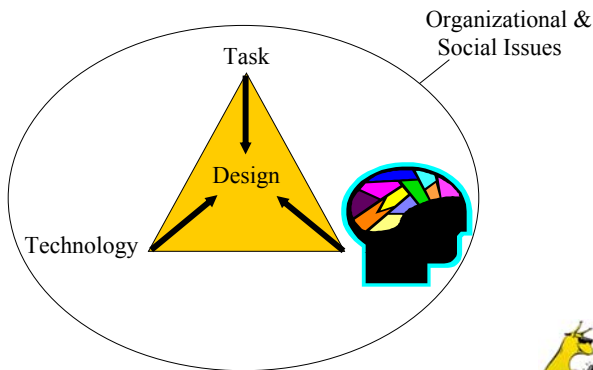


HCI Application: Computers and Emotion



Affective aspects

- ▶ HCI has traditionally been about designing efficient and effective systems
- ▶ Now more about how to design interactive systems that make people **respond** in certain ways
 - e.g. to be happy, to be trusting, to learn, to be motivated
- ▶ Affective Computing
 1. Getting computers to recognize emotion
 2. Enabling technologies to give the impression of having emotion
 3. Designing interactive systems which evoke positive human emotions
- ▶ Affective design = emotional/hedonic/empathetic design



1. Getting computers to recognize emotion

Q: What are emotions?

Emotions have three components:

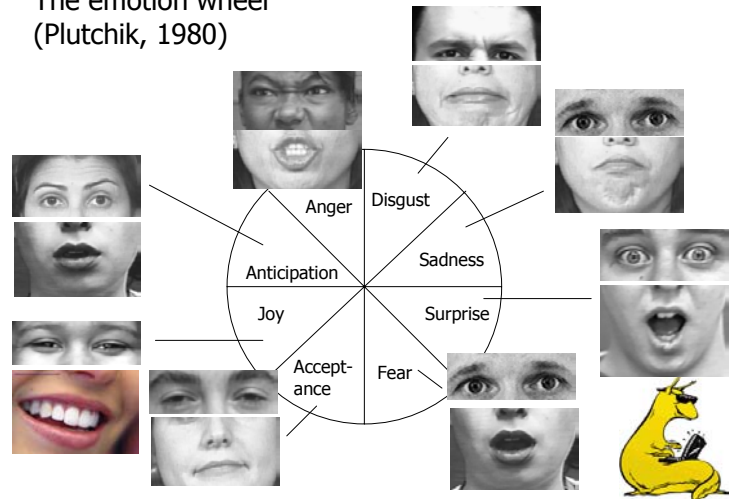
- ▶ Physiological changes: trembling with fear, blush with embarrassment, etc.
- ▶ Behavioral response: Retreating (fear), approaching (anger), "fight or flight"
- ▶ Subjective experience / cognitive interpretation ("cognitive labeling"): We interpret the emotion based on the stimulus, our physiological and behavioral responses and the larger context:

Pulse jumps, we move quickly backward in response to image:

- Image was unexpected: ("I was surprised")
- Image was of something disturbing: ("I was scared")

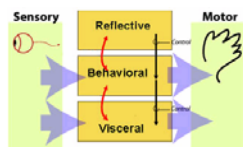


The emotion wheel (Plutchik, 1980)



Other definitions

- ▶ Donald Norman:
 - Visceral Design (evolutionary responses) → the look
 - Behavioral Design (bodily activity) → usability
 - Reflective Design (mental activity) → product image (Google: playful, anti-corporate; Apple's iPod: stylish, avant-garde)
- ▶ Our emotional state changes how we think
 - when frightened or angry we are more likely to be less tolerant
 - when happy we are more likely to overlook minor problems and be more creative
- ▶ Niels Engelsted:
 - Affect (environmental response)
 - Emotion (based on memory)
 - Sentiment (long-term, love and hate)



1. Getting computers to recognize emotion

Q: How could we enable technologies to recognize emotion?

- Input: Collect sensor data: images of faces, accelerometers/electromyograms measure body movements, record respiration rates, heart rate, skin conductance
- Pattern recognition: feature extraction; measure amount of furrowing on the brow, curvature of lips up or down (smile/frown), etc.
- Reasoning: transform features into a prediction of what emotion is being expressed:

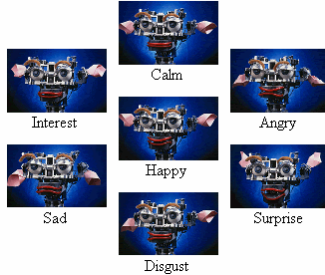
```

If (teethDetected == true)
  if (lipCurvature == UPWARD)
    then predictedEmotion = JOY
  else if (browFurrowed == true)
    then predictedEmotion = ANGER
    
```



2. Enabling technologies to give the impression of having emotion

- ▶ People respond very strongly to objects that seem to express emotions:
- ▶ Anthropomorphization: attributing human qualities to non-human objects.
- ▶ By expressing emotions, technologies can help create an emotional bond between the user and technology... Q: Why would this be useful?
- ▶ Educational software requires the user to persevere ("I know this is difficult for you, but...")
- ▶ Therapeutic software persuades the user to continue despite the pain ("I know this is emotionally difficult, but...")



3. Designing interactive systems which evoke positive human emotions

Four dimensions to pleasure: how to maximize them using technology?

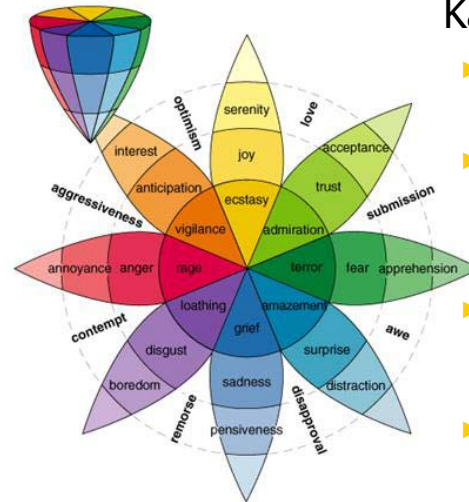
- ▶ Physio-pleasure: Arises from the observation or handling of technology
 - Examples of technologies that maximize this? iPods, ...
- ▶ Socio-pleasure: Arises from relationships with others.
 - What technologies facilitate social activity; create new ways to connect; improve relationships with others?
- ▶ Psycho-pleasure: Cognitive or emotional satisfaction:
 - Learning something challenging (a new language);
 - Getting things done efficiently, etc.
- ▶ Ideo-pleasure: "Ideological pleasure": witnessing / experiencing something that conforms to our core values.
 - Using open-source rather than commercial software,
 - Using green technologies, ...



Expressive interfaces



- ▶ Colour, icons, sounds, graphical elements and animations are used to make the 'look and feel' of an interface appealing
 - Conveys an emotional state
- ▶ In turn this can affect the usability of an interface
 - People are prepared to put up with certain aspects of an interface (e.g. slow download rate) if the end result is appealing and aesthetic
- ▶ Users have created a range of *emoticons* – to compensate for lack of expressiveness in text communication:
 - :-) :< :X >: >:-(
- ▶ Also use of icons and shorthand in texting and instant messaging has emotional connotations, e.g. I 12 CU 2NITE

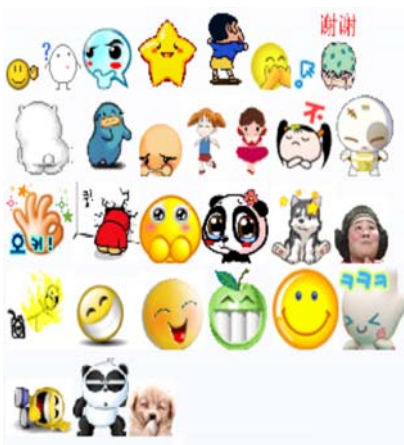


Kansei's colors

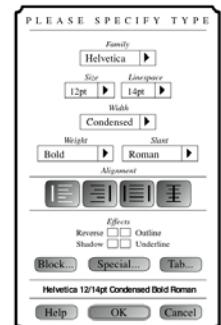
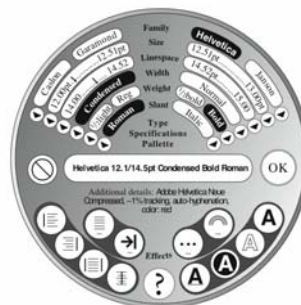
- ▶ Invented by Nagamachi in Japan in 1970
- ▶ KANSEI study seeks the structure of emotions, which exists beneath human behaviors
- ▶ Used a lot in customer product (first used in the US by Mazda)
- ▶ Not just colors



Would you use any of these? What for?



Which one do you prefer?



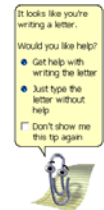
Marcus and Teasley study

- ▶ Marcus (1992) proposed interfaces for different user groups
 - Left dialog box was designed for white American females
 - who “prefer a more detailed presentation, curvilinear shapes and the absence of some of the more brutal terms ... favored by male software engineers.”
 - Right dialog box was designed for European adult male intellectuals
 - who like “suave prose, a restrained treatment of information density, and a classical approach to font selection”
- ▶ Teasley et al (1994) found this not to be true
 - the European dialog box was preferred by all and was considered most appropriate for all users
 - round dialog box was strongly disliked by everyone



Friendly interfaces

- ▶ Microsoft pioneered friendly interfaces for technophobes - ‘At home with Bob’ software
- ▶ 3D metaphors based on familiar places (e.g. living rooms)
- ▶ Agents in the guise of pets (e.g. bunny, dog) were included to talk to the user
 - Make users feel more at ease and comfortable

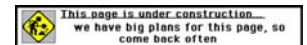


User frustration

- ▶ Many causes:
 - When an application doesn't work properly or crashes
 - When a system doesn't do what the user wants it to do
 - When a user's expectations are not met
 - When a system does not provide sufficient information to enable the user to know what to do
 - When error messages pop up that are vague, obtuse or condemning
 - When the appearance of an interface is garish, noisy, gimmicky or patronizing
 - When a system requires users to carry out too many steps to perform a task, only to discover a mistake was made earlier and they need to start all over again



Gimmicks



- ▶ Non-working (part of the) system
 - under construction, 404 **Error 404 – Web Page Not Found**
- ▶ Self-righteous vague error messages
 - “The application **Word Wonder** has unexpectedly quit due to a **type 2 error**” instead of
 - “The application has *expectedly* quit due to poor coding in the operating system”
- ▶ Shneiderman's guidelines for error messages include:
 - ▶ avoid using terms like FATAL, INVALID, BAD
 - ▶ Audio warnings
 - ▶ Avoid UPPERCASE and long code numbers
 - ▶ Messages should be precise rather than vague
 - ▶ Provide context-sensitive help



Should computers say they're sorry?

- ▶ Reeves and Nass (1996) → the Media Equation, argue that computers should be made to apologize
- ▶ Should emulate human etiquette
- ▶ “Humans readily generalize their expectations from human-human interaction to HCI regardless of whether or not that is the intent of system designers” (Miller 2004).
- ▶ How sincere would they think the computer was being? For example, after a system crash:
 - “I'm really sorry I crashed. I'll try not to do it again”
- ▶ How else should computers communicate with users?



Persuasive technologies

- ▶ Interactive computing systems deliberately designed to change people's attitudes and behaviors
- ▶ A diversity of techniques now used to change what they do or think
 - Pop-up ads, warning messages, reminders, prompts, personalized messages, recommendations, Amazon 1-click
- ▶ Nintendo's pocket pikachu
 - Designed to motivate children into being more physically active on a consistent basis
 - The owner of the digital pet that 'lives' in the device is required to walk, run, or jump
 - If owner does not exercise the virtual pet becomes unhappy and eventually dies




How effective?

- ▶ Is the use of novel forms of interactive technologies (e.g., the combination of sensors and dynamically updated information) that monitor, nag, or send personalized messages intermittently to a person more effective at changing a person's behavior than non-interactive methods, such as the placement of warning signs, labels, or ads in prominent positions?



Anthropomorphism

- ▶ Attributing human-like qualities to inanimate objects (e.g. cars) 
- ▶ Well known phenomenon in ads
 - Dancing butter, drinks, cereals
- ▶ Much exploited in human-computer interaction
 - Make user experience more enjoyable, more motivating, make people feel at ease, reduce anxiety
- ▶ Welcome message
 - "Hello Chris! Nice to see you again. Welcome back. Now what were we doing last time? Oh yes, exercise 5. Let's start again."
 - "User 24, commence exercise 5."
- ▶ Feedback
 - "Now Chris, that's not right. You can do better than that. Try again."
 - "Incorrect. Try again."



Virtual Characters: Agents

- ▶ Can be classified in terms of the degree of anthropomorphism they exhibit:
 - synthetic characters → autonomous, with internal states and able to respond to external events
 - animated agents → play a collaborative role at the interface
 - emotional agents → pre-defined personality and set of emotions that user can change
 - embodied conversational agents → sophisticated AI techniques used to enable agents to respond to conversation in meaningful way



Virtual characters

- ▶ Increasingly appearing on our screens
 - Web agents, characters in videogames, learning companions, wizards, pets, newsreaders, popstars
- ▶ Provides a persona that is welcoming, has personality and makes user feel involved with them
- ▶ But
 - Lead people into false sense of belief, enticing them to confide personal secrets (e.g., Alice chatterbots)
 - Annoying and frustrating
 - Not trustworthy: virtual shop assistants



Your opinions

- ▶ Have you interacted with virtual agents?
- ▶ Do they elicit an emotional response in you?
- ▶ Do you trust them?
- ▶ What is the style of interaction?
- ▶ What facial expression do they have?
- ▶ Are they believable, pushy, helpful?
- ▶ Would it be different if they were male? Older? Dressed more formally?



Believability of agent

- ▶ Believability refers to the extent to which users come to believe an agent's intentions and personality
- ▶ Appearance is very important
 - Are simple cartoon-like characters or more realistic characters, resembling the human form more believable?
- ▶ Behaviour is very important
 - How an agent moves, gestures and refers to objects on the screen
 - Exaggeration of facial expressions and gestures to show underlying emotions (c.f. animation industry)



Experience Design

- ▶ User experience is about creating design focused on people's personal growth, so they can live in harmony with each other and with their natural and artificial environment (Marzano, Philips Design)
- ▶ User experience goals differ from the more objective usability goals in that they are concerned with how users experience an interactive product from their perspective rather than assessing how useful or productive a system is from its own perspective (Preece et al.)
- ▶ User Experience Design extends HCI design by addressing all aspects of a product or service as perceived by users. HCI design addresses the interaction between a human and a computer. User Experience Design addresses the user's initial awareness, discovery, ordering, fulfilment, installation, service, support, upgrades, and end-of-life activities (IBM website)



Usability vs. User experience

Usability Goals

- ▶ Consistency
- ▶ User-control
- ▶ Flexibility
- ▶ Error-prevention
- ▶ Help
- ▶ etc...

User-Experience Goals

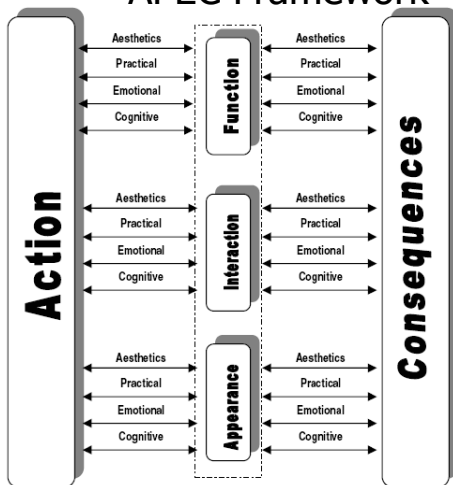
- ❖ Enjoyment
- ❖ Fun
- ❖ Pleasure
- ❖ Values
- ❖ Positive emotions
- ❖ etc...

Conditions of experience

- an experience is a result of the interaction between a live creature and the experienced object
- an experience has a beginning and an end
- an experience has a unity that gives it a name
- in an experience a user 'does something' to the object and in consequence he 'undergoes something'



APEC Framework



Vyas & van der Veer (2005)



APEC Framework

1. Aesthetic Aspect:

- Visceral appreciations based on sensory information only
- Naturally determined
- Skin-deep beauty

2. Practical Aspect:

- Physical activities a user is capable of with respect to the system
- Exploits Usability & Functionality

3. Emotional Aspect:

- Related to emotions such as joy, anger, disgust, etc.
- Helps in the decision making

4. Cognitive Aspect:

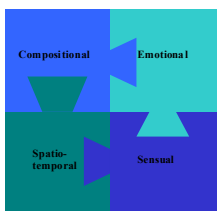
- Involve interpretation, information processing, problem solving, use of memory, etc.
- Beauty within



Experience Design

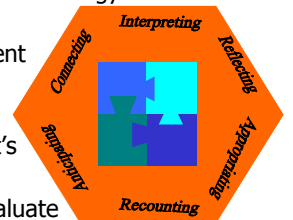
▶ Technology as experience – 4 threads

1. Compositional: How do the elements of an experience fit together to form a coherent whole?
2. Emotional: What emotions color the experience for us?
3. Spatio-temporal: What effects do place and time have on our experience?
4. Sensual: What does the design and texture and the overall atmosphere make us feel?



Technology as experience – processes

1. Anticipating: We never come to technology unprejudiced
2. Connecting: We make a judgment in an instant and without much thought
3. Interpreting: We work out what's going on and how we work out
4. Reflecting: We examine and evaluate what's happening in an interaction
5. Appropriating: We work out how a new experience fits with other experiences we have had and with our sense of self
6. Recounting: We enjoy storytelling and make sense of experience in stories.



Technology as experience – procedure

- ▶ UE in a never visited Apple store in SF
 1. Introduced the framework to the participants and provided them with a notebook
 2. In the notebook, the page was divided into sections corresponding to the sense making processes (e.g. anticipating connecting, interpreting etc.) and it was accompanied by a checklist of concepts and guide words from the framework
 3. Participants were then asked to go off and have their Apple store experiences.
 4. In addition to their diary, they provided an oral account during a one-on-one debriefing afterwards
 5. The gathered data facilitated the construction of a narrative of the experience that would engage with the concepts of the framework



Technology as Experience - Results

Anticipating

- ▶ Expect to find what I am looking for. Environment likely to be young, lively, loud music, packed full of products, very visible Apple branding.
- ▶ Upon arrival, surprised that iPods were not on main floor, surprised to find shop has Starbucks, surprised by limited product range, and that ambient music was jazz

Connecting, interpreting, reflecting

- ▶ First impressions confirmed what I had anticipated. Shop was spacious and airy. Positive feelings from the moment you walk in the door felt relaxed in shop. I feel in control. Perhaps music reflects customer class. And hey, they need reliable supplier, hence Starbucks.

Recounting

- ▶ I would tell people to shop there, but would warn them about the ambient music and Starbucks.



Persona for Experience Design

- ▶ Jane Smith, 18 years old, living downtown
- ▶ studying music at UCSC
- ▶ very ambitious and wants make a career in the music industry
- ▶ loves R&B, Hip-hop and Reggae music and has music CDs of almost all R&B stars.
- ▶ whenever in her room, she always listens to music on her computer. Her room is full of posters of movie/pop stars.
- ▶ keen sports player – an active member of the UCSC basketball team
- ▶ cares for her fitness, sometimes goes out for drinks with team-mates
- ▶ dating Carlos, an 18 year old student in the same School
- ▶ eating out at restaurants and going to the musical shows
- ▶ friends slightly envious of her lifestyle



Designing for Pleasure

How do you design for the 4-dimensions of pleasure?

1. **Physio-pleasure**
 - Feels good in the hand
 - Easy to carry around
 - Fits well and comfortably inside her pocket
 - Operable without causing damage to fingernails
 - Should have aesthetic looks
 2. **Socio-pleasure**
 - Should convey her socio-economic & cultural status
 - Should convey her interests in those types of music
 - Should be competitive amongst her friend circle
 3. **Psycho-pleasure**
 - Supports quick and intuitive operations
 - Good quality music
 - Personalization of music
 - Durable batteries
- Q: Ideo-pleasure?



Designing based on APEC Framework

- ▶ Appearance → Aesthetic
 - Pleasing to eyes – plastic body with metallic/white color
- ▶ Appearance → Emotional
 - Pleasant surprise – unconventional look
- ▶ Appearance → Cognitive
 - Something that everybody 'gets it' from the first look
- ▶ Interaction → Practical
 - Easy to hold and use with one hand
- ▶ Interaction → Emotional
 - Pleasure – rubbery button that is soft to touch
 - Fun – a DJ like interaction through Click-Wheel



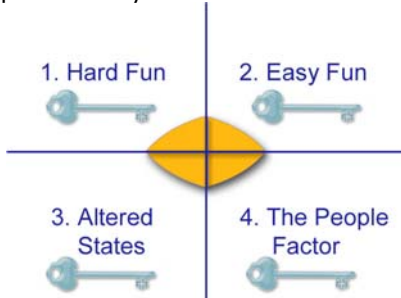
Designing based on APEC Framework

- ▶ Interaction → Cognitive
 - Fun – mapping of circular Click-Wheel interaction with linear screen interaction
 - Familiarity – the player's screen has a very familiar metaphor
 - Menu Driven Interface
- ▶ Function → Emotional
 - Pleasure – good quality music with small file size
 - Personalization of playlist
 - Pleasant surprise – shuffle/random function
- ▶ Function → Cognitive
 - Being able to create multiple music files
 - Flexibility – can store and play multiple file formats
 - Can record lectures in the same device



Games and Emotion

- ▶ E-poll in 2003, 2000 players → experience
 - Experience of mastering the game
 - Experience they have in playing
 - Experience they have on the inside
 - Experience they have with others



Player experience – hard fun

- ▶ Ex: Tetris, EverQuest, Sims, crosswords
 - Emotions from meaningful challenges, strategies, and puzzles
 - Played to concentrate
 - Relief from boredom
 - Enjoyed sense of accomplishment
 - Cathartic experience



- ▶ Requirements for Flow
 1. Clear goals
 2. Opportunity to concentrate
 3. Achievable tasks
 4. Immediate feedback
 5. Deep effortless involvement
 6. Uncertain outcomes



Player experience

- ▶ Easy fun; ex: Solitaire, Star Wars Galaxies, Grand theft auto
 - Fill attention and memory
 - Inspire curiosity and engagement
 - Simply exploring & figuring it out
- ▶ Altered state
 - Excitement → relaxation vv. (games as therapy)
- ▶ The people factor, ex: Dark Age of Camelot, Mario Kart 64, Halo
 - It's the people that are addictive, not the game
 - Create opportunities for competition, cooperation, performance, and spectacle
 - Produces Schadenfreude (gloat over misfortune of rival) Naches (prodigy/master relationship)

