UNIVERSITY OF CRETE
FACULTY OF SCIENCES AND ENGINEERING
COMPUTER SCIENCE DEPARTMENT

COURSE CS-564 (OPTIONAL)

ADVANCED TOPICS

IN HUMAN – COMPUTER INTERACTION

Course Convenor: Constantine Stephanidis

# AESTHETICS AND EMOTION

# Overview

- Definitions
  - Visual Aesthetics
  - Emotion
    - Affect, Mood, Emotion, Personality
- Visual aesthetics and emotion in HCI
  - The Vitruvian design principles
  - Emotional design by Norman
  - Visual aesthetics' and emotional effects on various variables
- Affective Computing
  - Theories of Emotion
  - Emotion detection methods
  - Criticism and challenges

# Introduction (1/3)

- Aesthetics and Emotion are two subjects that had been largely ignored in HCI research until the mid-90s
  - The extremely influential Design of Everyday Things (Norman) strongly emphasized usability in design and completely neglected aesthetics
    - "If we were to follow Norman's prescriptions, our designs would all be usable-but they would also be ugly"
    - Norman: "Alas, the critique is valid"
  - Systematic research on visual aesthetics of interactive systems can only be traced to the mid-1990's (Kurosu & Kashimura, 1995; Tractinsky, 1997)
  - This work in turn influenced Norman to focus his work towards the role of emotion in design: Aesthetics, attractiveness and beauty and how people feel about owning a product

# Introduction (2/3)

- On the other hand, the field of Artificial Intelligence likewise ignored the importance of emotion in human cognition and perception, despite voices that stressed otherwise
  - AI pioneer Herbert A. Simon (1967) was the first to denote the importance of emotion for Artificial Intelligence
  - Minsky confirmed this by stating: “The question is not whether intelligent machines can have emotions, but whether machines can be intelligent without emotions” (1986)
- Nevertheless, in practice emotions were mostly ignored in the quest towards intelligent machines until Picard (1997) introduced the field “affective computing”

# Introduction (3/3)

- Since then, a steady stream of studies has explored various aspects of both subjects
- The timeline of this research has roughly corresponded to even more dramatic developments in the information technology industry
  - Visual aesthetics is considered a prominent antecedent of the concept of “User Experience”
    - In a survey of the user experience (UX) literature, Bargas-Avila and Hornbaek (2011) found that emotions, enjoyment and aesthetics are the most frequently assessed dimensions of UX
  - The need to be able to identify or assess human emotion during computer usage
    - A holy grail for adaptative and responsive applications or services, e.g. ambient intelligence

# Aesthetics: definition

- Tractinsky uses the term “aesthetics” in its fairly ordinary and common sense as reflected in dictionary definitions such as:
  - “an artistically beautiful or pleasing appearance” (The American Heritage Dictionary of the English Language),
  - “a pleasing appearance or effect: Beauty” (Merriam-Webster’s Collegiate Dictionary).
  - The term “visual” indicates concentration on the visual sense, which is the central human sense, occupying “almost half the brain” (Ware, 2008, ix).
- We will not be concerned about various other phenomena studied under the “aesthetics” heading, such as literary aesthetics, abstract forms of aesthetic experiences or criteria (e.g., the elegance of mathematical proofs), or reactions to object qualities that do not immediately and primarily stem from its visual attributes

# Emotion: working definition

- Kleinginna and Kleinginna (1981) compiled a list of more than 100 definitions of emotion
- They had to conclude that psychologists cannot agree on many distinguishing characteristics of emotions
- They proposed a working definition which works well
- Emotion is a complex set of interactions among subjective and objective factors, mediated by neural/hormonal systems, which can
  a) give rise to affective experiences such as feelings of arousal and pleasure / displeasure
  b) generate cognitive processes such as emotionally relevant perceptual effects, appraisals, labeling processes
  c) activate widespread physiological adjustments to the arousing conditions
  d) lead to behavior that is often, but not always, expressive, goal directed, and adaptive

# Affect, Mood, Emotion, Personality (1/3)

- The words affect, mood, and emotion are often used interchangeably
- There are clear differences between these concepts in the psychological literature
- **Affect** is often used as the common denominator of mood and emotion
- **Emotions** are often defined as relatively short-lasting (i.e., a matter of seconds) reactions to specific stimuli in the environment
  - They result in mental, physiological and behavioral changes to deal with the sudden change in the environment

# Affect, Mood, Emotion, Personality (2/3)

- In contrast to emotions, **moods** are:
  1. long lasting and change gradually (over the course of minutes or hours, or even longer)
  2. not object related
  3. often experienced without awareness of their origin
  - Moods can also be accompanied by physiological changes but do not result in direct action tendencies

# Affect, Mood, Emotion, Personality (3/3)

- Moods influence behavior indirectly
- Moods are often operationalized in terms of **valence** and **energy** or **arousal**
- **Valence** refers to the pleasantness of the mood ranging from very sad to very happy
- **Energy (or arousal)** ranges from very relaxed to very excited

- **Personality**: A person's set of distinctive traits and behavioral and emotional characteristics

# Visual aesthetics and emotion in HCI

# The Vitruvian design principles (1/2 )

- Vitruvius (1st century BC) is probably the first person to lay forth systematic and elaborated principles of design
  - Architecture was the subject of his elaborated writings, being the most salient and complex design discipline, which has affected human life ubiquitously
  - Information technology and interactive systems have now become just as ubiquitous and there is much in common for architecture and information technology
  - It is reflected by the term “information architecture,” used by professionals to designate the process of creating information-based environments and systems

# The Vitruvian design principles (2/2 )

- The similarities between these two disciplines can be illustrated by considering Vitruvius's three core principles of sound architectural work
- ***Firmitas***
  - the strength and durability of the building
- ***Utilitas***
  - the utility of the building, its usefulness and its suitability for the needs of its intended inhabitants and users
- ***Venustas***
  - the building's beauty

# IT and the Vitruvian principles

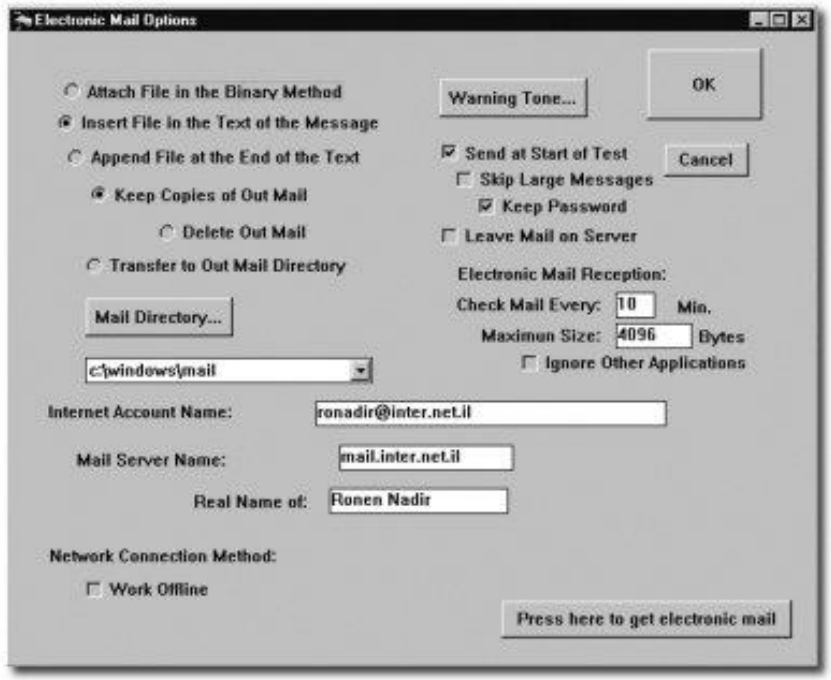
- ***Firmitas*** can naturally be considered as the core principle of the various computing and IT disciplines' research and practice
  - The need for robust, reliable and dependable software, hardware, systems and products
- The ***utilitas*** principle
  - In the context of IT, this principle deals with designing to meet individual and organizational needs and goals, with emphasis on the efficiency and the effectiveness of the interaction between people and artifacts
  - the HCI community can take much of the credit for incorporating the *utilitas* principle into mainstream practices in the computing industry
  - The field of HCI has its roots in attempts to study and design systems and product that will allow people to use them efficiently (Card et al, 1983)
  - The notion of usability, for example, which has served as a centerpiece of the HCI community has permeated not only other parts of the IT industry, but have gained almost universal recognition and support for the values of human-centered design

# What about Venustas?

- For years, beauty and delight were considered by the HCI community as gratuity, often to be avoided
- The emergence of beautiful interactive products during the first decade of the 21st century led to commercial success and to academic research
- This has demonstrated quite convincingly, that as in other design disciplines, the third Vitruvian leg, *venustas*, should be fully embraced as cornerstone of designing interactive technology

# Question

- Which of these two interfaces is of higher quality?

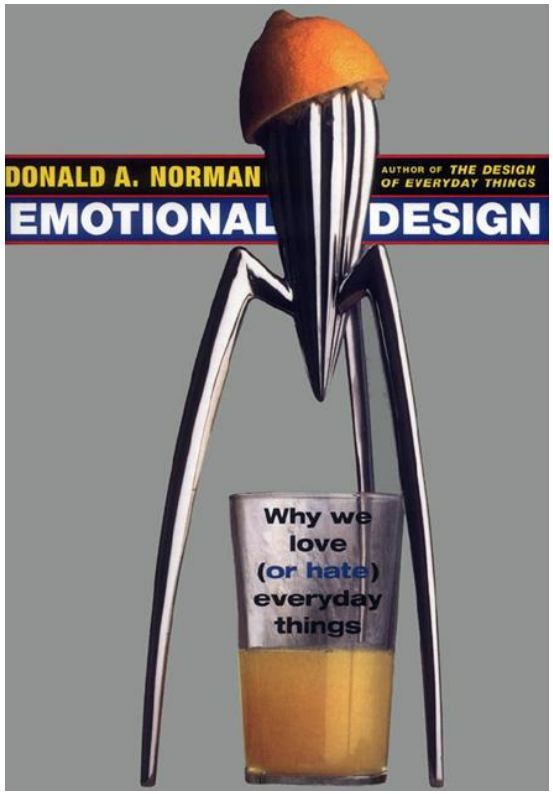

Parush et al, 1998

# Aesthetics, Affect and emotions

- Affect and emotions are oft-cited corollaries of visual aesthetics
- The effects of attractive and appealing design on emotions were demonstrated in various studies
  - E.g. in the domain of portable music players and in the domain of online shopping
- The importance of aesthetics' effects on emotions is twofold

1. Positive affect contributes to positive experience and well-being, and as such is an end in itself
2. Second, emotions have a role in affecting subsequent information processing, appraisal of other system attributes, and forming attitudes towards the system

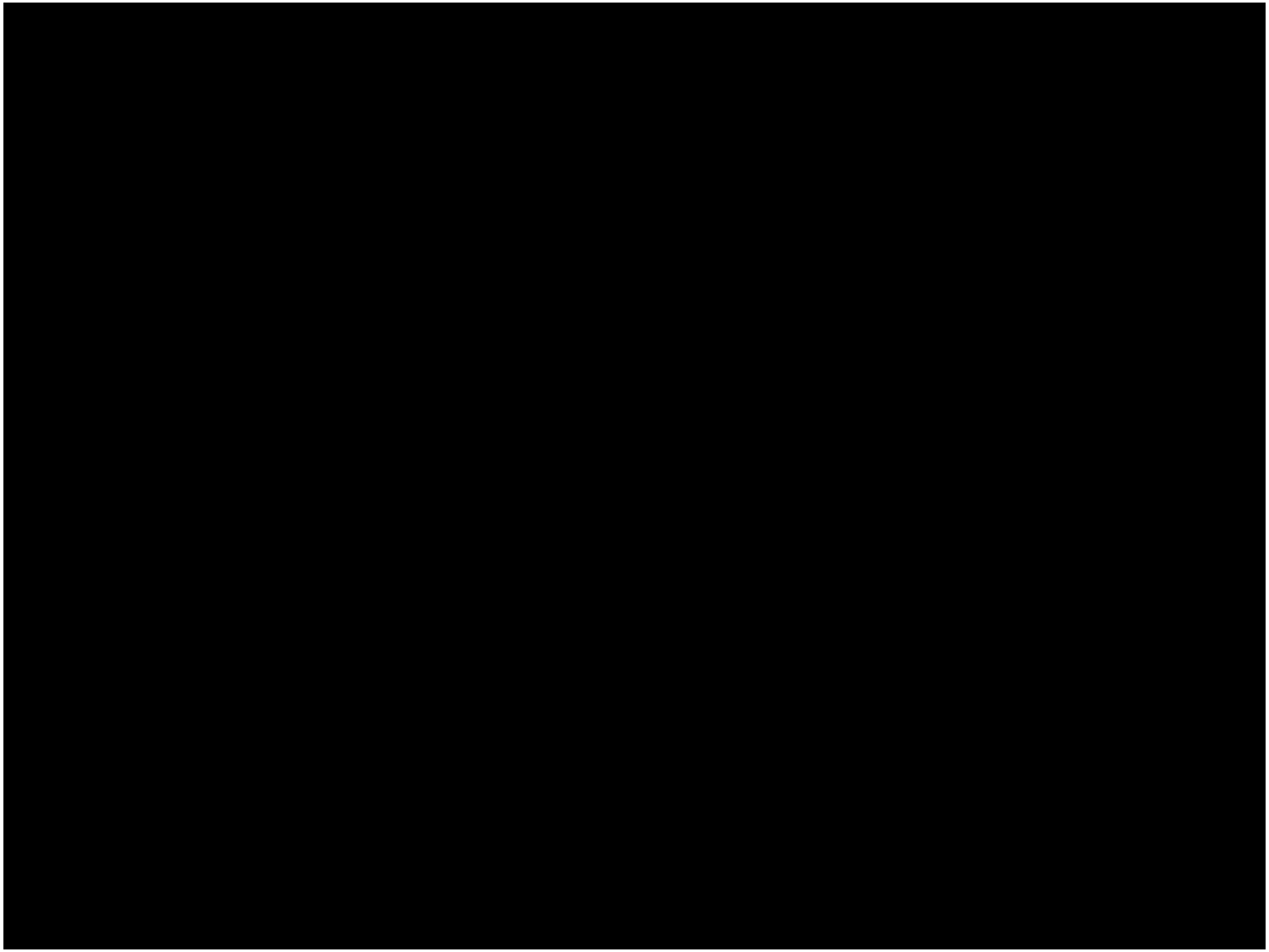
# Emotional Design




- Published in 2004, the book identifies three aspects of design that deal with our response towards it:

1. Visceral
   - Appearance, beauty
2. Behavioral
   - Pleasure and effectiveness of use (i.e. usability)
3. Reflective
   - Rationalization and intellectualization of a product.
     - Can I tell a story about it?
     - Does it appeal to my self-image, to my pride?
     - Example: the “teapot for masochists”
       - It is entirely reflective
       - It isn’t particularly beautiful
       - It’s certainly not useful
       - But what a wonderful story it tells!

# Don Norman's talk at TED on "Three ways good design makes you happy"



**Full video available at: http://www.ted.com/talks/don_norman_on_design_and_emotion.ht**

# Examples


"The Aviator" Keyboard


MOTOROLA
Getty


PROTECTION
CASIO
G-SHOCK

# Aesthetic impressions are fast, enduring and consequential

- Aesthetic impressions can be very fast
  - Studies of brain activity suggests that aesthetic impressions form within 300ms
  - Research on people's impressions of web pages demonstrated that reliable and consistent aesthetic judgments are formed with exposure of less than 500 milliseconds
- These very fast impressions are the first opportunity we have to form an attitude towards an object (e.g., an interactive system), whose other qualities are usually concealed until later time when opportunities to evaluate them arise
  - e.g., when trying to accomplish a task with the system

# Aesthetics satisfies basic human needs and is a source of pleasure

- Aesthetic experiences are associated with affective responses and reflective thought
  - Research using functional magnetic resonance imaging (fMRI) found further neurophysiologic support for this association in the context of product packaging
- Whereas task-related criteria are often based on extrinsic motivation, aesthetics, through pleasure and engagement, primarily contributes to intrinsic motivation
- Visually pleasing design enriches our experiences with interactive systems just like they do with any other environment
- There is empirical evidence that aesthetic design of interactive technology increases users' pleasure and engagement
- Consequently, we expect pleasurable interactions to make us happier and to improve our well-being
- Furthermore, they may make us more tolerable of other design imperfections and improve our task performance under certain conditions

# Trustworthiness

- *Trustworthiness* was a variable that was studied early as an outcome of visual design in the domain of online banking
- In other studies on website design, found that web-site color appeal is a significant determinant of website trust
- Lindgaard et al. (2011) also found strong correlations between visual appeal and trust in websites
- A related variable to trust, *reputation* of an academic department was correlated with aesthetics in a study of websites

# What is beautiful is usable

- The primacy of first impression on attitudes is well documented in social science research
- We also know that people try to actively improve how they appear to others in order to gain benefits or to avoid sanctions
- Such attempts can be found, for example, in how people try to improve information about things under their responsibility (e.g., at work) by presenting the information in more attractive formats
- Such aesthetic improvements may pay off: research suggests that under ordinary conditions, aesthetic financial reports increase both novice and professional investors' valuation of a firm
- Similarly, the way things appear may influence our attitudes towards them. By "things" we may refer to natural settings and objects such as landscapes or to various sorts of designed environments and artifacts
- Thus, it should come as no surprise that the visual aesthetics of interactive systems, both hardware and software, may affect our evaluation of other system attributes
- Hence, the suggestion that "beautiful is usable" that is, beautiful systems are considered by users to be more usable

# Performance

- Following Norman's (2004) claim that "attractive things work better," perhaps the most intriguing question regarding the outcomes of visual aesthetic is whether it influences not only users' perceptions and evaluations of the system, but also their **performance**
- Recent studies have started looking for empirical evidence regarding this question
  - In a study of 11 data visualization techniques, Cawthon & Moere (2007) found positive relation between aesthetic data visualizations and performance of data retrieval tasks
  - Sonderegger and Sauer (2010) and Quinn and Tran (2010) similarly found more effective task performance when using attractive versus unattractive mobile phones
  - Van Schaik & Ling (2009), however, did not find relation between perceptions of classical and expressive aesthetics and performance measures

# Not black and white

- Linkages between perceived beauty and various outcomes or between design attributes and aesthetic perceptions, even if backed up by solid research evidence, common sense, or philosophical arguments, **should not** be considered universal or deterministic
  - Against studies that empirically found associations between aesthetic evaluations and evaluations of other perceived system attributes, such as usability, there are studies that found weaker or no such associations, indicating that at least under certain circumstances they do not hold

# Aesthetics as a differentiating factor

- The accelerated process of consumer-centeredness and commoditization of interactive technologies, increases the importance of aesthetics as a differentiating factor between competing products
  - The watch industry
  - IBM → Microsoft → Apple

Smartphones, 2007

Apple's iPhone (1st gen) really stands out from its contemporaries

# Affective computing

Theories on emotion and emotion detection

# Affective Computing: definition

- Affective computing is defined as the field of computer science that is concerned with, is derived from or deliberately influences our emotional world
- The aim of researchers of this scientific field is to promote techniques/methods/tools that will deal either with the recognition of human emotional states or with the way these are created or expressed in information machines

# Roles of emotion in intelligent human functioning

- Scientific findings have illuminated important roles of emotion in intelligent human functioning, even when it looks like a person is showing no emotion
- These findings have reshaped scientific understanding of emotion: emotional mechanisms might be more valuable than previously believed
- Building machines that have several affective abilities, especially: **recognizing, expressing, modelling, communicating**, and **responding** to emotion

# Reason and emotion (1/4)

- Emotion is essential for reasoning
  - Mr Spock vs. “Elliot”
  - Mr Spock from Star Trek is from the planet Vulcan where they don’t have emotions and presumably operate on reason alone, thus being more efficient and clever and taking the most rational decisions
  - Elliot was a good father and husband who held a good job with a business firm. He was smart and had many skills. According to the author, Elliot “had attained an enviable personal, professional, and social status.” Elliot had a small tumour cut from his cortex near the brain's frontal lobe. During Elliot’s physical recovery, he and his family noticed drastic personality changes. Although his intellect, motor skills, and language use remained intact, Elliot had clearly changed since the surgery
  - Elliot had trouble getting started in the morning and preparing for work. He had trouble managing his time while at work and could not operate on a schedule. While at work, Elliot had trouble reaching his main goals because he would get caught up in a single task for an unnecessary amount of time. He continually lost sight of his main priorities because of his irrational amount of detail on subsidiary tasks. After surgery, Elliot became emotionally blunted. When one would typically expect an emotional response, he showed none

# Reason and emotion (2/4)

- Emotion is essential for reasoning
  - However, emotion is not just a random influence. In many situations there are detectable differences between options, but we may be faced with choices where the criteria are incomparable or the outcomes uncertain
    - On a rainy day do I risk running across the road to catch my bus? If I do I will get home dry, but risk being hit by a car. Even if one knows all the probabilities, how do you weigh up a 1 in 10,000 risk of being run over with a 100% chance of getting wet?
    - Mathematical decision procedures and computer algorithms often need complete knowledge in order to make fully 'rational' choices and where only partial knowledge is available they use heuristics, approximations, and crude hacks ... and end up behaving not so unlike emotional people

# Reason and emotion (3/4)

- Also regulates focus and attention
  - Keeps us on the job
  - Emotion also is important in maintaining focus and attention, the planning and control parts of thinking
  - Elliot eventually lost his job partly because he could get distracted very easily, or alternatively spend a whole day trying to decide on some insignificant decision. The idea of the bigger picture, that the whole is more important than a part was lost to him

# Reason and emotion (4/4)

- Also regulates focus and attention
  - Even simple boredom is important
    - without boredom we will constantly try and retry very similar solutions rather than look for 'something completely different'
- Finally, as noted previous emotion is efficient
- It is often better to make a poor decision quickly than make a good one over a long time:
- Yunga the cavewoman hears a rustling in the bushes. "It could be the wind", she thinks, "or a bird". Some time later she decides, on balance of probabilities it is most likely a sabre tooth tiger – oops too late!

# Assessing people's emotional state: How (1/2)

- People's emotional state can be assessed by processing a range of their biosignals
- These signals can be assigned to two groups:

1. A broad range of physiological measures signals
    1. Electrocardiogram (ECG)
    2. Electromyography (EMG)
    3. Electrodermal response (EDR)
    4. Blood volume pulse (BVP)
    5. Respiration
2. Specialized areas of signal processing:
    1. speech processing
    2. movement analysis
    3. computer vision techniques

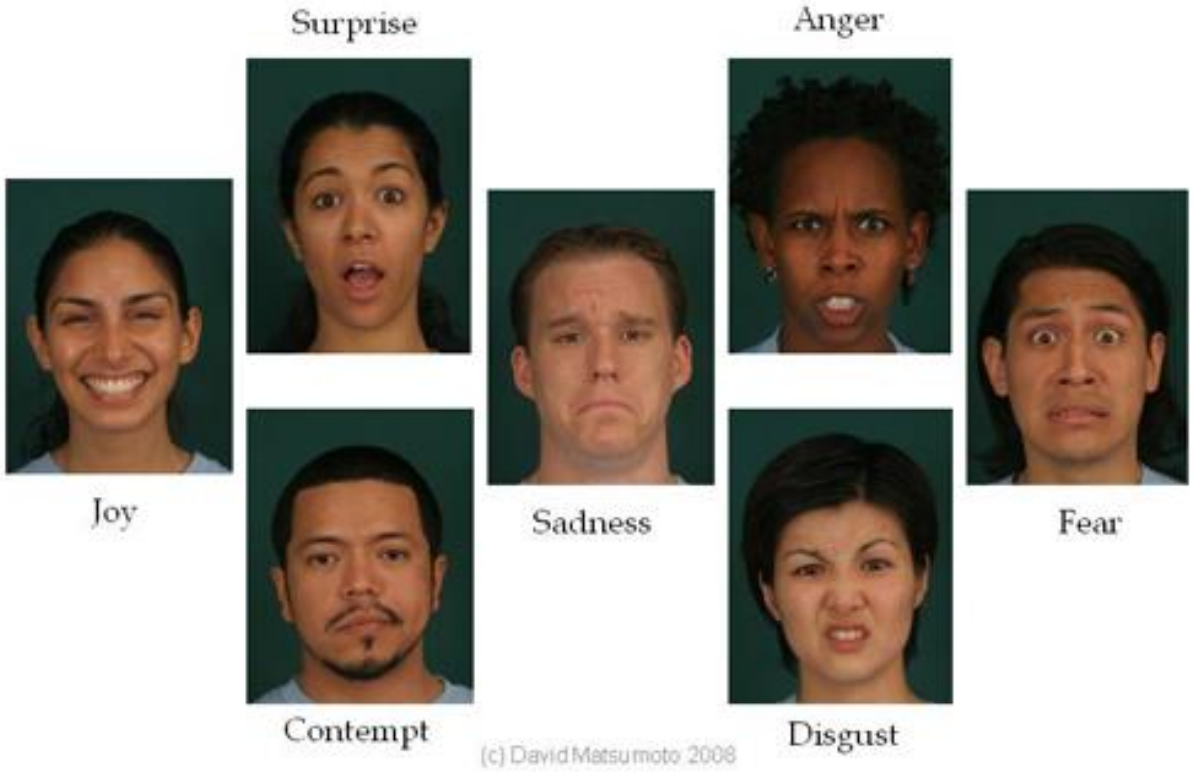
# Assessing people's emotional state: How (2/2)

- These distinct measurement methods are seldom combined
  - several physiological measures are frequently combined
  - speech processing, movement analysis, and computer vision are frequently combined
  - **Research opportunity**: combine both groups
    - Such efforts have been successfully undertaken by Kim et al (2005-2008) and van de Broek (2009, 2011)

# Speech signal

- Speech processing, dialogue, and synthesis can exhibit some form of intelligent, user perceived behavior
  - However, speech comprises another feature: emotion elicitation
- The human speech signal can be characterized by various features and their accompanying parameters
- However, no consensus exists on the features and parameters of speech that reflect the emotional state of the speaker
- Most evidence exists for the **variability** (e.g., standard deviation; SD) **of the fundamental frequency** (F0), **energy of speech**, and **intensity of air pressure**

# Facial expressions



# Physiological signals: heart related (1/2)

- The electrocardiogram (ECG) is an autonomic signal that cannot be controlled easily, as is the case with electrodermal activity
- ECG can be measured directly from the chest
- Alternatively, the periodic component of the blood flow in the finger or in an ear can be translated into the ECG

# Physiological signals: heart related (2/2)

- From the ECG, the heart rate (HR) can nowadays be easily obtained
  - Research identified features of HR as indicators for both experienced valence and arousal
- The HR variability (HRV) can also be determined from the ECG
  - The HRV is a frequently used variable in psychophysiological research
  - HRV decreases with an increase in mental effort, stress, and frustration
  - Some indications have been found that HRV is also influenced by the valence of an event, object, or action

# Other physiological signals

- Skin conductance level, respiration, and skin temperature (ST)
  - These physiological signals have been used before to measure affective states
  - For example, in Janssen et al (2012), the skin temperature was monitored during the listening of various music pieces, selected for the positive and negative reactions they elicit
    - Users' self-report of emotions and the readings obtained by the sensor matched
    - Positive music slightly decreases temperature, while negative music increases it
    - Still this research is in early stages to make that an absolute finding
    - The sensor was totally unobtrusive (on a ring), which is another issue that should be considered in biosignal measurements

# Contaminating factors

- Physiology is responsive to many psychological and physical influences beside affect
- Because of that, many factors contaminate the affective information in physiological signals
  - For instance, physical activity, cognitive workload, or simply a cup of coffee all influence our physiological signatures
- Other emotional influences not originating from music can influence the affective state of the user;
  - for example, an upset colleague or a happy e-mail
- As we want to investigate a system that works in the real world, we have no control over all these factors

# Obtrusiveness and noise sensitivity (1/2)

- Physiological measures are often obtrusive and used to be disregarded for user-centered applications
- Wearable computing and wireless sensing technologies relieve this problem
- Physiological signals can be measured unobtrusively with wearable sensors incorporated in a bracelet or a ring

# Obtrusiveness and noise sensitivity (2/2)

- Speech and computer vision are unobtrusive but very noise sensitive
  - The audio recordings used for speech processing suffer from various types of noise
  - Computer vision techniques are only usable for emotion recognition in very stable environments
    - e.g., without occlusion, stable light sources, and the users sitting at a desk or on a couch

# Emotion elicitation methods (1/3)

- A large number of laboratory assessment paradigms have been utilized to elicit emotions and probe varying aspects of emotion on different time scales
- One of the most frequently used stimulus set is the International Affective Picture System (IAPS, Lang et al., 1995)
  - IAPS contains a large number of pictures with normative ratings for their level of experienced valence and arousal
- Subsets eliciting specific emotions can be selected for specific research questions

# Emotion elicitation methods (2/3)

- Sounds of several seconds duration have been assembled for the same purpose
- Another frequently-used method employs viewing brief video film clips taken from commercial movies and has proven highly effective in eliciting various emotions (e.g., anxiety, anger, sadness and joy), in relation to longer-term dynamic emotion processes
- Scripted imagery has also been used for this purpose

# Emotion elicitation methods (3/3)

- Closer to real life are behavioral emotion-induction procedures such as mental stress tasks
  - For example, the Trier Social Stress reliably induces not only stress but also social anxiety and embarrassment
  - Short public speaking or math tasks are also quite effective
  - Stimuli like animals (e.g., spiders, snakes) or needles can be used to induce anxiety among phobic patients
  - Frustration and anger can be induced by standardized obnoxious behavior of the experimenter
  - A range of emotions can be induced in an almost real-life social context by social interaction on controversial topics

# Affective Computing Challenges

Criticism and discussion

# Introduction

- The topic of affective computing is in its very early stages of research and many challenges and severe difficulties have been encountered
- Some were briefly mentioned in the previous section but there are many more
- This section presents a set of criticisms and challenges as discussed by R. Pickard (2003) covering the basic areas of Affective Computing research

# Sensing and recognizing emotion: Impossible?

- **Criticism 1**: The range of means and modalities of emotion expression is so broad, with many of these modalities being inaccessible (e.g., blood chemistry, brain activity, neurotransmitters), and many others being too non-differentiated
- This makes it unlikely that collecting the necessary data will be possible or feasible in the near future
- **Criticism 2**: People's expression of emotion is so idiosyncratic and variable, that there is little hope of accurately recognizing an individual's emotional state from the available data

# Humans are not that good either (1/2)

- The level of our human ability to recognize human emotion is variable. Pickard, writes:
- Three-quarters of computer users admit to swearing at computers, a verbal form of emotional expression that most people have no difficulty recognizing
- On the other hand, if you were asked to jot the emotional state of the next person you see (feel free to try this) the challenge grows significantly

# Humans are not that good either (2/2)

- Many people do not know how to articulate their own feeling state
- Think about it: you have better access to your innermost feelings than anyone, but you still do not always know how to ‘‘recognize’’ or label what you are feeling
- In particular it can be hard to assign a single word to label a feeling state. Nonetheless, we have feelings essentially all the time: it is common to hear somebody say, ‘‘Sorry, I wasn’t **thinking**’’, but not ‘‘Sorry, I wasn’t **feeling**’’

# The weather analogy (1/3)

- The term emotion refers to relations among external incentives, thoughts, and changes in internal feelings, as weather is a superordinate term for the changing relations among wind velocity, humidity, temperature, barometric pressure, and form of precipitation
- With emotion, as with weather, one can build sensors for measuring the physical equivalents of temperature, pressure, humidity, etc.
- One can also build successful algorithms for combining patterns of such measures, and thus recognize the emotional equivalents of a tornado or a blizzard

# The weather analogy (2/3)

- Pickard does not expect researchers will have success matching human labels when such labels may not exist:
  - We do not have special names for most of the states of weather—but rather only for its extreme states. In the in-between cases, we use adjectives like, ‘‘ok day’’ or ‘‘partly cloudy’’ referring only to some quality of the weather
  - Similarly, not all aspects of affective state will be relevant or useful to observers
  - Sometimes just reporting the quality of the state—it’s ‘‘ok’’ or it’s ‘‘not so great’’ will suffice

# The weather analogy (3/3)

- Computers could label any state that they could represent, but such labels might not matter much unless they are in service of some greater purpose
- And this latter service is what motivates much of affective computing
  - how can we enable computers to better serve people's needs
  - adapting to you, vs. treating you like some fictional idealized user
  - recognizing that humans are powerfully influenced by emotion, even when they are not showing any emotion?

# A possible solution

- More recent work on affect recognition at MIT (Picard, 2003) has focused on recognizing things like ‘‘*the state you are in when all is going well with the computer*’’ vs. ‘‘*the state you are in when encountering annoying usability problems*’’
  - **NOT** on recognizing the eight affective states with names like ‘‘joy’’ or ‘‘anger’’
- Each of these states may be a complex mix of emotions
  - if the pattern of their expression is distinctive, then we can try to have the machine recognize it, and respond to it
- The belief is that such discrimination is of value in designing systems that reduce user frustration

# Partial solutions

- When confronted with a really difficult problem like affect recognition, it is helpful to remember that partial solutions can still be of value
  - infants recognize some kinds of affect in speech, long before they recognize what is said; dogs empathize with their owner
- Such examples of recognition remind us that there are many applications even for systems that do not fully solve the problem
- When a computer is capable of conversing with a person, the computer can augment its imperfect non-verbal affect sensing with an occasional verbal inquiry—‘‘hey, how’s it going?’’

# Example

- Tim Bickmore crafted a ‘‘Relational Agent,’’ a conversational character designed to build and maintain a long-term social-emotional relationship with users who were undergoing a month-long program to increase their exercise levels (Bickmore, 2003)
  - One of the factors believed to contribute to the success of this agent was its ability to inquire about and respond to the user’s feelings and show occasional empathetic caring and concern with both text and bodily expression
  - Even though users (rightfully) doubted the character had any feelings or really cared, and the computer character was up front about its limited abilities, users still rated the relational agent significantly higher on likeability, trust, respect, feelings (it cared for them), and willingness to continue interacting with it
- Thus, appropriate use of even limited affective abilities may lead to improved quality of experience for users, especially over long-term interaction

# Ethics (Criticism 3)

- Emotions, perhaps more so than thoughts, are ultimately personal and private
- Any attempts to detect, recognize, or worse manipulate, a user's emotions thus constitutes the ultimate breach of ethics and will never be acceptable to computer users
- Attempts to endow computers with these abilities will lead to widespread rejection of such computer systems and will help promote an attitude of distrust to computers in general

# Ethics discussion: the boss example

- If your boss yells at you, is it wrong to detect his angry voice, or to recognize he is angry?
- Is it unethical, once you have recognized his anger, to try to take steps to alleviate his anger, or to ‘‘manipulate’’ it, perhaps by sharing new information with him, so that he is no longer angry?
- One can think of situations where the foregoing answers are ‘‘no’’: e.g., he is yelling at you directly, and clearly wants you to recognize it and take steps in response
- One can imagine the answers might be more complex if you surreptitiously detected his anger, and had nefarious purposes in mind by attempting to change it

# Ethics discussion (cont.)

- Humans routinely detect, recognize, and respond to emotions or manipulate them in ways that most would consider highly ethical and desirable
  - Playing music to cheer up a friend's mood, eating chocolate, exercising to perk oneself up, are all perfectly acceptable
- There can be unscrupulous uses of affect detection, recognition, expression, and manipulation—both by people with their direct senses, and by people employing affective computers
  - Some of these, including ways affective machines might mislead customers, assuage productive emotional states, and violate privacy norms, are discussed in Picard (1997) and in Picard and Klein (2002)

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# Additional Reading (1/2)


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# The end!

Questions?