Veranstaltung 1:

(1) Soziale Roboter als Interface zwischen Mensch und Maschine
(2) Definition: Soziale Roboter
(3) Typen sozialer Roboter nach Breazeal

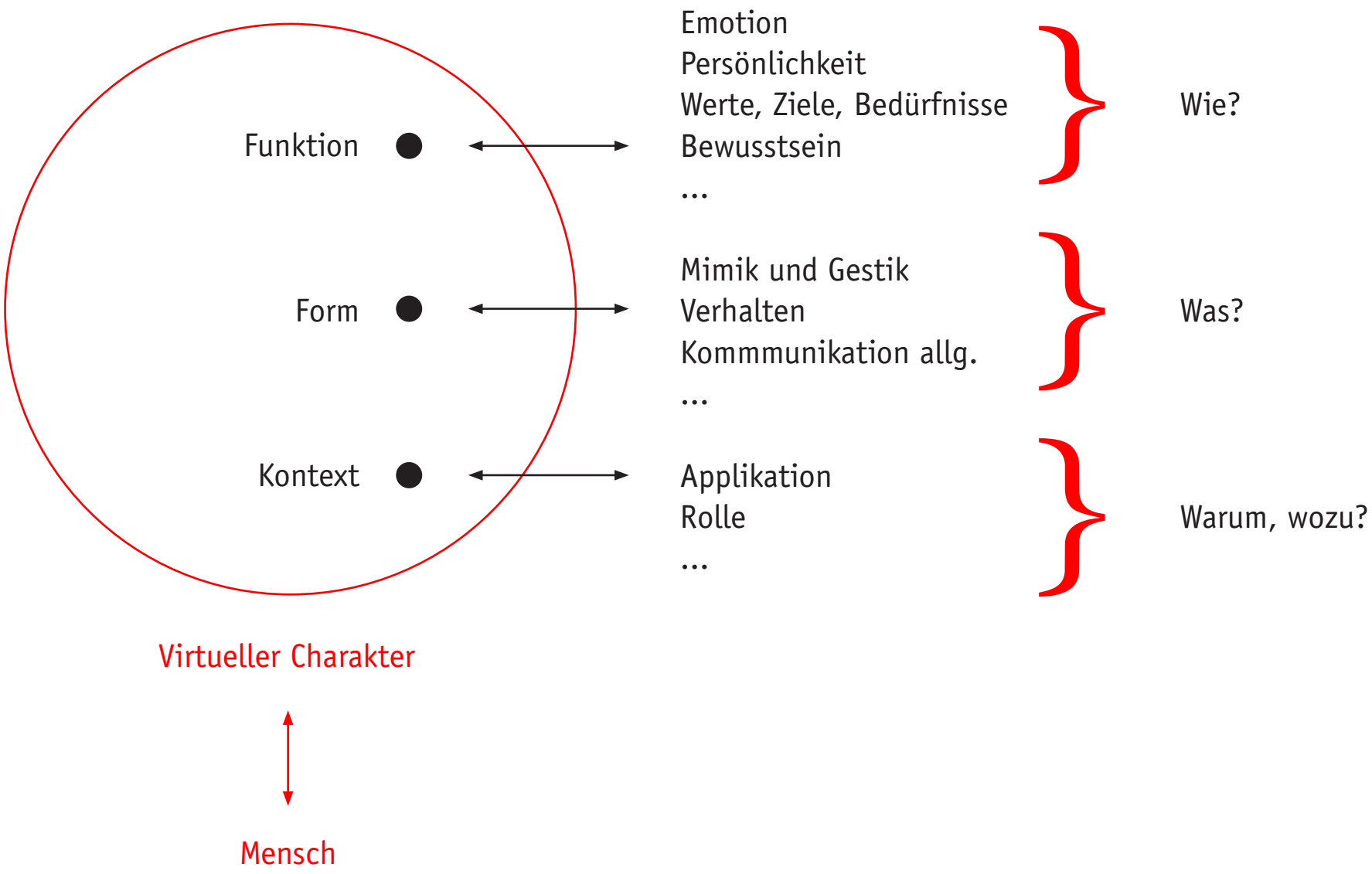
Veranstaltung 2:

(1) Anthropomorphismus
(2) Klassifikation der Roboter nach Form

→ Veranstaltung 3:

(1) Emotionen
(2) Natural Cues

Virtueller Charakter als Roboter/Agent



(a) Biologisch orientierter Ansatz versucht Roboter zu erschaffen, deren interne Architektur die Informationsverarbeitung bzw. mentalen Prozesse von Menschen (zumindest Lebewesen) simuliert - so weit verstanden.

(b) Funktional orientierter Ansatz hat das Ziel, Roboter so zu gestalten, dass Menschen diese als soziale Akteure akzeptieren und entsprechend behandeln – auch wenn die interne Architektur der Maschine diese Annahmen nicht rechtfertigt.

T. Fong et al, A Survey of Socially Interactive Robots (2003)

Relevante Parameter zum Design sozialer Roboter

(a) Human-Oriented Perception
Robot must perceive and interpret human behavior and activity

(b) Natural Human-Robot Interaction
Playing a duett like musicians

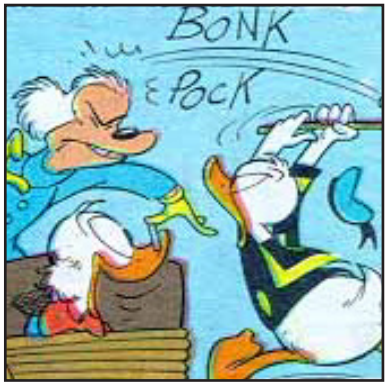
(c) Readable Social Cues
Robot must send signals to human to provide feedback of its state and to allow the human to interact in a transparent manner

(d) Real-Time Performance
Robots must operate at human interaction rates

T. Fong et al, A Survey of Socially Interactive Robots (2003)

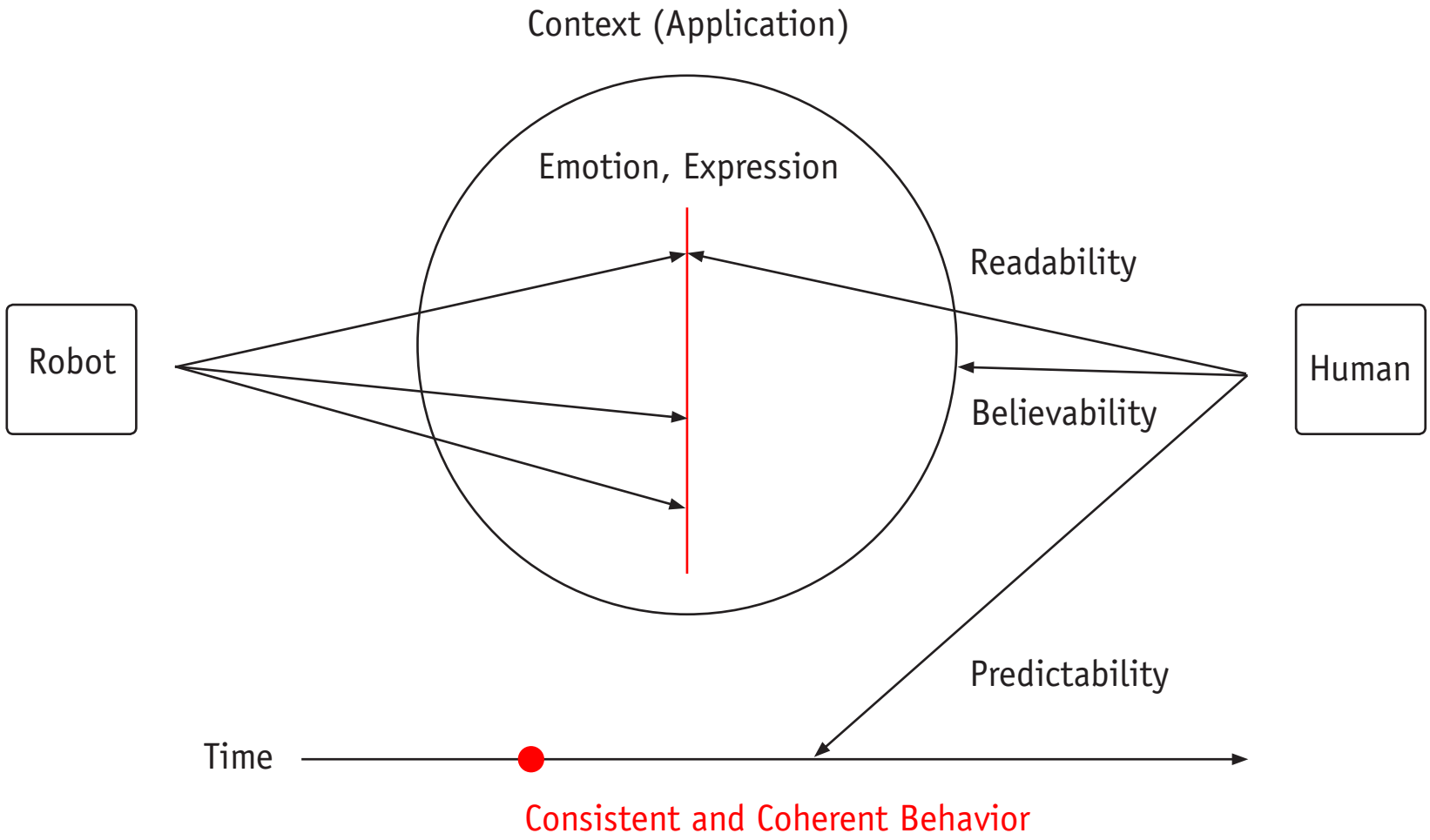
Readability, Believability, and Predictability!

Believability in theater and comic



(1) F. Thomas and O. Johnston, The Illusion of Life (1981)

Readability, Believability, and Predictability!



Human-Social Charasteristics: Eigenschaften sozialer Roboter

(a) Express and perceive emotions
(b) Communicate with high-level dialogue
(c) Learn/recognize models of other agents
(d) Establish/maintain social relationships
(e) Use natural cues (gaze, gestures, etc.)
(f) Exhibit distinctive personality and character

T. Fong et al, A Survey of Socially Interactive Robots (2003)

Why do we have emotions? Emotions are important in:

- human intelligence
- rational decision making
- social interaction
- perception
- memory
- learning
- creativity

...

R. Picard, Affective Computing, 1997

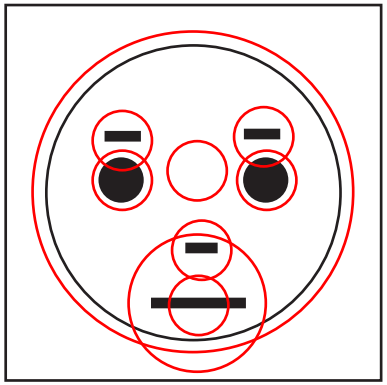
Affective Computing

There are four main categories in affective computing:

(a) Computers that recognize emotions
(b) Computers that express emotions
(c) Computers that have emotions
(d) Computers that have emotional intelligence

R. Picard, Affective Computing, 1997

Computers that recognize emotions



Emotionsmerkmale:

→ Kopflage, Augengröße, Nasenlänge, Nasenbreite, Mundbiegung, Mundbreite, Mundoffenheit, Augenabstand, Pupillengröße, Augenform, Augenbrauenwinkel

→ Computers that express emotions

(a) A computer can express emotions without having emotions - just like humans

(b) WHAT is said (semantic) and HOW is it said (affective)

(c) Affective inflection not only makes for a more pleasant interaction, but also it makes for efficient communication (information and valence).

Can machines feel? Picard suggests a machine „has emotions“ if the following five components are present in a computer:

(a) Emotional Behavior
(b) Fast Primary Emotions
(c) Cognitively Generated Emotions
(d) Emotional Experience
(e) Body-Mind Interactions

Affective Computing - Computers that have emotional intelligence

→ A computer with emotional intelligence will be one that is

(a) skilled at understanding and expressing its own emotions,
(b) recognizing emotions in others,
(c) regulating affect,
(d) and using moods and emotions to motivate adaptive behaviors.

→ Emotionale Intelligenz nach Goleman

(a) Selbstbewusstheit (Fähigkeit eines Menschen, seine Stimmungen, Gefühle und Bedürfnisse zu akzeptieren und zu verstehen, und die Fähigkeit, deren Wirkung auf andere einzuschätzen)

(b) Selbstmotivation (Begeisterungsfähigkeit für die Arbeit, sich selbst unabhängig von finanziellen Anreizen oder Status anfeuern zu können)

(c) Selbststeuerung (planvolles Handeln in Bezug auf Zeit und Ressourcen)

(d) Soziale Kompetenz (Fähigkeit, Kontakte zu knüpfen und tragfähige Beziehungen aufzubauen, gutes Beziehungsmanagement und Netzwerkpflege)

(e) Empathie (Fähigkeit, emotionale Befindlichkeiten anderer Menschen zu verstehen und angemessen darauf zu reagieren)

D. Goleman, Emotionale Intelligenz (1996)

Do we need all Emotions?

→ Emotional expressions are the signals used by an infant to communicate her needs: she cries when cold, bored, dirty, hungry, or in pain.

→ It will become clear that every computer does not need all of these abilities all of the time. In fact, there will be many examples in the next chapter of applications where only a subset of the abilities is needed.

Natural Cues - The Face

The face is one of the most important human communication channels and reading faces is a fundamental aspect of social interaction.

The human face has 46 action units to form expressions. There are some cultural differences in emotion display patterns, but most researcher agree that there are at least four universal basic emotions:

(a) anger
(b) fear
(c) happiness
(d) sadness
(e) surprise
(f) disgust

K. Isbister, Better Game Characters by Design - A Psychological Approach (2006)

Readability of Emotions

iCat: 5 basic emotions and thinking

Readability of Emotions

Barthoc Jr.: 5 basic emotions and thinking

Readability of Emotions

	iCat (n=48)	Barthoc jr. (n=76)
Happiness	47,9	22,7
Anger	89,6	71,2
Sadness	97,6	23,3
Surprise	45,8	30,7
Fear	18,8	68,0
Thinking	64,6	39,7

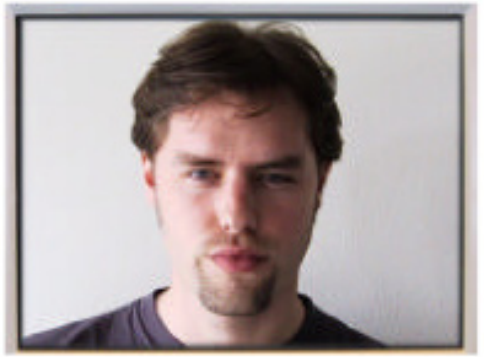
(in %)

Readability of Emotions

Basic Emotions

Happiness

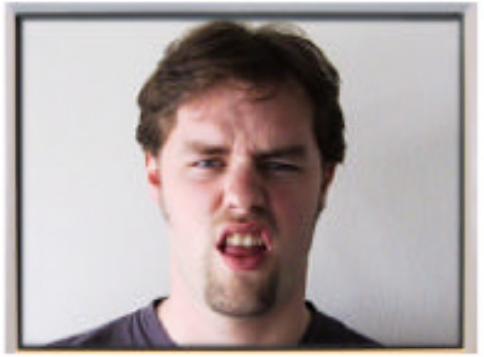
Sadness



Anger

Surprise

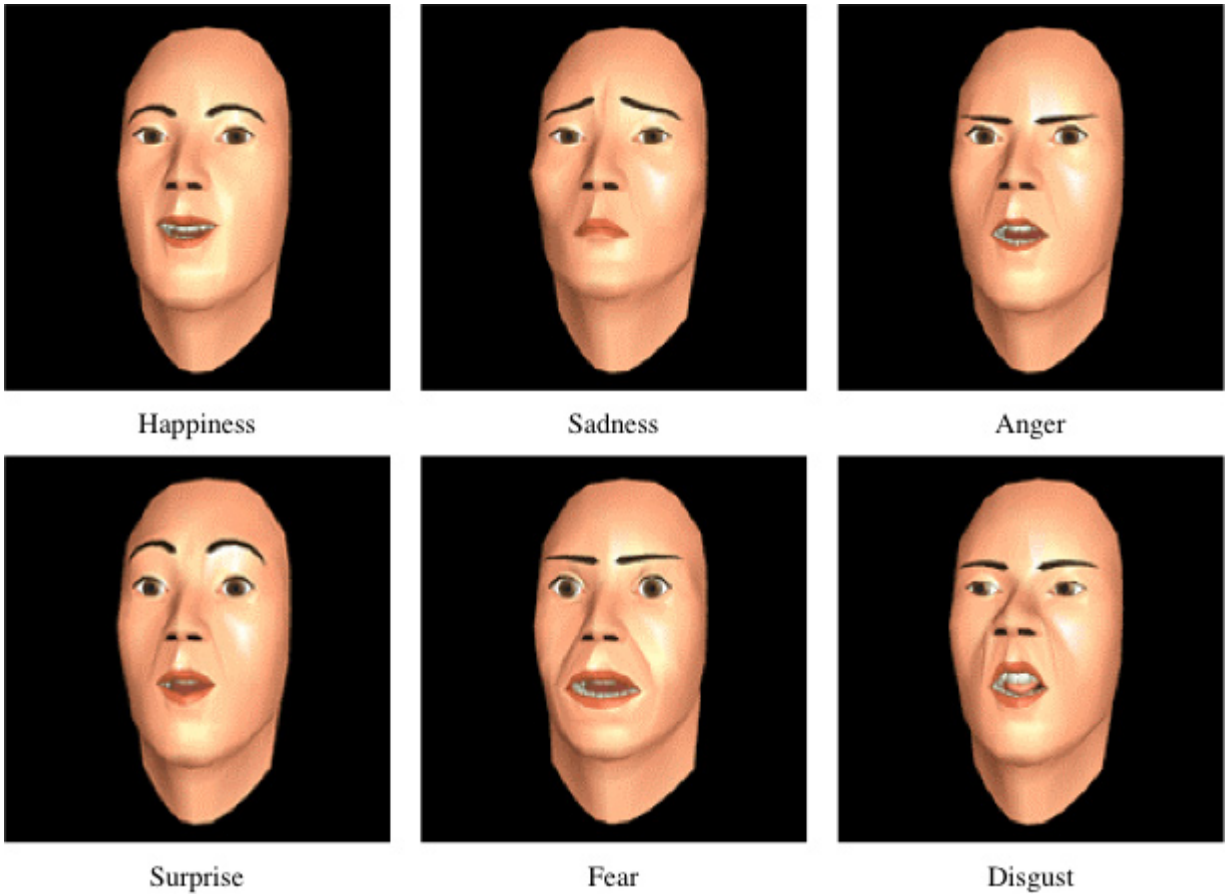
Fear



Disgust

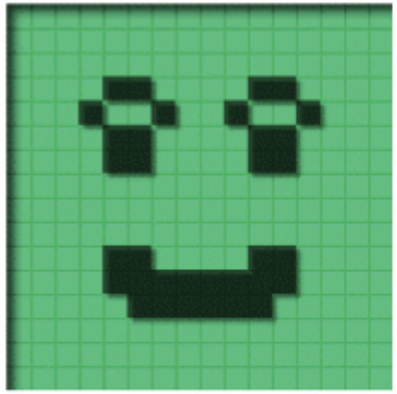
Readability of Emotions

Basic Emotions

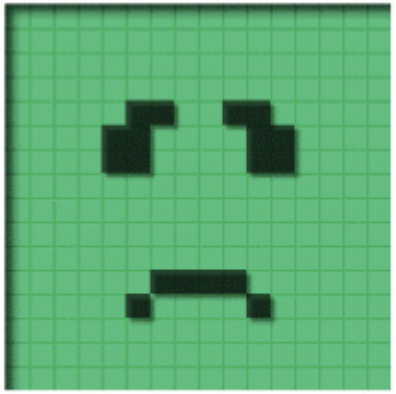


Readability of Emotions

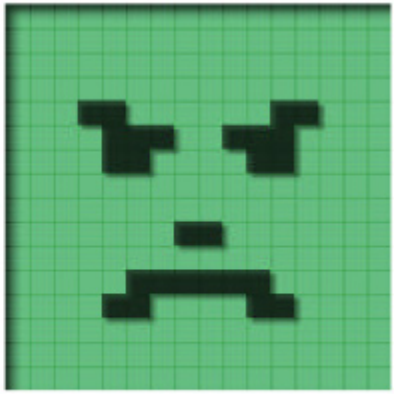
Basic Emotions



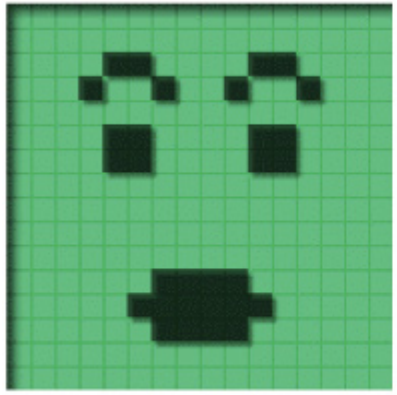
Happiness



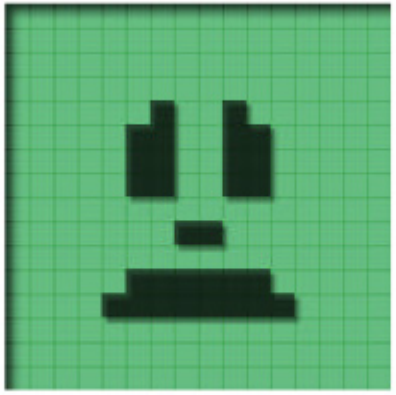
Sadness



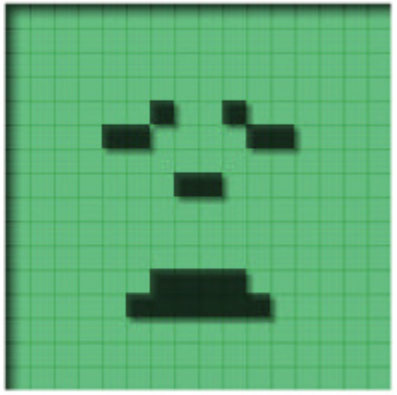
Anger



Surprise



Fear



Disgust

Natural Cues - The Face: Gaze

→ When watching a person´s face, people are also paying attention to gaze.

Where the other looks and whether and for how long they make eye-contact, provide important information. Timing and direction of gaze can indicate

→
(a) dominance or submissiveness
(b) where a person´s attention is at the moment
(c) flirtation
(d) interest in beginning a conversation - or desire to avoid one
(e) an invitation for one´s conversation partner to take a turn in the dialogue
(f) active listening
(g) pondering of a point

Natural Cues - The Face: Empathy and Emotional Feedback

→ Mirroring the expression on another´s face with your own helps establish connection and demonstrates empathy.

For example, listening to a funny story, you may put on a happy expression at the moment when the teller describes a happy surprise, showing that you are emotionally on board for the tale.

Natural Cues - The Face: Empathy and Emotional Feedback

→ Emotional facial expressions are shown as a sign of empathy in the form of mimicry (1). Motor mimicry has been interpreted as revealing relationship information and that such nonverbal and analogical communication serve to define and reinforce the relationship. It is thus an analogically (or iconically) coded illustrator that is equivalent to the message „I know how you feel“, which probably implies: I can feel as you do; I am like you. (2)

→ This mirroring can have an impact on your own emotions (facial feedback hypothesis). Participants who had a smile on their face rated cartoons funnier.

(1) J. B. Bavelas et al., I show how you feel: Motor Mimikry... (1986)
(2) J. B. Bavelas et al, Motor mimicry as primitive empathy (1987)

→ Expressions on human faces are not simply automatic reflections of internal feelings nor unconscious imitations of others. Expressions are consciously controlled signals that help people connect.

→ It has been found that humans use emotional expressions much more when other people are in the presence.

Bowling Player

Olympic winners

K. Isbister, Better Game Characters by Design - A Psychological Approach (2006)

→ Fridlund pointed out that facial expressions are social tools with which the sender tries to influence the behavior of the receiver. From this perspective, facial expressions are a social tools that convey nonverbal information in a dialog with a user.

→ Fridlund (1) emphazised that facial expressions communicate

(a) action requests (a sad face requests help)
(b) indicate intentions (an angry face indicates the intention to attack)
(c) statements (a surprised face indicates unexpectedness) and
(d) declarations (a neutral face declares that one has not a special attitude)

(1) A. Fridlund, Human Facial Expression (1994)

Natural Cues - The Body

→ Body cues have a pervasive influence on social relationships and they are an important part of crafting engaging characters that feel lifelike and that evoke social reactions.

→ Interpersonal Touch and Distance

(a) Public distance (more than 12 feet)
It´s easy to see everybody´s full body. People will slightliy exxagerate their expressions and movements so that they are easy to interpret.

(b) Social distance (standing 4-12 feet apart)
The closer people stand the better thy probably know one another

(c) Personal distance (18 inches to 4 feet apart)
It´s easy to read facial expressions. This distance is used for private conversation.

(d) Intimate distance (less than 18 inches apart)
This allows people to easily touch and smell each other.

→ Interpersonal Touch and Distance