Affect/Emotion in Design
Administrivia

• Poster session Thursday
  – NOT MY FAULT

• Critiques will be Tuesday
  – NOT MY FAULT
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 describe 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

![Diagram showing the process of emotion recognition]

- 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

• 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

• Role of computers:
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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 condemn; 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

• Can be used negatively
  – Phishing
    • 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
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, 6\textsuperscript{th} sense

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
Firesheep

• **Firesheep**

• How do we encourage users to be more secure?
  – Technological solutions?
  – Education?

• Affect in Interaction