a phone) to detect drinking action
  - Camera to detect water level
- Play to use "social pressure" to cause behavioral change
  - Computer-mediated human persuasion, not computer persuasion