Affect/Emotion in Design

What are we trying to do with designs?

What is Affect?

- Affect:
  - General emotional response
- Essentially, the desire of designers to:
  - Create positive responses in users
    - At ease, comfortable, enjoy using, etc.
  - Motivate users
    - Learn, play, be social
  - Make users trust
    - eCommerce, banking, etc.
- You want positive responses from users
  - Positive response = generating positive emotions

Models of Affect in Design

- Norman et al.'s Emotional Design Model (2004)
  - Separates response into visceral, behavioral, and reflective levels
    - Visceral = look, feel, sound (iPhone, new car)
    - Behavioral = traditional usability
    - Reflective = meaning/personal value (Swatch/Luxury Car)
  - Claims that state affects thinking
    - Happy = more likely to overlook small problems
    - Angry/Anxious = less tolerant
  - Hard to apply in design
    - Serious versus hobby systems?

Models of Affect in Design

- McCarthy and Wright's Technology as Experience Framework (2004)
  - Propose four core threads to decribe technology
    - Sensual thread
      - Thrill, fear, pain, comfort
      - Computer games, chat rooms, etc.
    - Emotional thread
      - Sorrow, joy, anger, happiness
      - Intertwined with object: angry with computer
    - Compositional thread
      - Thinking we do during experiences
      - Finding way through on-line shopping site
    - Spatio-temporal thread
      - Context of experiences
  - Again, allows users to talk about affect during design

Models of Affect in Design

- Jordan's Pleasure Model (2000)
  - Focuses on pleasure and benefits
  - Four levels
    - Physio-pleasure = touch, taste, smell (iPod)
    - Socio-pleasure = being in company of friends (showing photos via LCD screen on camera)
    - Psycho-pleasure = emotional/cognitive reactions to products (shopping on a clearly laid out website)
    - Ideo-pleasure = cultural and personal values attributed to a product (hybrid car)
  - Doesn't explain pleasure
  - Allows designers to think about pleasure during design

Affect in Design

- Role of computers:
  - Recognizing emotion
  - Expressing emotion
  - Inducing emotional responses
  - Facilitating interpersonal emotional connections

Recognizing Emotions: Implications

- Implications
  - Consider driving a car
  - Consider playing a computer game
  - Consider health and safety applications
  - Consider military and/or first responder applications
  - Consider using physiological sensors on keyboards
    - Frustration?

Recognizing Emotions

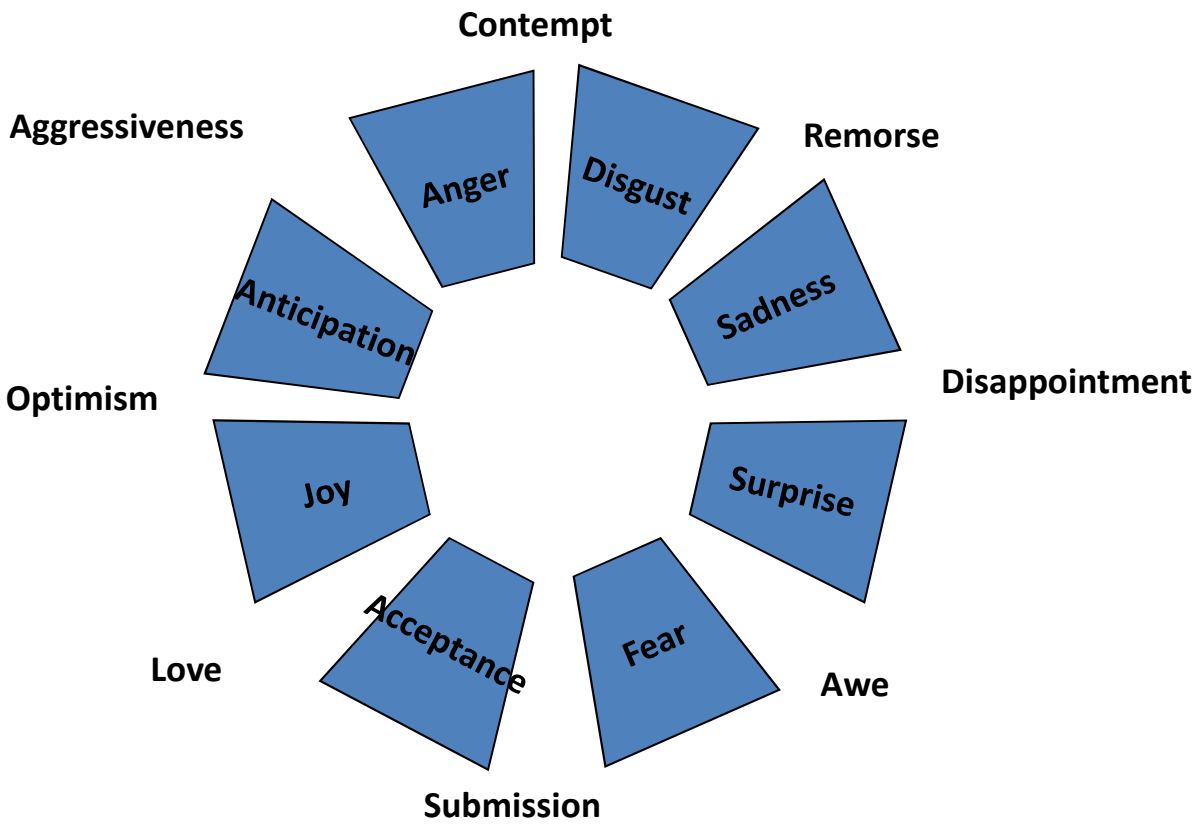
- Psychological Theories of Emotion
  - How many?
  - How do we recognize emotions in ourselves?
- Techniques for detecting and recognizing emotions
  - Technology areas

Recognizing Emotions: How Many?

- Ekman, Friesen and Ellsworth (1972)
  - Most widely used method for detecting emotions
  - Six basic/primary emotions:
    - Fear
    - Surprise
    - Disgust
    - Anger
    - Happiness
    - Sadness
  - Recognized and expressed facially across all cultures
  - Used these to develop FACS
    - Facial Action Coding System

Recognizing Emotions: How Many?

- Plutchik (1980)
  - Eight basic/primary emotions
  - Combine to produce secondary emotions



Recognizing Emotions: How Many?

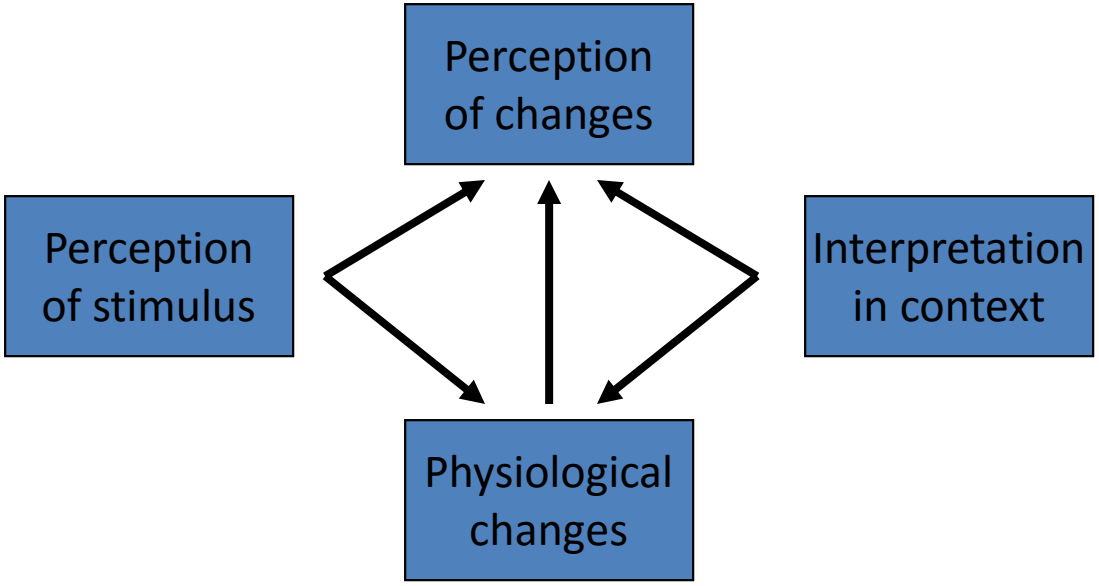
- Debate about number of basic/primary emotions
- Basic/Primary
  - Adaptive (evolved for some purpose)
  - Cross-cultural and common among individuals
  - Quick onset (autonomic nervous system)
- Came up with these emotions through "forced choice"
- Russell et al. (1997) proposed alternative
  - Two dimensions
    - Pleasure
    - Arousal
  - Example: happy versus content
    - Happy = positive pleasure, slight positive arousal
    - Contentment = positive pleasure, slight negative arousal

Recognizing Emotions: How do we label emotions?

- James-Lange theory
  - Action precedes emotion
    - Someone comes at us
    - Pulse/respiration rises, sweat
    - Recognize fear in ourselves
- Canon-Baird theory
  - Actions follow cognitive appraisal
    - Someone comes at us
    - We perceive this as something fearful
    - Emotional and physiological responses occur together

Recognizing Emotions: How do we? (continued)

- Schachter-Singer/Lazarus theory
- Emotion experienced via cognitive labeling and appraisal



- Experimental studies
  - Four groups, induced arousal
  - Found external information affected emotional choices

Recognizing Emotions

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Process for Recognizing Emotions (by computers)

- From Rosalind Picard's work (Book: *Affective Computing*)
  - Input
    - Sensors for face, hand gestures, posture/gait, respirations, electrothermal response, temperature, electrocardiogram, bp, blood volume, electromyogram
  - Pattern recognition
    - Feature extraction and classification
  - Reasoning
    - Incorporates context
  - Learning
    - Adapts to individual, as people differ
  - Bias
    - Recognize that designer's (or computer's) emotions might influence recognition
  - Output

Recognizing Emotions

- Picard's work: using physiology
  - Used electromyogram, skin conductance, blood volume pulse, respiration
  - Studies people over a period of many weeks
  - Recognized eight emotions at levels significantly higher than chance

Recognizing Emotions: Implications

- Still debate
  - Accepted that some cognitive evaluation occurs
  - Debate about relative dominance of cognitive evaluation versus physiological reaction
- For designing emotional recognition:
  - More than just arousal
  - Need context in order to identify emotion
- For creating emotion
  - Features of the environment alter affect
  - Consider perceiving heights in a virtual environment versus in real world
- Partial accuracy in emotion identification using physiological indicators
  - Relatively simple to sense

Recognizing Emotions: Implications

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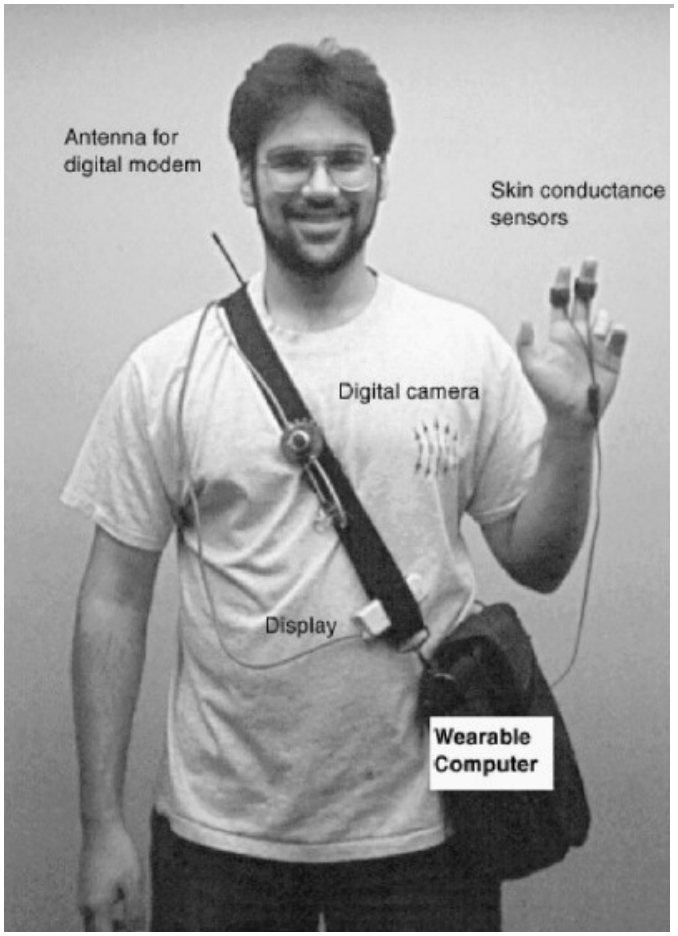
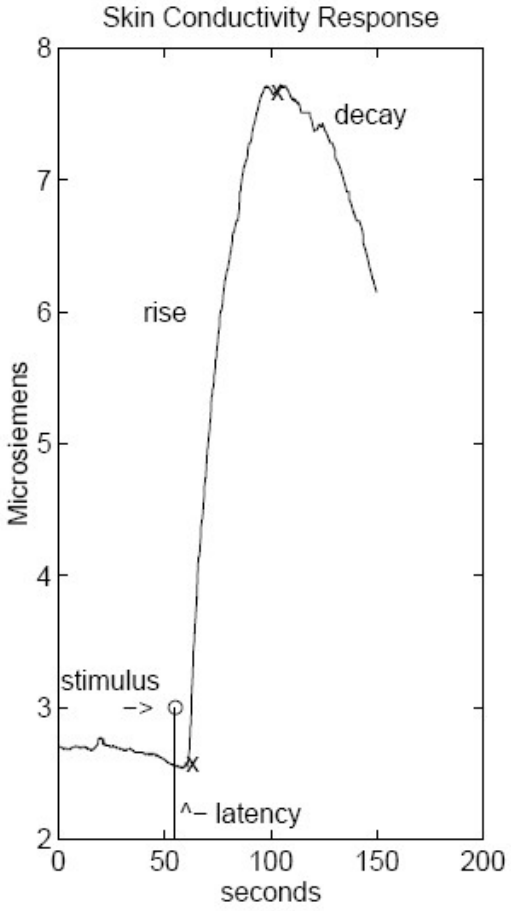
Implications

- StartleCam





Affect in Design

- Role of computers:
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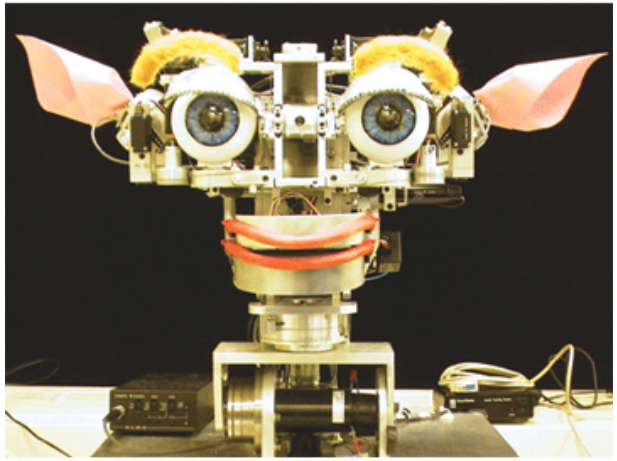
Computers Expressing Emotions

- Various instances of this
  - Microsoft Office Assistant:
    - Sulks
  - Happy Mac/Sad Mac

- Common in robotics research
  - Can be done using very simple facial models

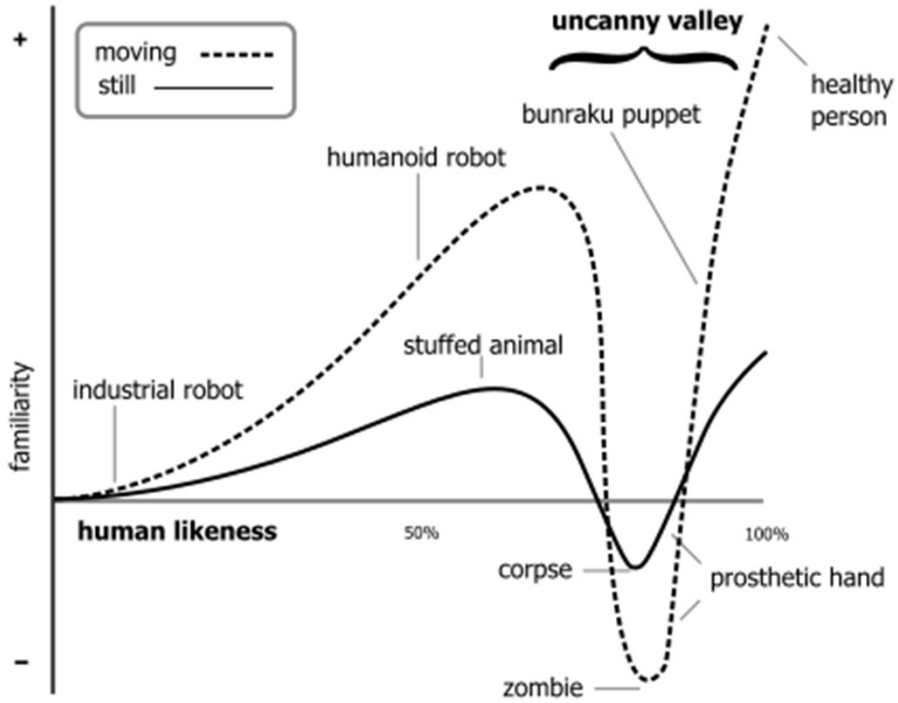
- Kismet (MIT)



- More human-like
  - David Hanson

Computers Expressing Emotions

- Uncanny valley
  - Masahiro Mori
  - Hypothesis about emotional response to robots
  - Familiarity versus human likeness
- As robots become more human
  - Reach a point where they appear more unusual
  - One side or other of valley is fine
  - In valley seems weird
- Examples
  - Prosthetic hand
- **May** apply equally to computer software



Anthropomorphism

- Extends “uncanny valley”
- Issue is deception (Shneiderman)
  - Adding human qualities like first names, first person, on-screen characters deceives
  - People think computer is like a human
- Studies of tutoring systems
  - Generally positive comments perceived better than negative comments
  - However, some users still feel disconcernted/displeased

Affect in Design

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Inducing Emotional Responses

- Research systems
- Application characteristics that induce negative emotions
- Error messages and affect
- Persuasive technologies

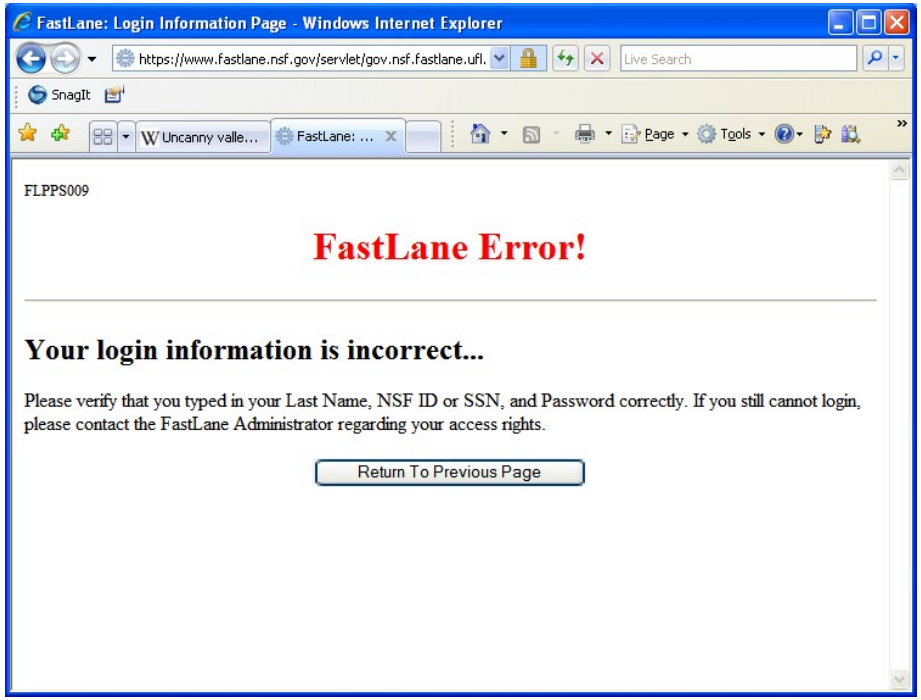
Inducing Emotional Responses

- Common research and technology effort
  - Microsoft Bob
  - SenToy

Inducing Emotional Responses

- Negative
  - Avoidable via system level programming
    - Application bugs or crashes
  - Avoidable through design
    - System not doing what user wants
    - System not meeting user's expectations
  - Avoidable through UI implementation
    - System not providing sufficient information
    - Vague or obtuse error messages
    - Noisy, garish, gimmicky, patronizing interfaces
    - System requiring many steps to perform task, with one error undoing all work

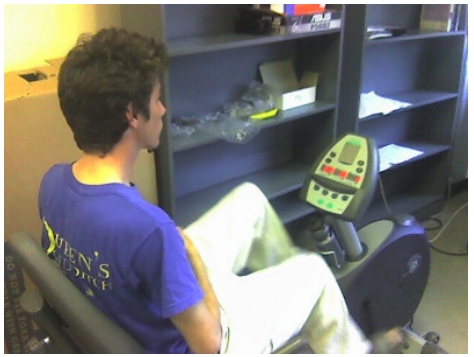
Error Messages and Affect

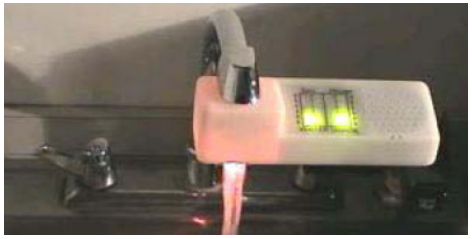


- Notorious for incomprehensibility
  - Consider error message to left
- Shneiderman's guidelines
  - Do not comdemn; be courteous
  - Avoid FATAL, ERROR, ILLEGAL, INVALID, BAD
  - Avoid code numbers and uppercase
  - Allow user control of audio warnings
  - Use precise messages
  - Provide help icon to get context-sensitive help
  - Provide multiple levels of detail

Persuasive Technologies

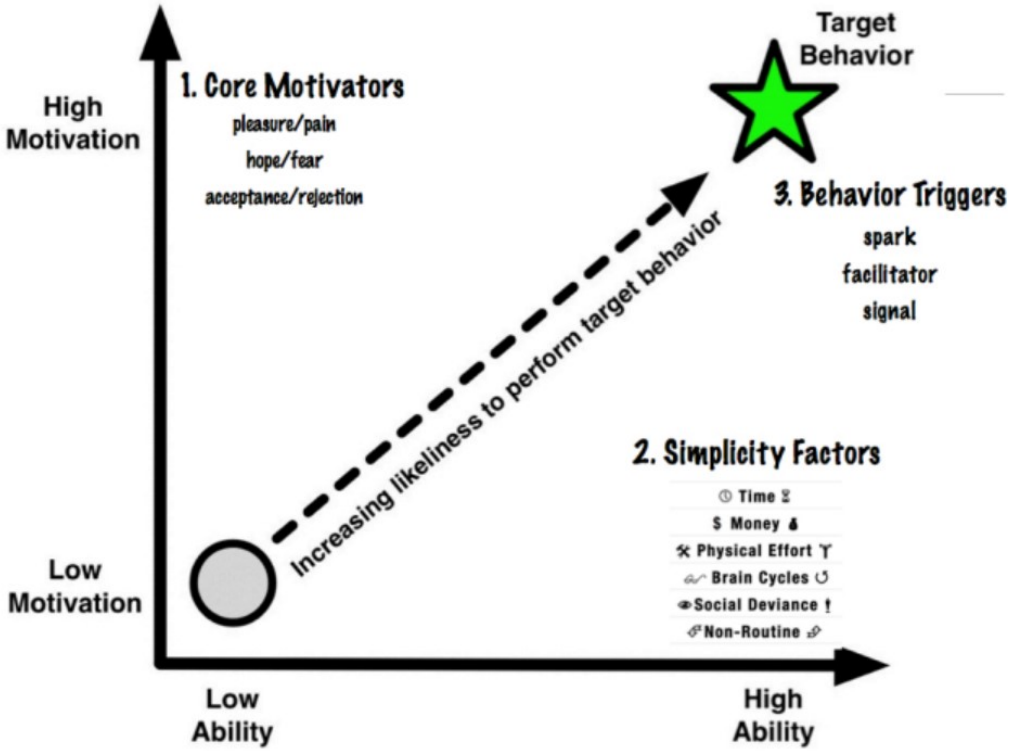
- Goal is to change users behaviours
  - Pop-up ads, warnings, reminders, prompts, personalized messages, recommendations
- Common on web
  - Amazon's 1-click purchasing, iTunes $0.99 per song
- Fitness
  - Computer-aided exercise
  - Gaming for physical fitness
- Environmental conscience
  - Waterbot





Persuasive Technologies

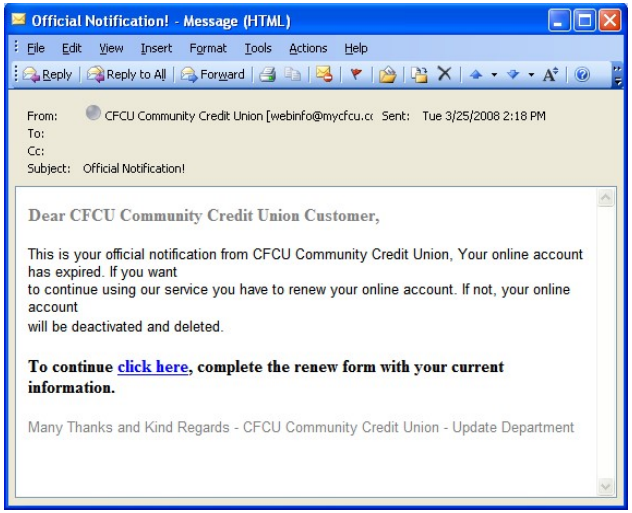
- A lot of interest in these for health and sustainability
- BJ Fogg's work

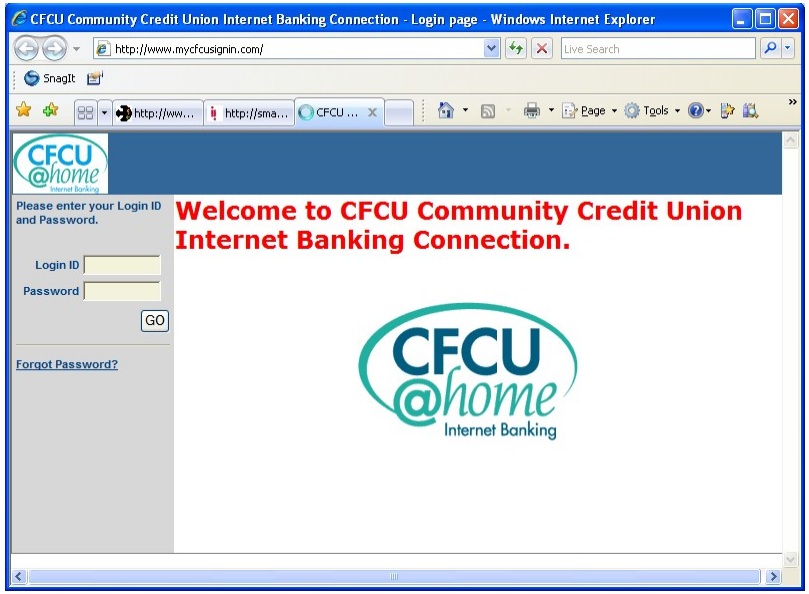


B.J. Fogg, "A Behavior Model for Persuasive Design", In *Proc of ACM International Conference on Persuasive Technology, 2009.*

Persuasive Technologies

- Can be used negatively
  - Pfishing
    - Bruce Schneier (author of *Applied Cryptography*)
      - "If you think technology can solve your security problems, then you don't understand the problems and you don't understand the technology"
    - Essentially social engineering
    - Broader issue of security





Firesheep

- Firesheep
- How do we encourage users to be more secure?
  - Technological solutions?
  - Education?
- Affect in Interaction

Emotional Responses

- Rules for messages
- Design processes
- Persuasive technology
- SenToy

Affect in Design

- Role of computers:
  - Recognizing emotion
  - Expressing emotion
  - Engendering emotional responses
  - Facilitating interpersonal emotional connections

Facilitating Interpersonal Connections

- Three aspects to interpersonal connection
  - Awareness
  - Conversation
  - Coordination
- Particularly remote connecting

Facilitating Interpersonal Connections – Awareness

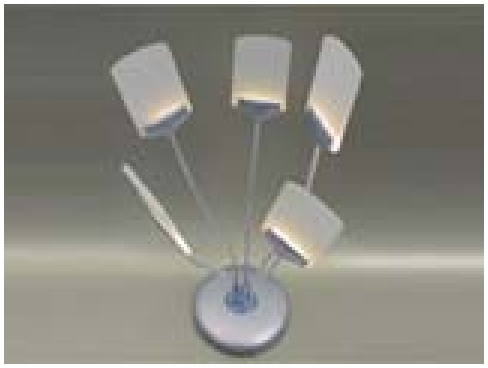
- Digital family portrait, CareNet, 6th sense

FIGURE 3. Digital Family Portrait Examples

Mynatt et al.

The CareNet Display uses activity inference to let loved ones monitor the activities of an elder living alone

Landay et al.



Tollmar and Persson *Sixth Sense* senses body movement close to lamp and sends to sister lamps

Facilitating Interpersonal Connections

- Other technologies
  - Facebook
  - Skype
  - IM
  - Email
  - Twitter
- Many on-line forums
  - Nintendo WFC
  - MMORPGs
  - Second Life