Lessons from Emotion Psychology for the Design of Likelike Characters

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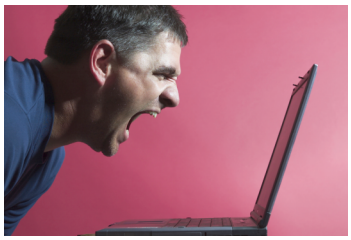
Overview

- Introduction
- Functions of Emotion
- Modeling of Emotion
- The Display of Emotion
- Conclusions
- Questions?

Introduction

- Emotions in Artificial Intelligence
  - Not important?
    - “Disruptive”
    - Diminishes rational thought



Introduction (2)

- Recently this thinking has changed
  - Neuroscience and psychology suggest otherwise
    - Emotions shown useful in effective decision-making, memory, teaching, etc.
    - Suggests emotions can be functionalized
      - Thus, used by an agent
  - Existing life-like conversational agents
    - Psychotherapy applications, tutoring systems, and marketing applications for example
    - People view their interactions as “social,” (even when disruptive)
    - Utilize emotion behaviors

Introduction (3)

- Problems
  - Emotion has different meanings
  - Which is being modeled?
  - What are its functions?
  - How is the impact evaluated?
- Paper provides outline for an emotion system
  - Functions of emotion
  - Modeling of emotion
  - Displaying emotion

Functions of Emotion

- Computer Scientists use “functions”
- Emotions can be functioned, but how?
  - Psychologists break emotion into two categories
    - Cognitive function
      - Mediates mental processes
    - Social function
      - Impacts social interaction
  - Difficult to distinguish (in humans)

Cognitive (Inter-Agent) Function

- Emotions mediate mental processes through cognitive functions:
  - Situation awareness
    - Appraisal theories go beyond “traditional” models of intelligence
  - Action selection
    - Categorized by emotional significance
  - Coping
    - Irrational, yet beneficial (i.e. denial means less stress)
  - Learning
    - Emotion benefits memory and recall

Social (Inter-Agent) Function

- Emotions mediate communication through emotional displays
  - Communication of mental state
    - True emotions not always displayed
    - Can at least make associations
      - Person’s beliefs (i.e. frowning -> disagreement)
      - Desires (i.e. joy -> happy about outcome)
      - Intentions/action tendencies (i.e. fear -> run away)
  - Social manipulators
    - Direct control with an emotional display
      - i.e. anger
    - Indirect control
      - “Emotional contagion” or social mimicry
      - “Pygmalion effect” or influencing by emoting expectations

Social (Inter-Agent) Function (2)

- Believability/Framing effects
  - Emotional agent is more believable
    - Seems more human
    - Easier to interact
    - Greater trust

- Social function important in educational systems
  - Guide students toward more effective learning

Modeling of Emotion

- How do we model emotional functions into a computational system?
- Two approaches:
  - Communication-driven
  - Simulation-based
- Hard to distinguish in humans
- Easy to distinguish in computational systems
  - Usually just one approach

Communication-driven Methods

- Systems are implemented to display emotions
  - Interaction with user
  - Goals of system

- Emotion is not calculated, instead developer encodes into responses

Communication-driven Methods (2)

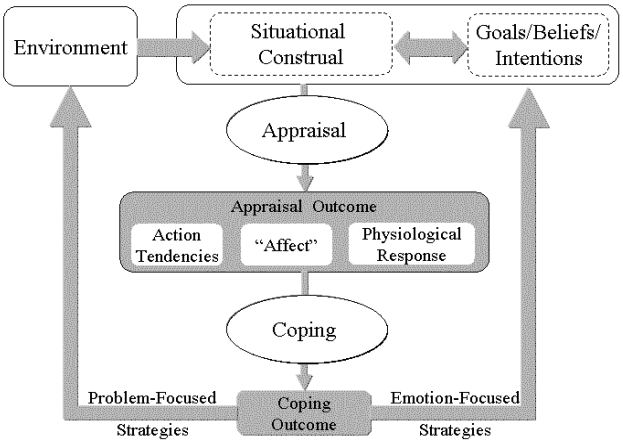
- Ideally, agent should understand user's emotional displays
  - Easier to determine state of interaction
  - Provides feedback on agent's output
- This approach usually used in tutoring applications
  - Express emotions to help motivate students
- Disadvantage: Emotional displays can be inconsistent and insincere

Simulation-based Methods

- Systems attempt to simulate "true" emotion
- Similar to communication-driven approach, yet displays take into account agent's "simulated" emotional state
  - Window into the agent's "soul"?

- Such methods based on appraisal theory
  - In short, events characterized by one's perspective; determines response

Simulation-based Methods (2)



A process view of appraisal theory, adapted from (Smith & Lazarus, 1990)

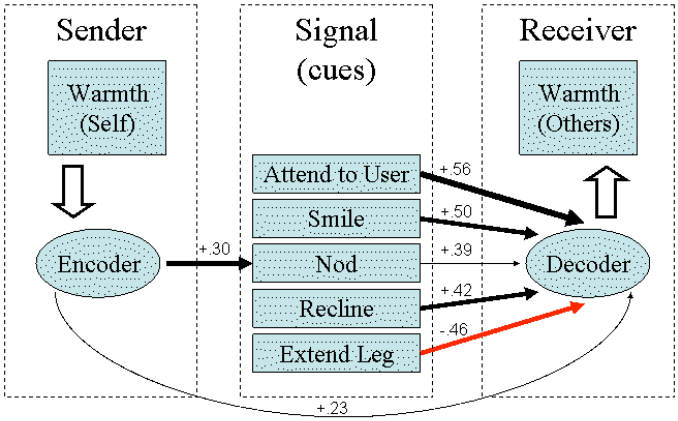
Simulation-based Methods (3)

- Simulation-based methods in educational applications
  - Most appropriate when goal is to teach users to recognize emotions
    - Emotion in others
    - Impact of their own emotions

The Display of Emotion

- Emotion is trying to express some content
  - Instead of just stating the content, it is “encoded” into an emotional display
  - The observer then “decodes” the emotional display to understand the message

The Display of Emotion (2)



An application of Brunswik's lens model to a study of the nonverbal indicators of personality. Adapted from (Gifford, 1994)

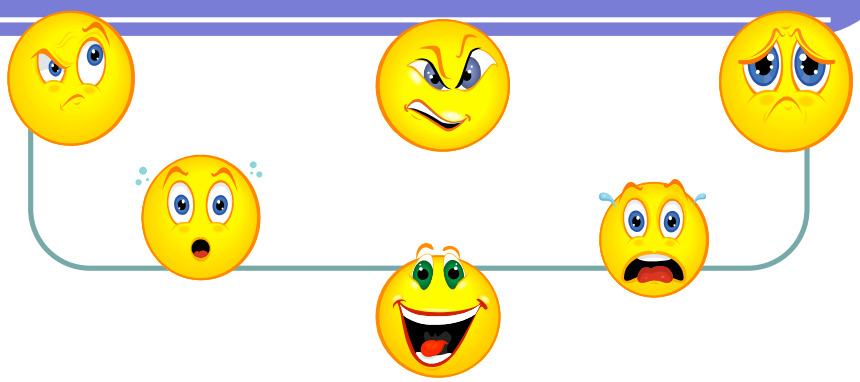
The Display of Emotion (3)

- Accurate encoding
  - Agent needs to be able to accurately encode, especially if teaching to recognize emotions
    - To what extent?
- Accurate decoding
  - Need to ensure the observer will be able to decode, otherwise message will be lost
    - Exaggerated behavior
  - Educational systems
    - Do accurate decoding models produce the same social impact?
      - Will a student feel the same if the agent is angry vs. if a human is angry?
    - What is the impact outside of the application?
      - Does decoding emotions from virtual characters affect how we decode emotions from humans?

Conclusions

- Educational applications can be expressive virtual agents
  - We've only begun to utilize them to their full potential
- This paper illustrates how to organize such an endeavor
  - Application designers know where to start
  - Also, their work will help us better understand the nature of emotion and expressive behavior

Questions?



References

- Gratch, Jonathan & Marsella, Stacy. (2005). Lessons from Emotion Psychology for the Design of Likelike Characters. *Applied Artificial Intelligence*, v19