Lecture 1 - What is emotion?

Jesse Hoey
School of Computer Science
University of Waterloo
jhoey@cs.uwaterloo.ca
cs.uwaterloo.ca/~jhoey/teaching/cs886-affect/
cs886-fall2021.slack.com

September 15, 2021

Readings (optional - my favorite cognitive science):

- Antonio Damasio *Descartes' Error*, 1994.
- David Heise *Expressive Order*, 2007.
- Daniel Kahneman *Thinking, Fast and Slow*, 2011.
- Henrich, J., *The WEIRDest People in the World*, 2010, Farrar, Strauss, Giroux, NY.
- Peter L. Berger and T. Luckmann *The Social Construction of Reality*, 1966
- Edward J. Lawler, S. R. Thye and J. Yoon. *Social Commitments in a Depersonalized World*, 2009.
- George Lakoff and Mark Johnson *Metaphors we Live By*, 1980/2003
- Keith J. Holyaok and Paul Thagard *Mental Leaps*, 1996
- Hugo Mercier and D. Sperber *The Enigma of Reason*, 2017

CS886 marking scheme

- **Summaries**: should be of one lecture, not video or class.
- **thumbs_up**: If I react to your summary with a *:thumbs_up:* then you have the 5 marks.
- **failsafe**: If you don't get all 6 done on the 9 lectures, you can write a summary of a student presentation (on top of your more complete write-up of a talk)
- **Participation**: if I know your name at the end of the class, you get the marks!
- **Project**: these marks will be given by me based on the merit of the paper submitted.
- **Talk**: marks given based on the presentation (I will give details about this later)
- **Assignments**: 1-2 will be worth 10% in total
- **Write-up of another talk**: these marks will also be given individually and should be approximately 1-2 pages in length, 12pt font.

What is Emotion?

Study of AI

Understand principles and build devices that embody them

Can machines fly?

Can machines think?

Goals of Artificial Intelligence Research

- Scientific: Understand the Principles that make intelligent behaviour possible in natural or artificial systems
  - **analysis** of natural and artificial agents
  - **testing hypotheses** about the construction of intelligent agents
  - **building and experimenting with** intelligent agents
- Engineering: Design and build useful intelligent artifacts

Alan Turing and the Turing Test

Alan Turing: 1912-1954

Can machines think? - the imitation game

The interrogator is connected to one person and one machine via a terminal, therefore can't see her counterparts. Her task is to find out which of the two candidates is the machine, and which is the human only by asking them questions. If the machine can "fool" the interrogator, it is intelligent.

Conversations

ELIZA - (1966 Joseph Weizembaum, Lisp)

ME: Hi

ELIZA: How do you do? What brings you to see me?

ME: I'm thinking of taking a course in artificial intelligence.

ELIZA: Why do you say that?

ME: I'm worried about it

ELIZA: Are you worried often?

ME: when I take AI courses

ELIZA: What happened when you take ai courses?

ME: I usually spend long nights doing assignments

ELIZA: Earlier you said you felt worried?

ME: about AI courses

ELIZA: Maybe your plans have something to do with this.

ME: no

ELIZA: Why not?

ME: because I think you are a computer

ELIZA: Is it because you think I am a computer that you came to me?

Loebner Prize

`https://aisb.org.uk/`

CONFEDERATE: Hello, my name is Sam and I am the human

JUDGE: Hi Sam, tell me which is larger, a TV screen or Belgium.

CONFEDERATE: Belgium is a little bit larger.

JUDGE: Wljso lwjejdo wleje elwjeo wjeol, isn't it?

CONFEDERATE: Is that Polish?

...

JUDGE: Which is further away from this apartment, Queens or the Queen of England?

CONFEDERATE: If the Queen is visiting Manhattan, she is closer.

JUDGE: If the Queen is visiting Manhattan, won't she want to abdicate?

CONFEDERATE: I would.

JUDGE: You would rather not be Queen, then, right?

CONFEDERATE: I'd like to be Queen, but England's damp. How about you?

Loebner Prize

Jabberwacky (Rollo Carpenter) 2005-06

JABBERWACKY: Hello, my name is George and I am the human.

JUDGE: If lsjkel lwehlx wouldn't you say?

JABBERWACKY: No, he's still good.

...

JUDGE: Which is further away from us, Queens or Inner Mongolia?

JABBERWACKY: HA! HA! That was stupid. Tell me a GOOD joke this time.

...

JUDGE: Which is larger, your brain or Belgium?

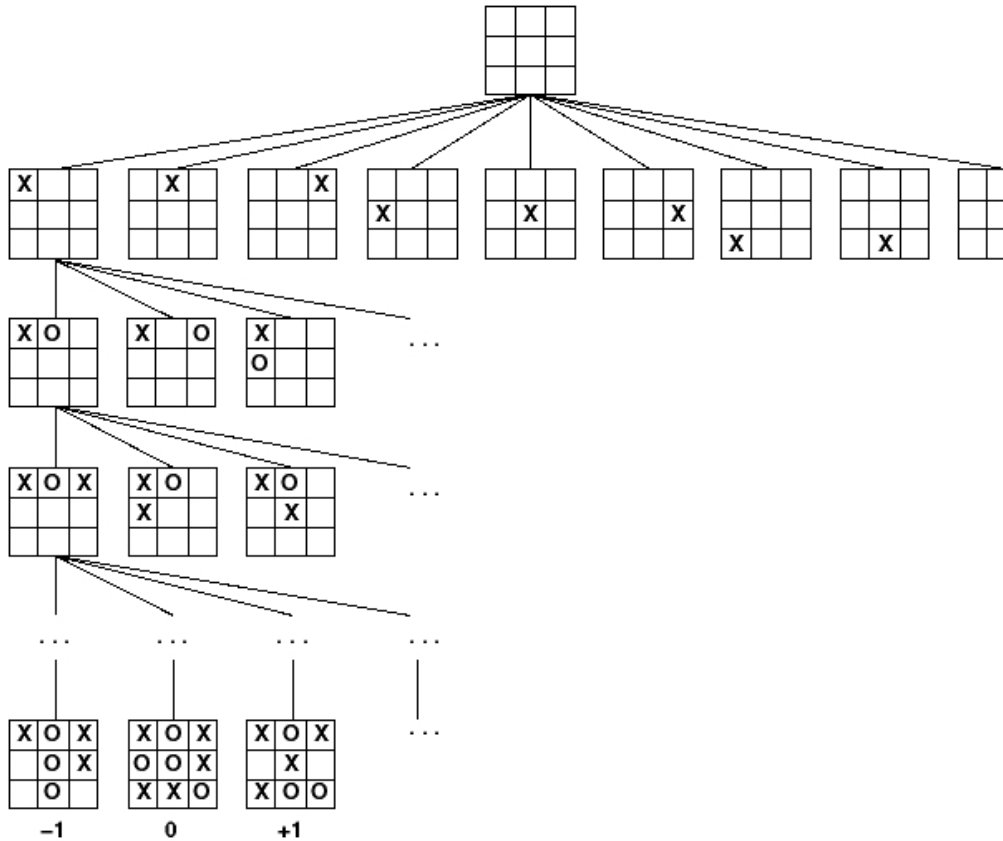
JABBERWACKY: Oh the one on the far left without a doubt.

- Jabberwacky just spits back nonsense-like things and makes jokes
- it fooled more judges two years in a row ('05 and '06)
- with very little resource
- how?

Game Playing and AI

- Much of AI considers two person, zero-sum games (competitive)
- like tic-tac-toe $\longrightarrow$
- construct a game tree and search
- each node can do computation
- assume zero-sum (the opponent will do the worst possible thing for you)
- but what about emotion?

Game tree:



Homo Economicus and the Prisoner's Dilemma

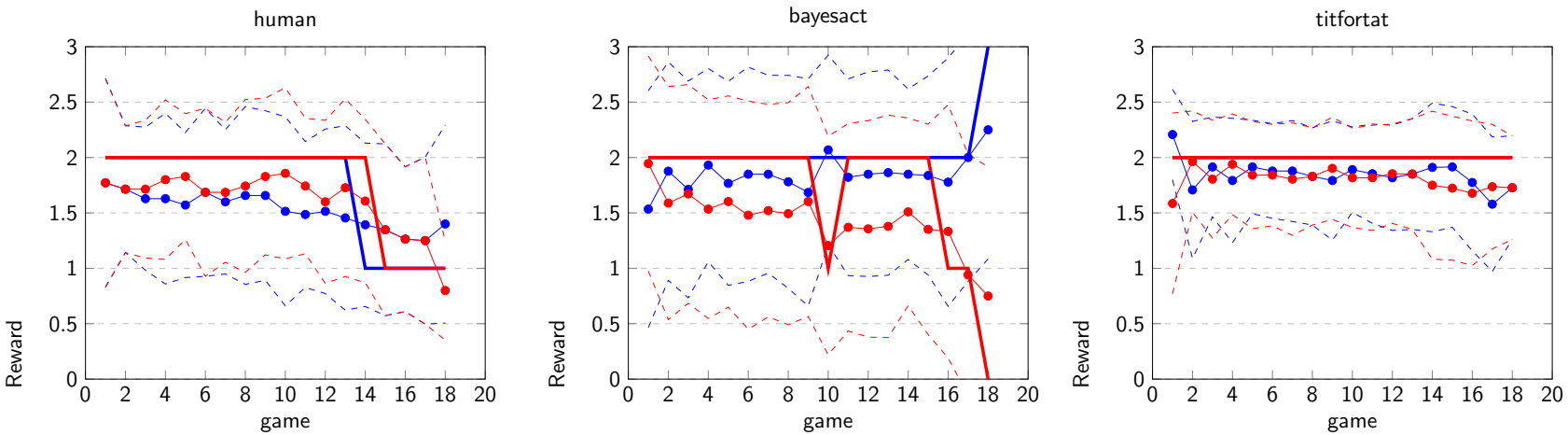
	C	D
C	2,2	0,3
D	3,0	1,1

- in a social dilemma,
- "opponent" modeling is required
- may not assume zero-sum
- emotional signaling is important
- tit-for-tat wins (start C, repeat opponent's last move)

BayesACT

Tit-for-Tat is unbeatable in the repeated (infinitely) game
but humans don't play tit-for-tat with each other
Cooperation Rates (last 10 games):

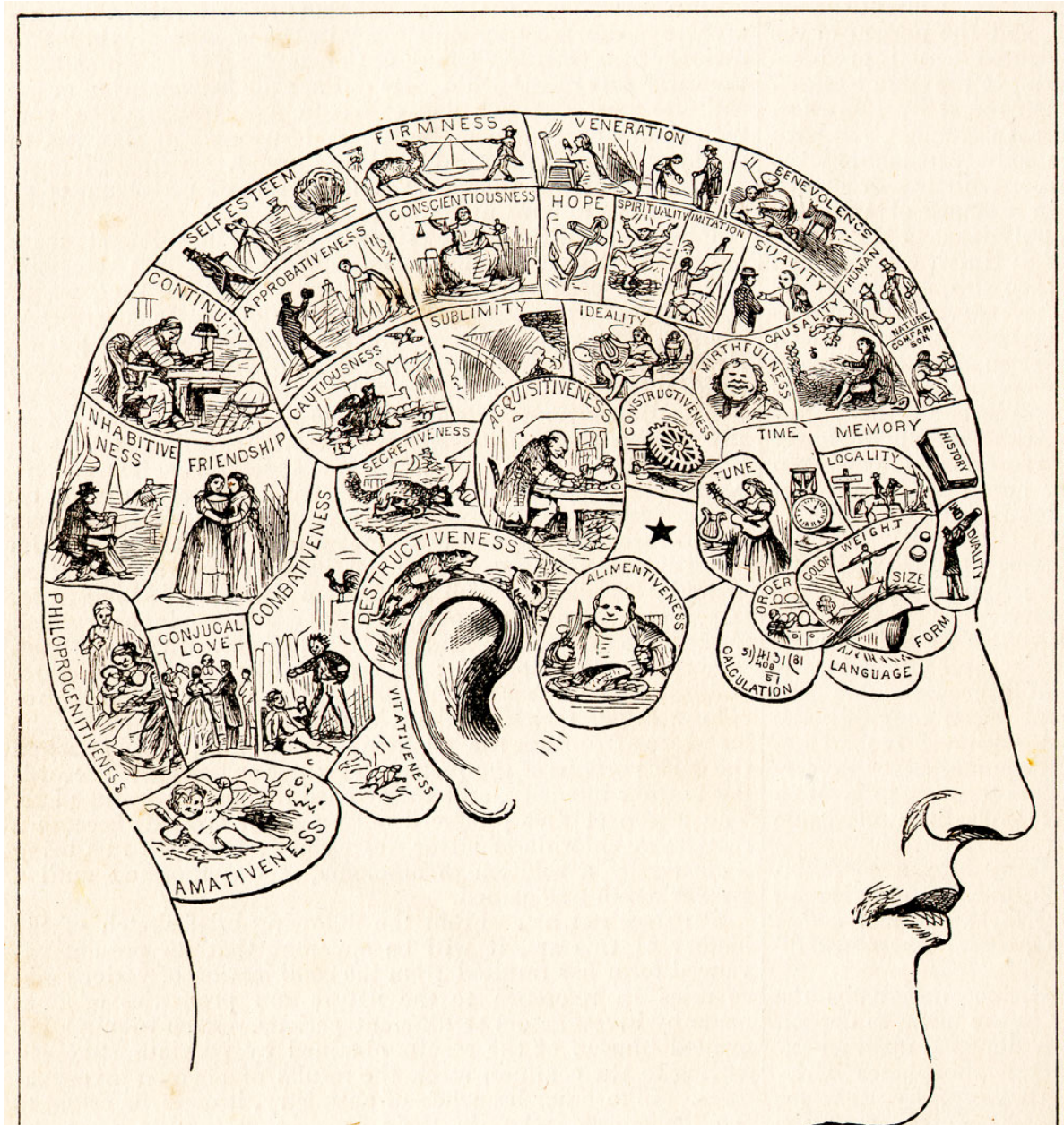
- Rational vs. Rational: 0.0
- Tit-for-Tat vs. Tit-for-Tat: 1.0
- Human vs. Human: 0.56 ± 0.45
- Human vs. BayesACT: 0.54 ± 0.40
- Human vs. Tit-for-Tat: 0.81 ± 0.35



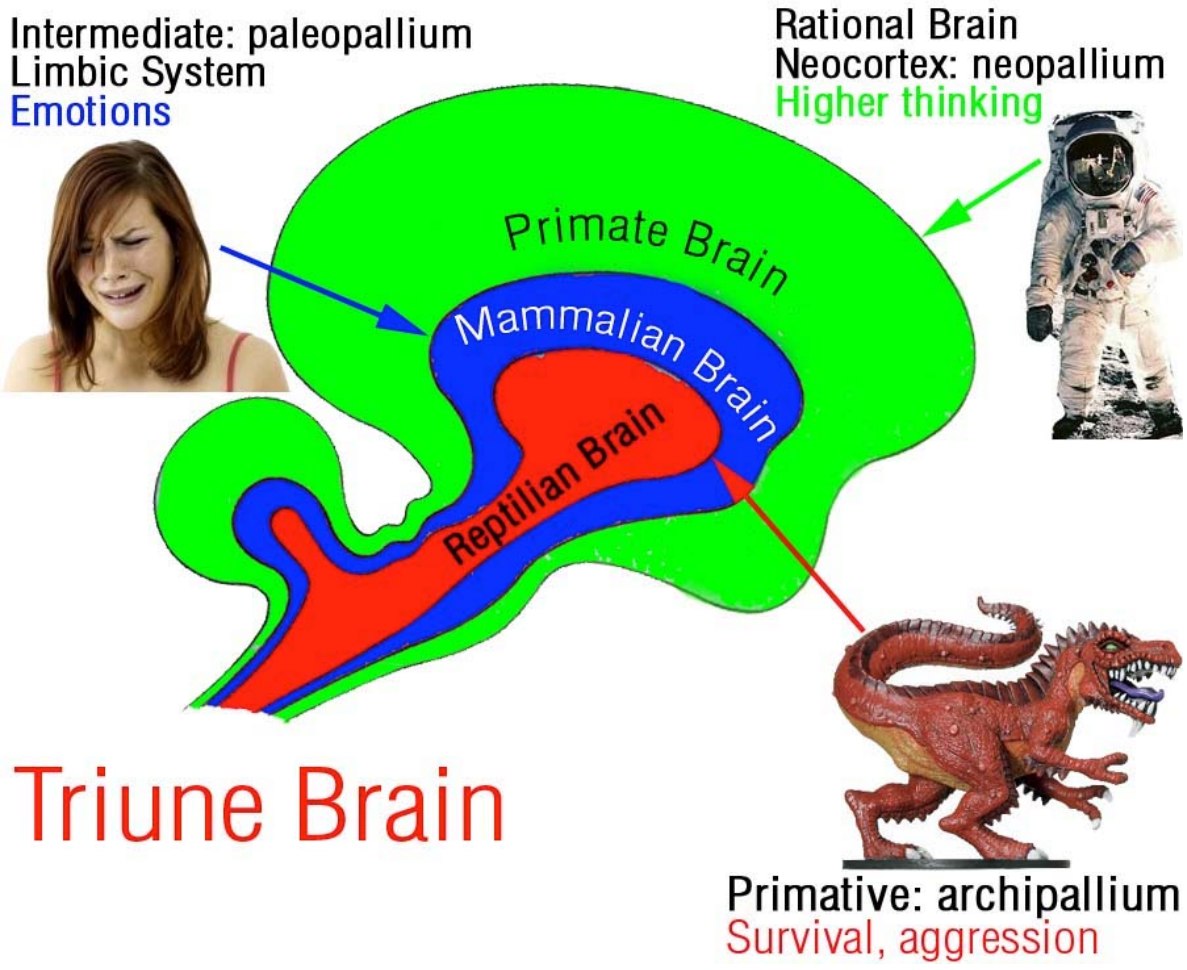
Blue=human; Red=agent (human, bayesact, titfortat);
dashed=std.dev.; solid (markers): mean; solid (thick): median.

Phrenology 1880s

Where is emotion?



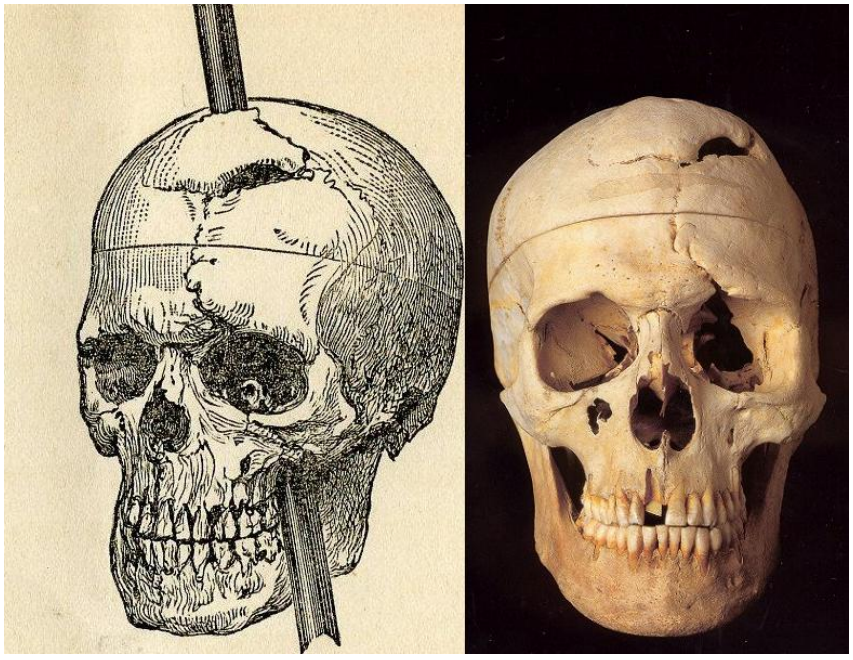
Limbic/Cortical Systems



- Paul MacLean's *Triune Brain* 1960s
- limbic $\approx$ hypothalamus, hippocampus, amygdala
- but these "systems" are really very mixed up in the brain

Phineas Gage

Antonio Damasio *Descartes' Error* Chapter 1



- Suffered brain damage (frontal lobe)
- Was perfectly good at reasoning and language
- Made disastrous decisions, or could not make decisions
- lacked "somatic markers" - "gut feelings" about decisions

Emotions as Somatic Markers

- Animals are faced with a vast space of possible decisions
- Resources are bounded
- Time is limited
- Must somehow only evaluate the "good" actions
- Somatic markers indicate which ones these are.
- Like an "oracle", but a learned oracle (somehow)

Neurophysiologically...

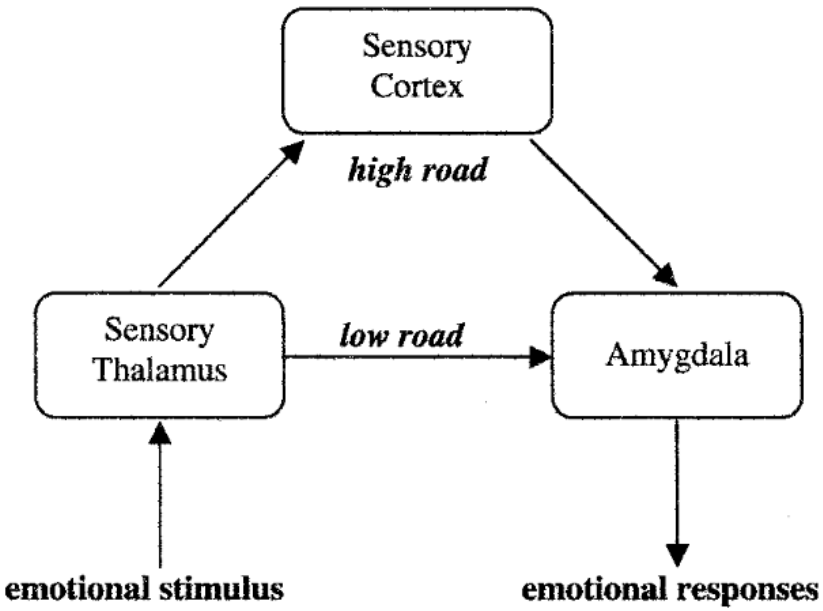


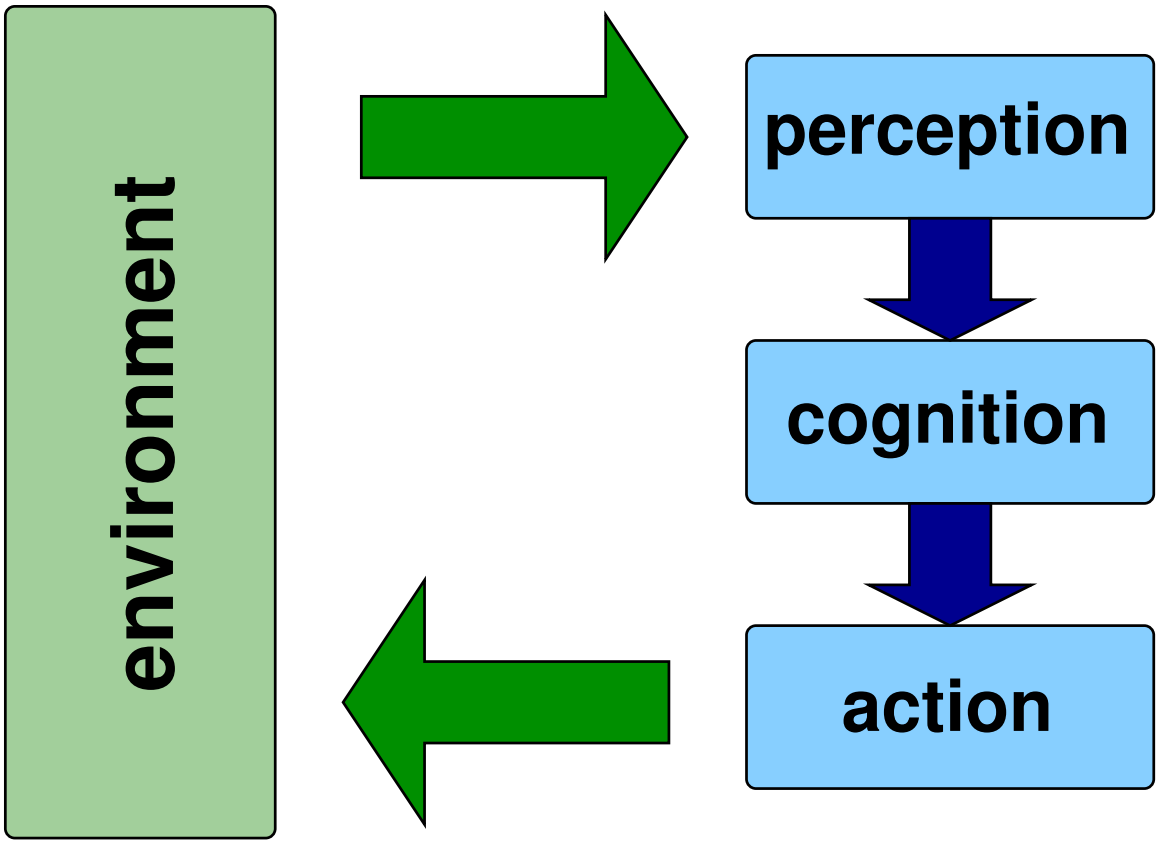
FIG. 3. Two separate pathways from sensory stimulus to emotional responses (adapted from LeDoux 1996, p. 164).

Zhu & Thagard "Emotion and Action". Philosophical Psychology Vol 15 No 1, 2002.

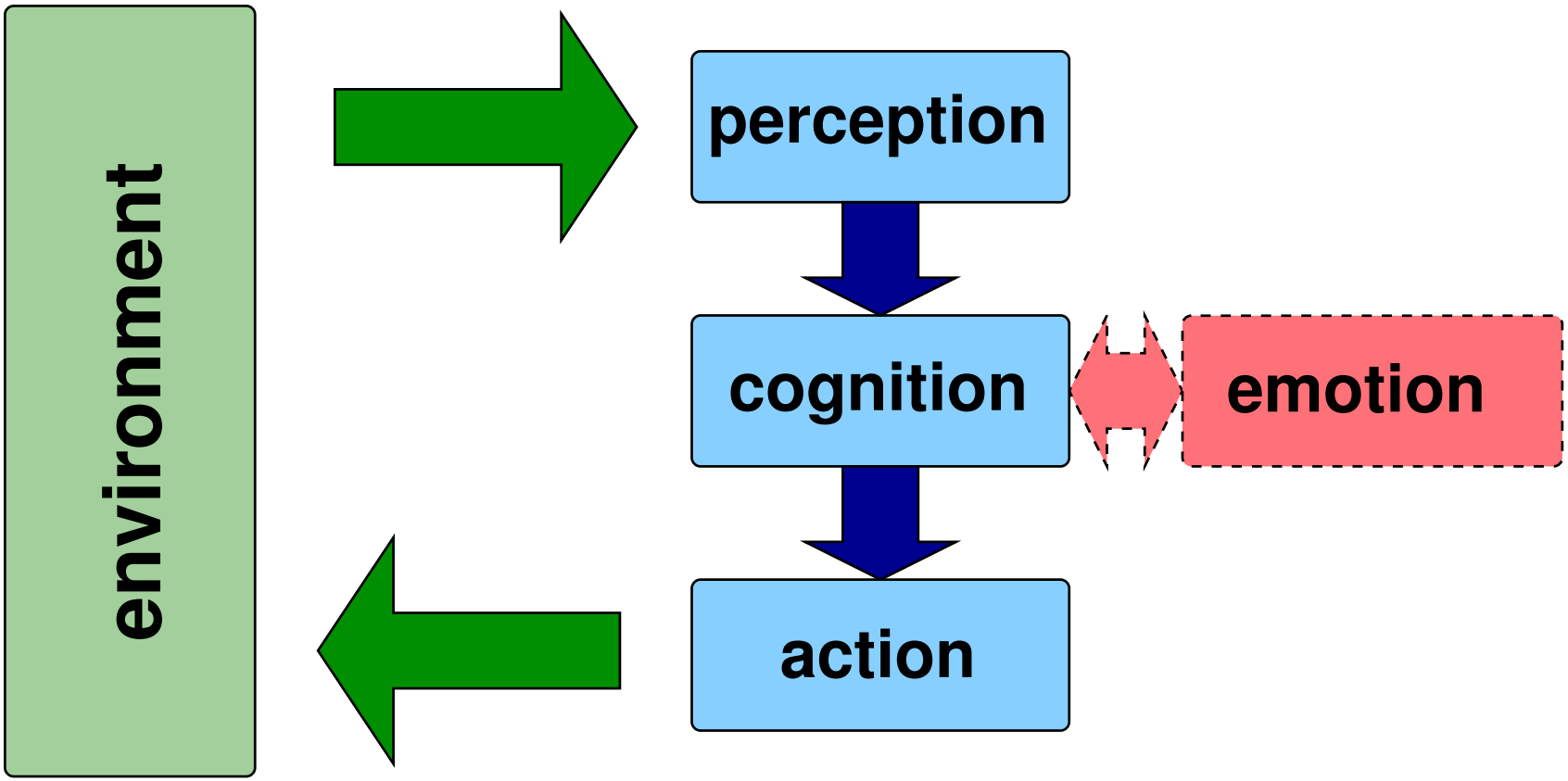
The same idea ...

Who	When	Affective	Cognitive
William James	1890	associative reasoning	true reasoning
Heidegger	1927	ready-to-hand	present-at-hand
Dreyfus/Ryle	1950	knowing-how	knowing-that
Gene Rodenberry	1966	Captain Kirk	Spock
George Lucas	1977	Han Solo	C3P0
Joseph LeDoux	1998	Low Road	High Road
Stanovich/West	2000	System I	System II
(Kahneman)	2011		
Jonathan Haidt	2001	intuitive	reasoning
Paul Thagard	2006	hot thought	cold thought

Traditional AI:

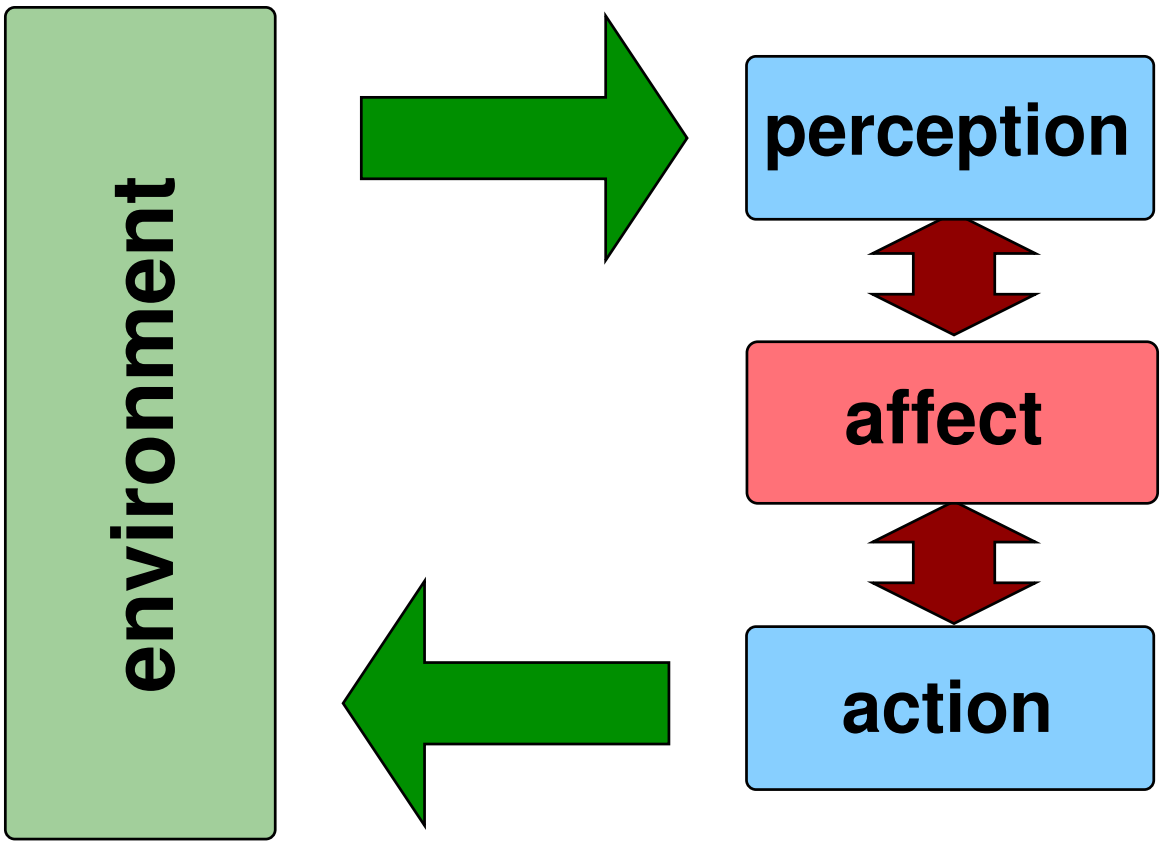


Traditional AI:

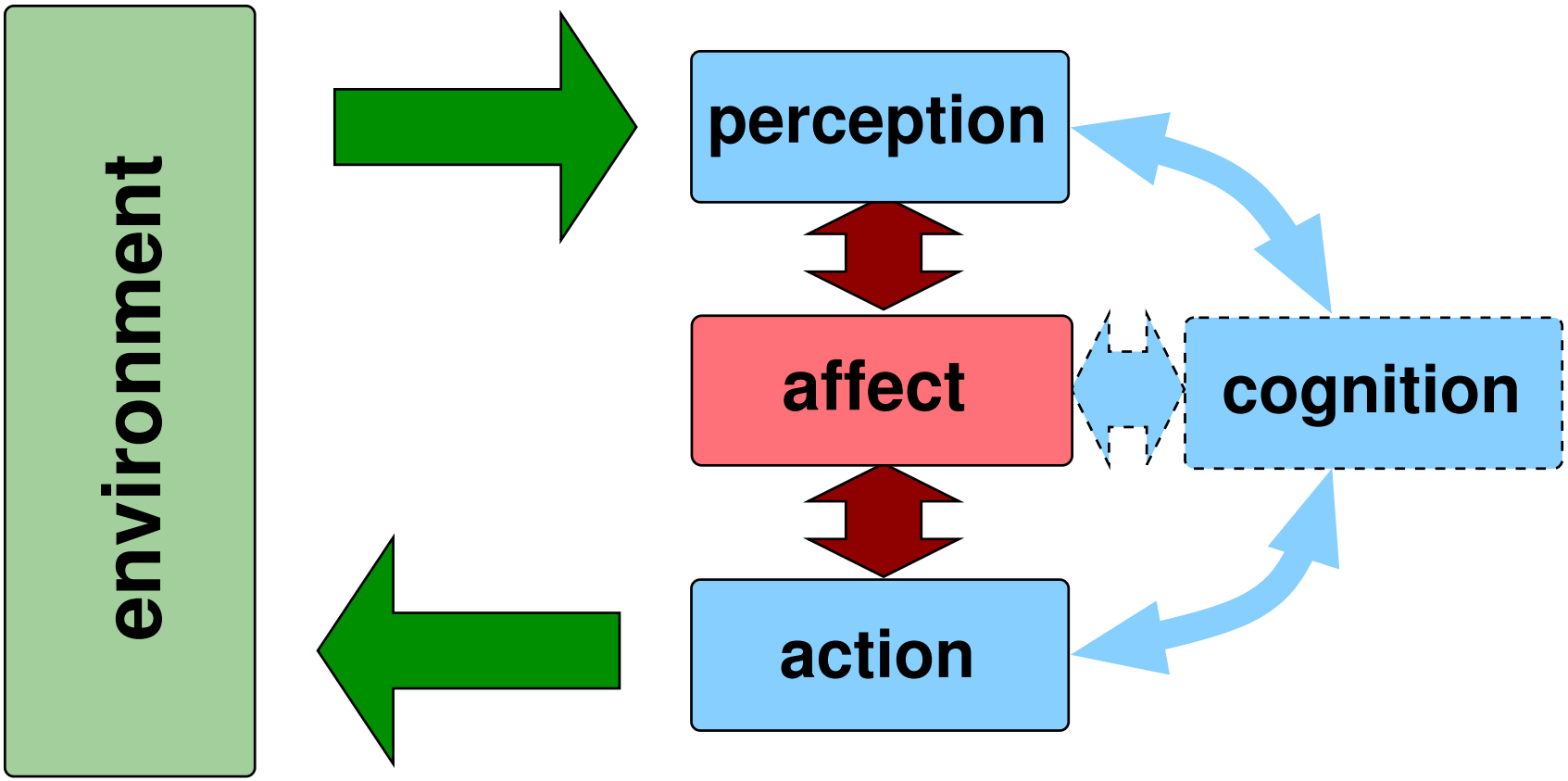


Rosalind Picard *Affective Computing*, MIT Press, 1997.

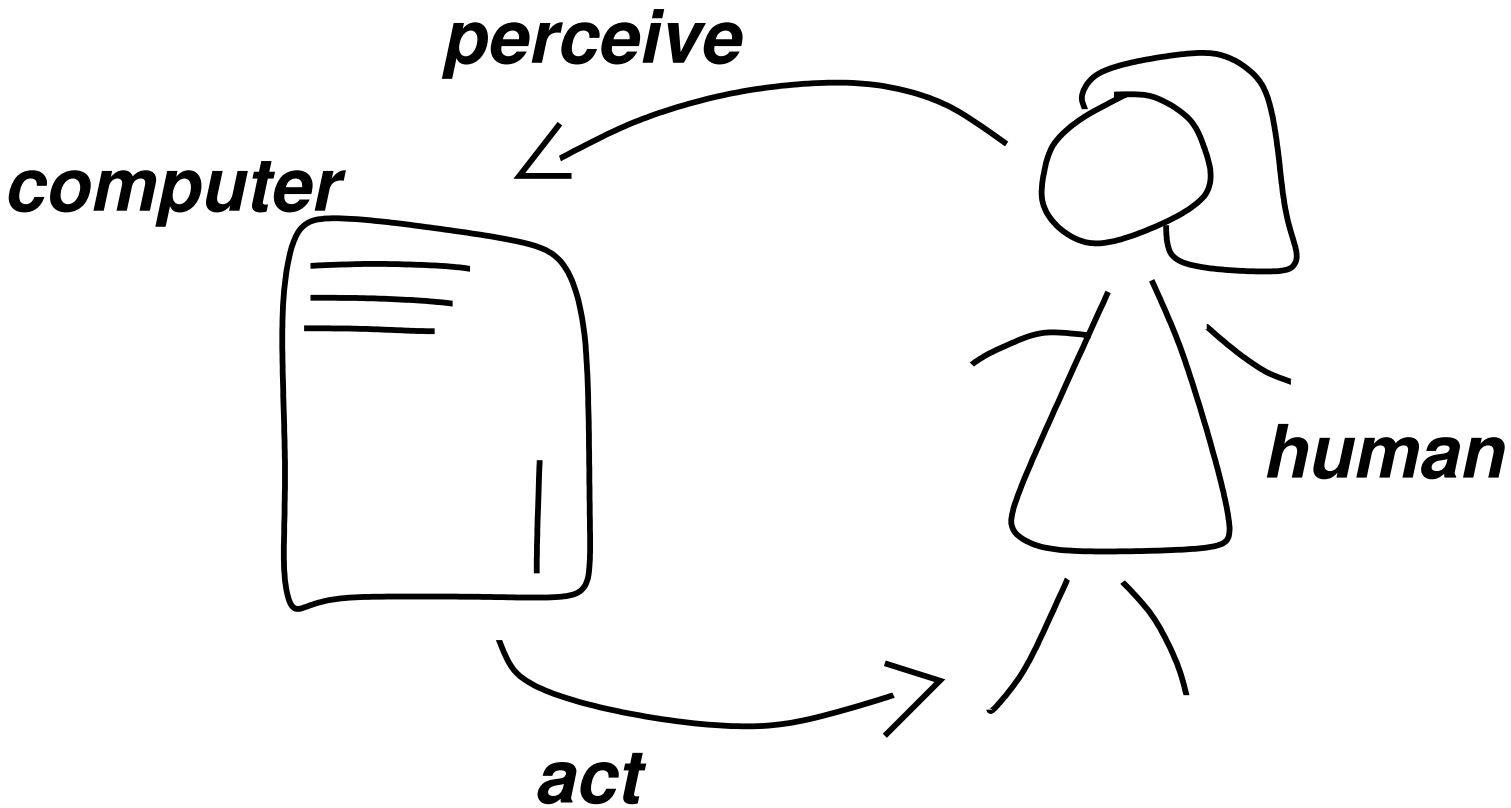
Socio-Cultural (Two-System) views



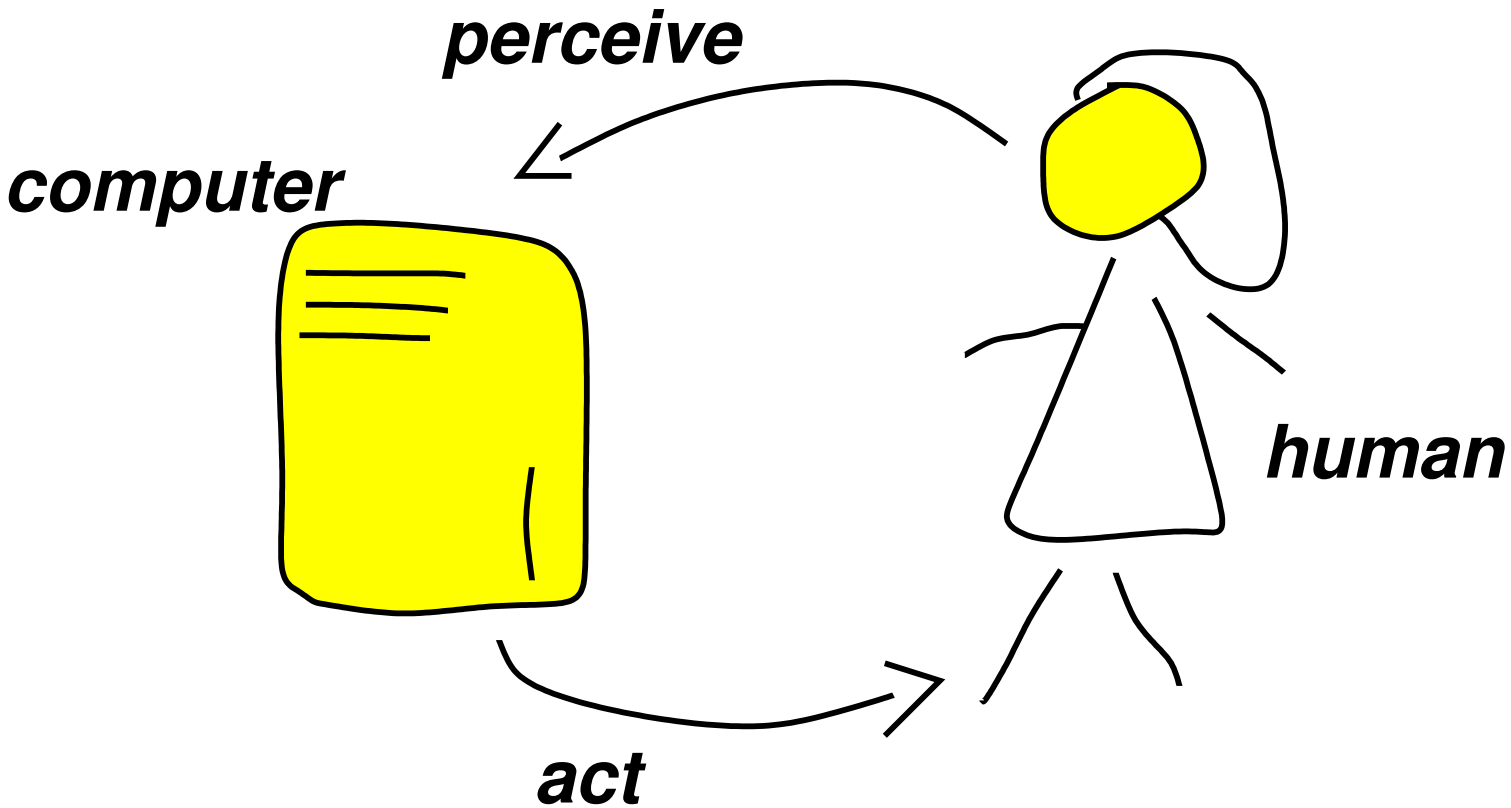
Socio-Cultural (Two-System) views



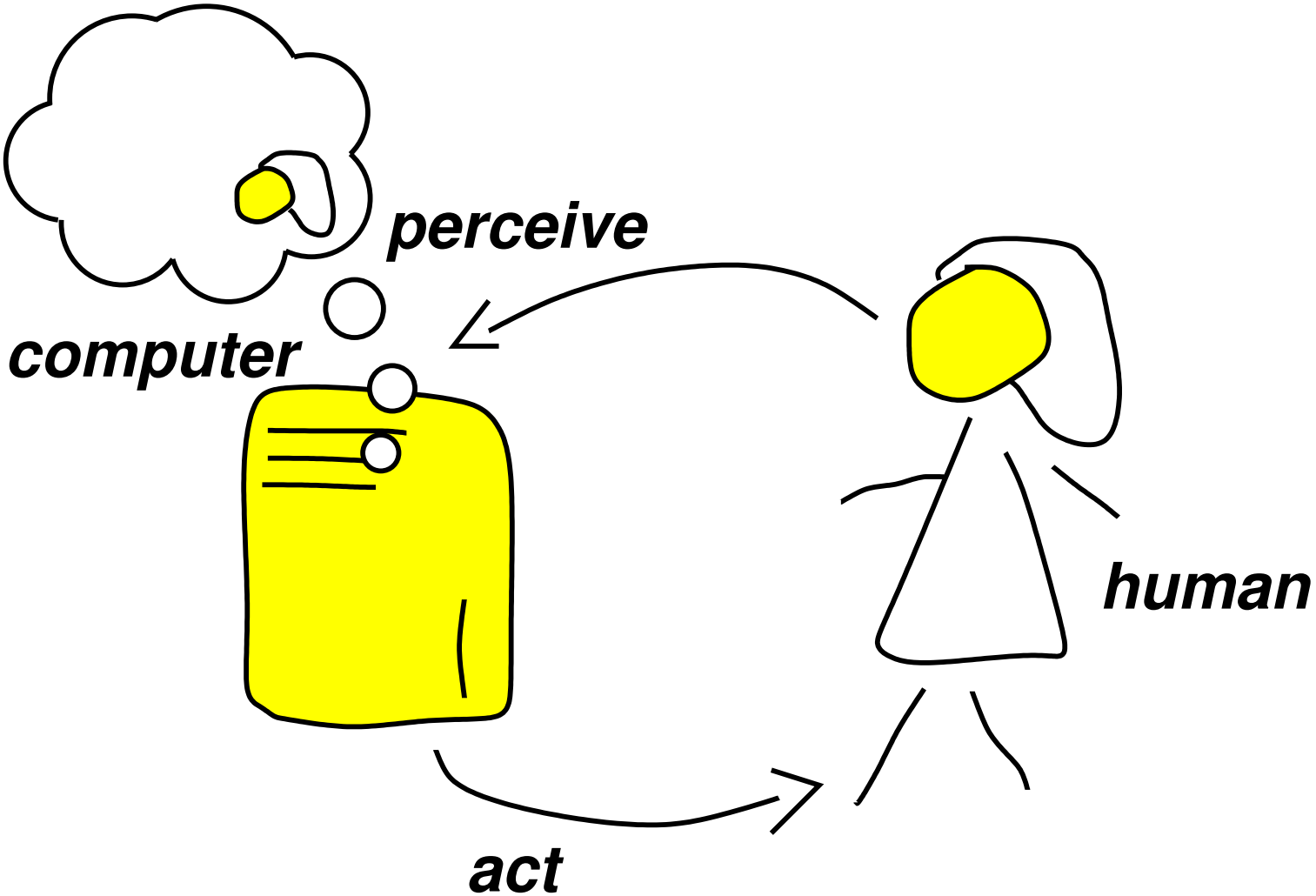
AI: Individualistic/Rational



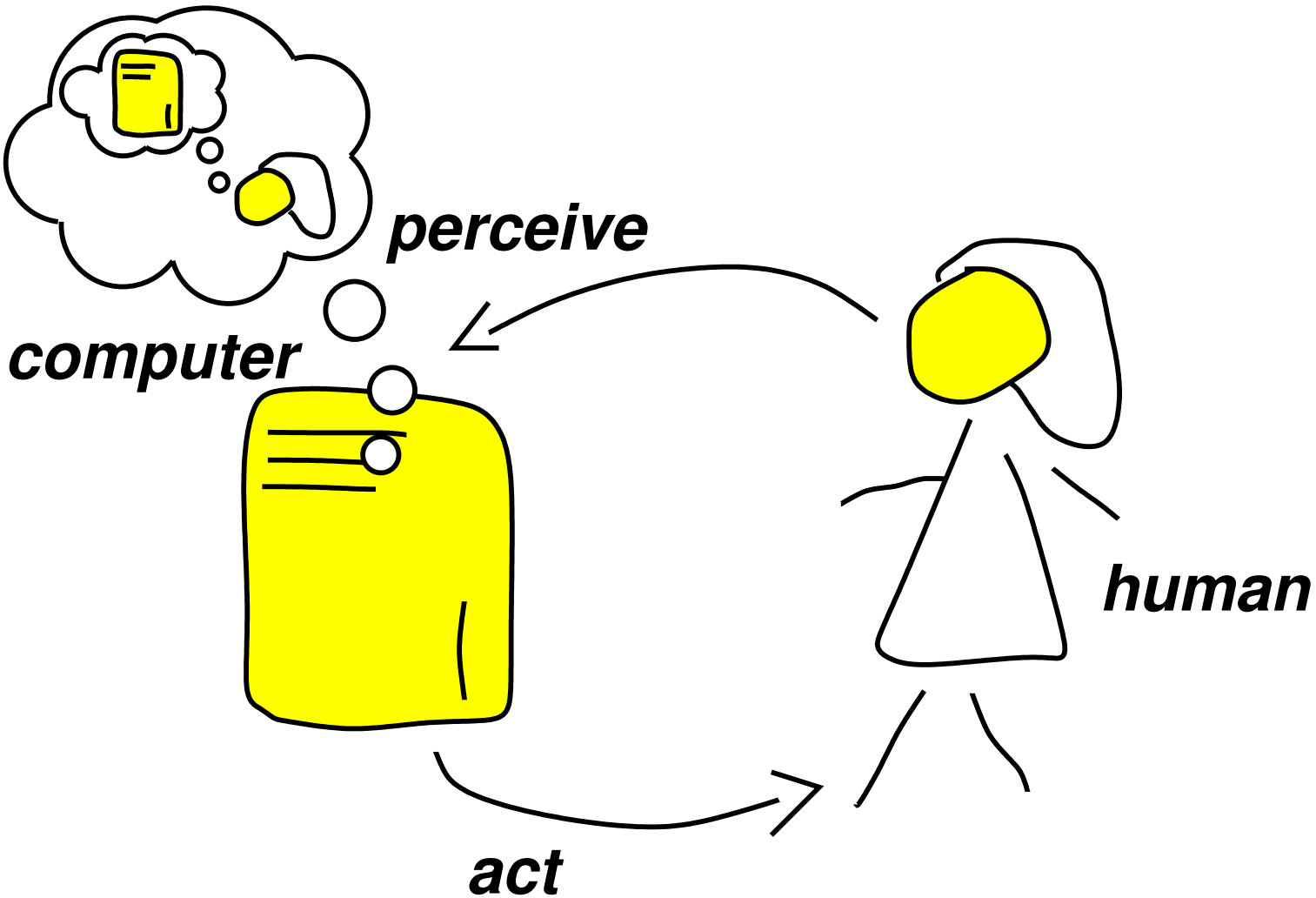
AI: Individualistic/Rational



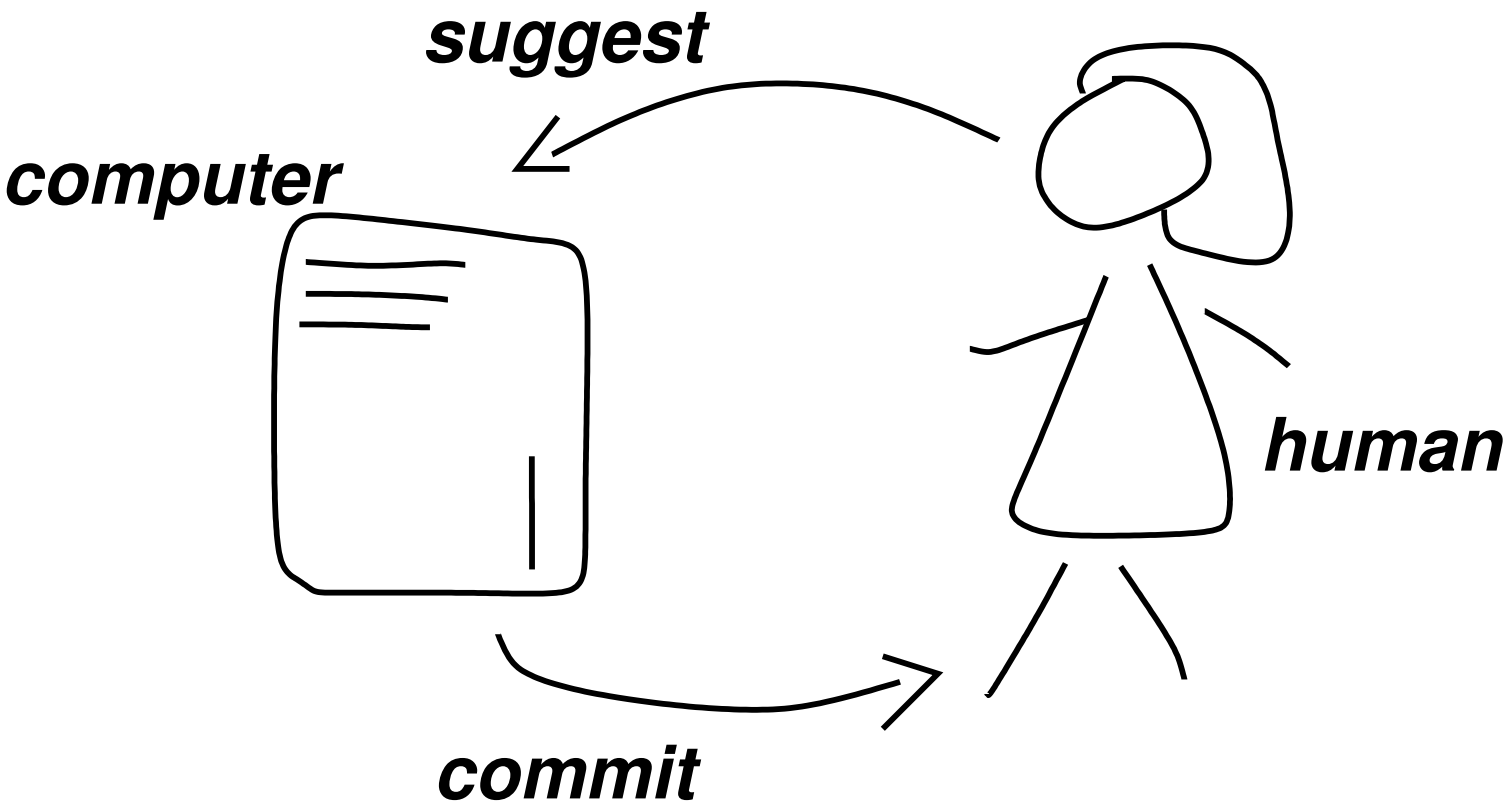
AI: Individualistic/Rational



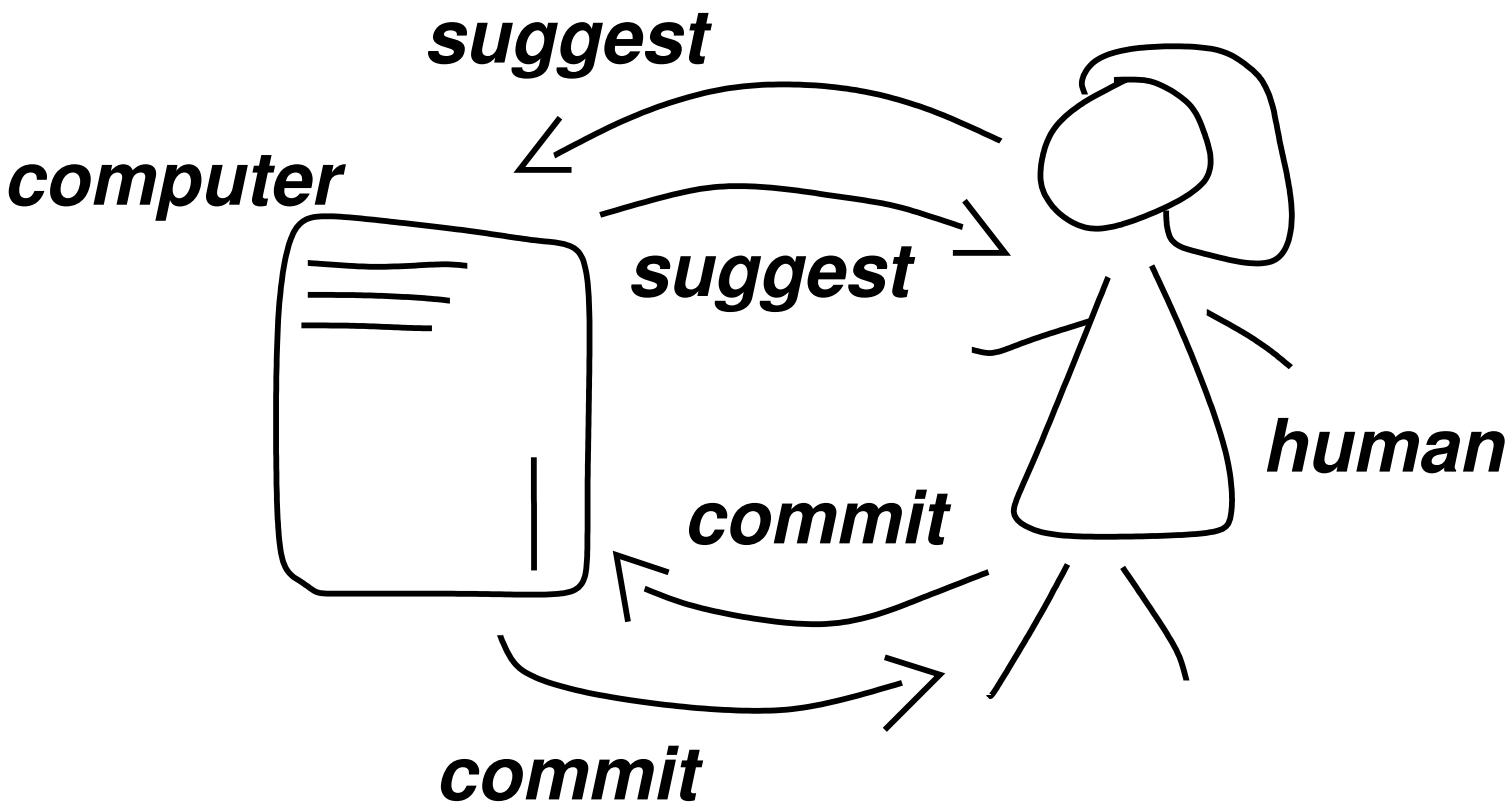
AI: Individualistic/Rational



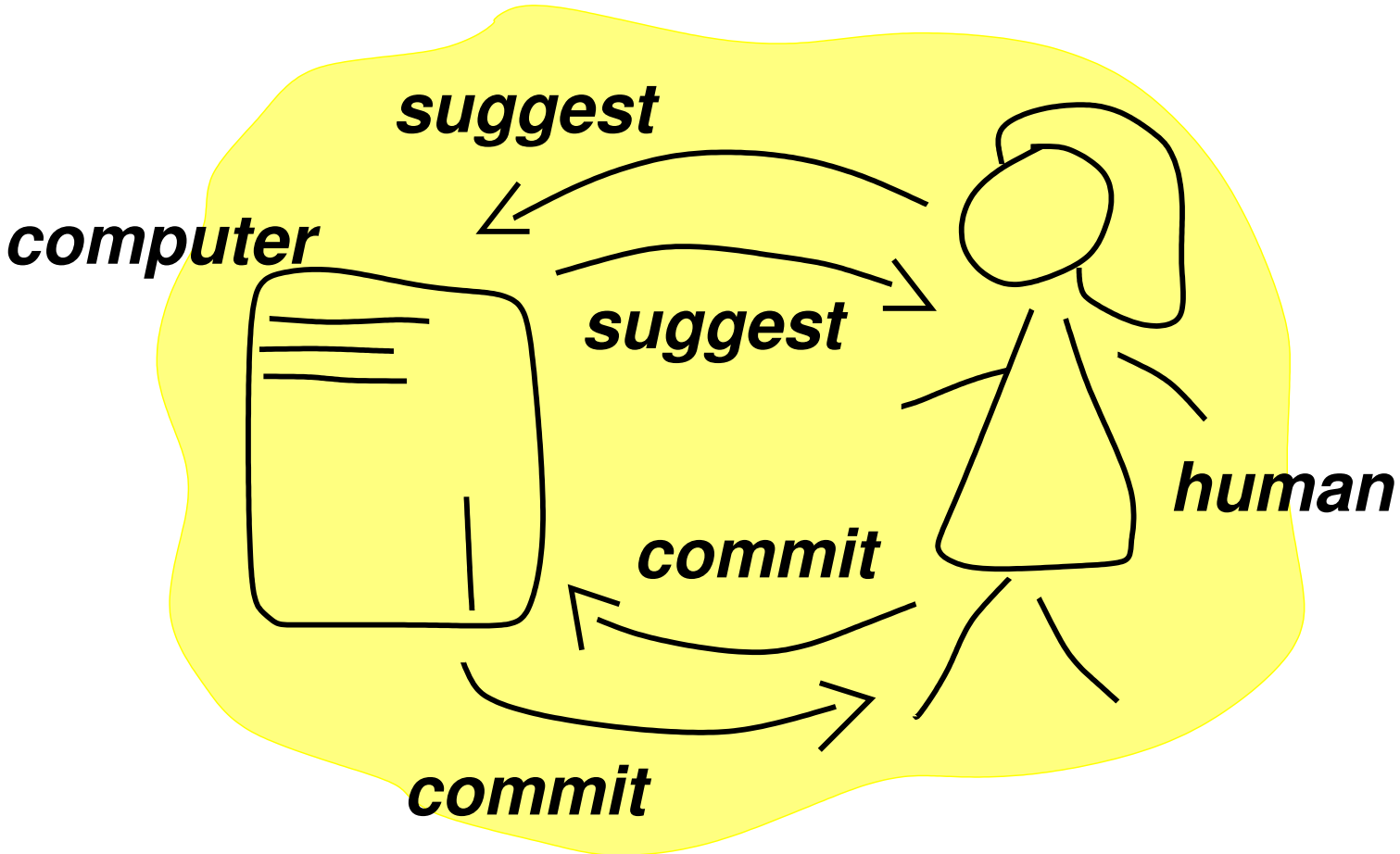
AI: Collective/Phenomenological



AI: Collective/Phenomenological

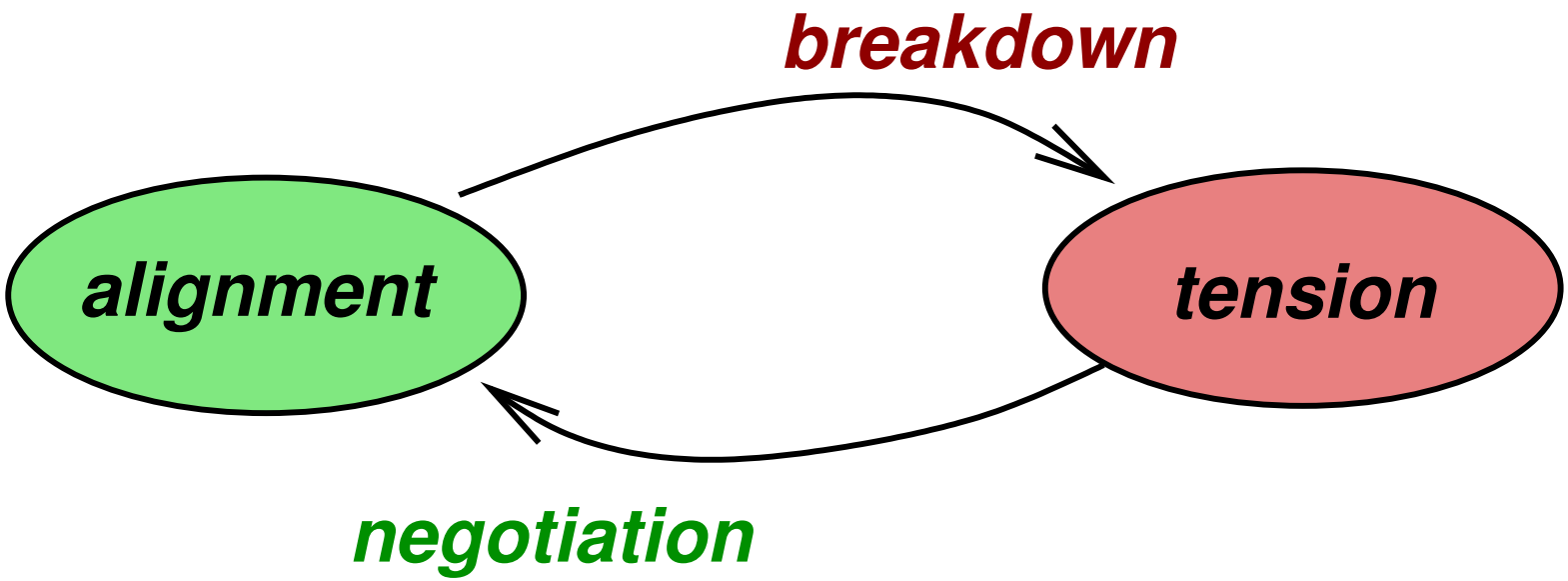


AI: Collective/Phenomenological

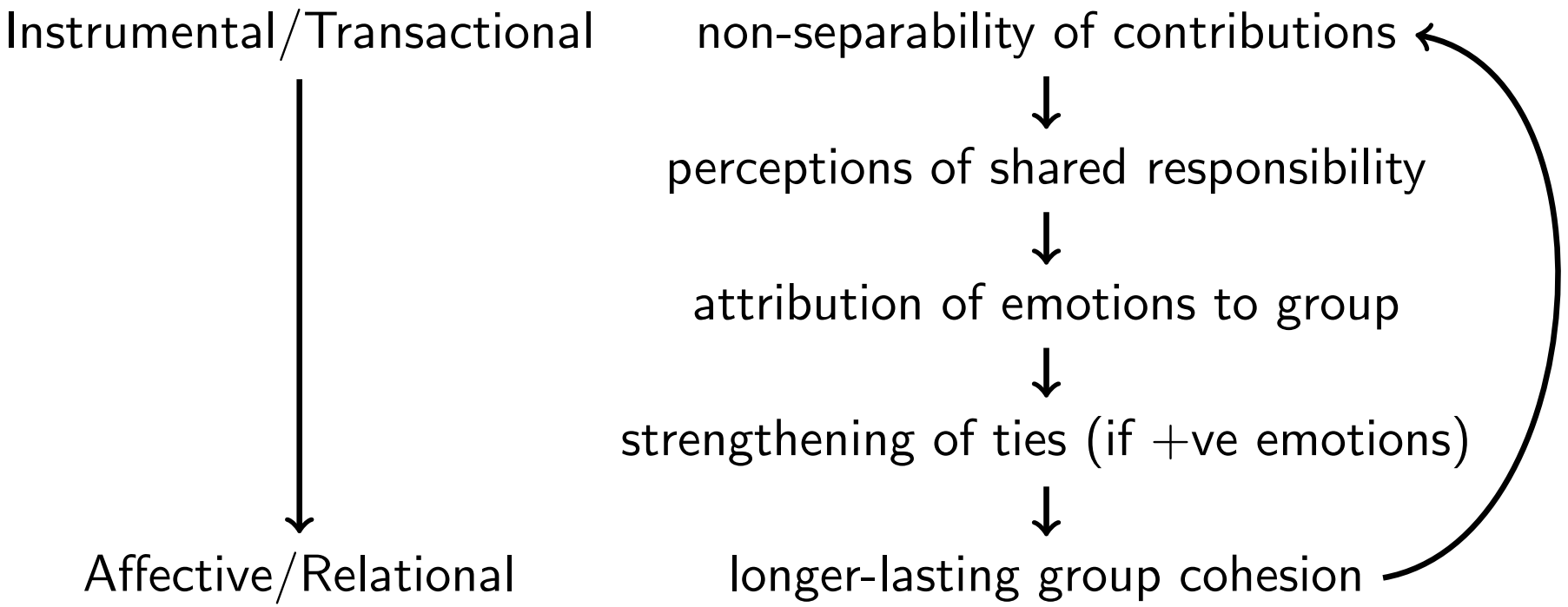


Breakdown and Negotiation

- Collective Intelligence
- Implies a shared knowledge
- Heuristics that solve social dilemmas
- Relational from Transactional
- Emotionally based



Theory of Social Commitments

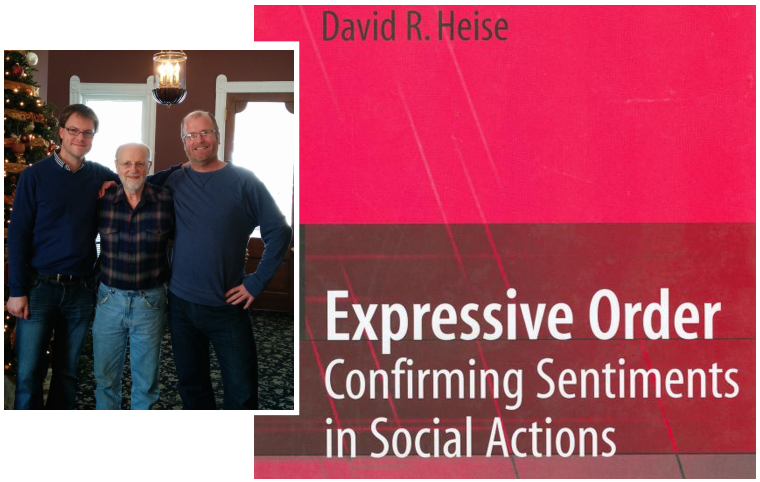


From: Edward J. Lawler, Shane R. Thye and Jeongkoo Yoon. *Social Commitments in a Depersonalized World*.

Russel Sage Foundation, 2009.

Affect Control Theory

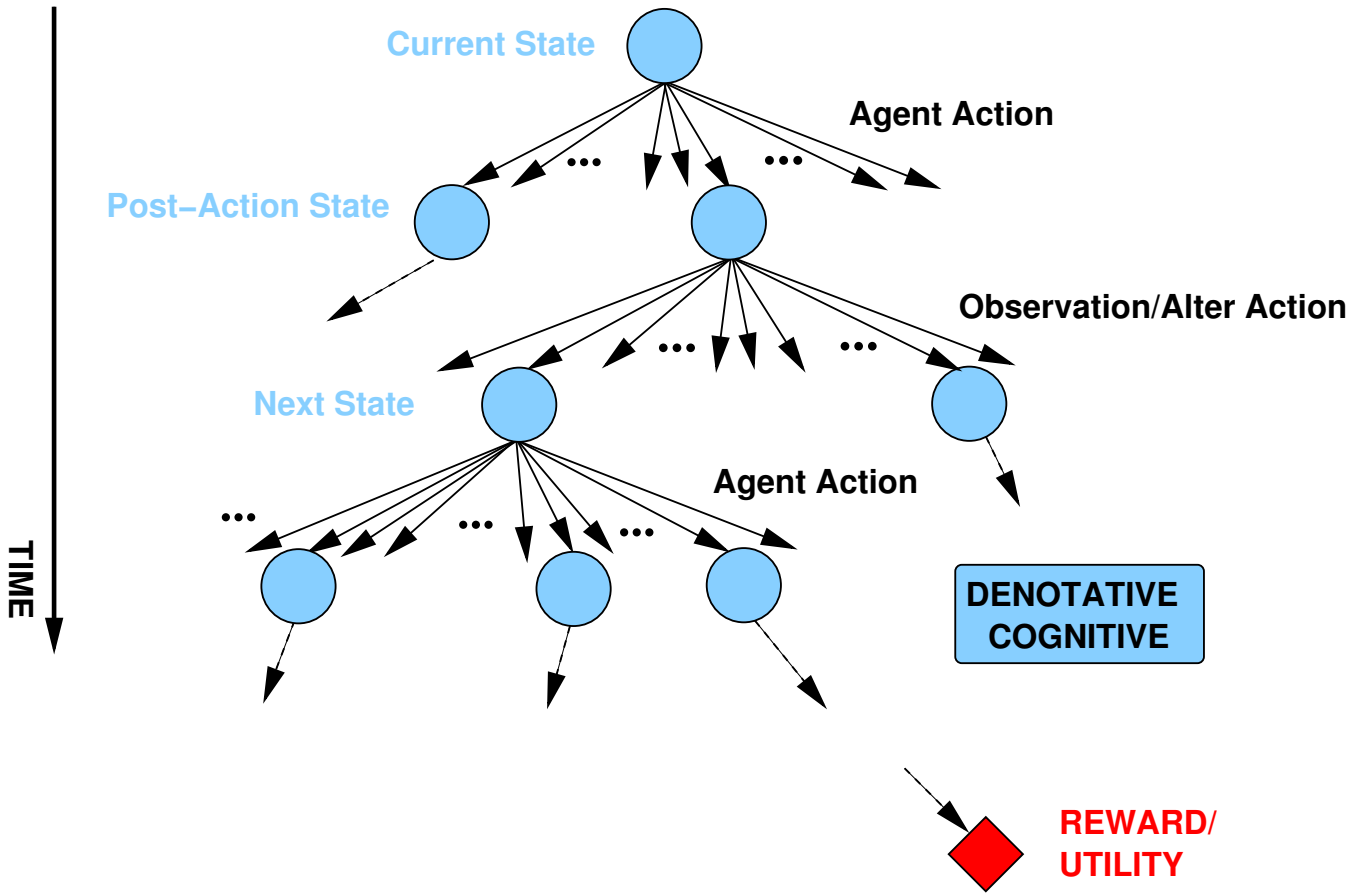
-David Heise. *Expressive Order: Confirming Sentiments in Social Actions*, Springer, 2007.



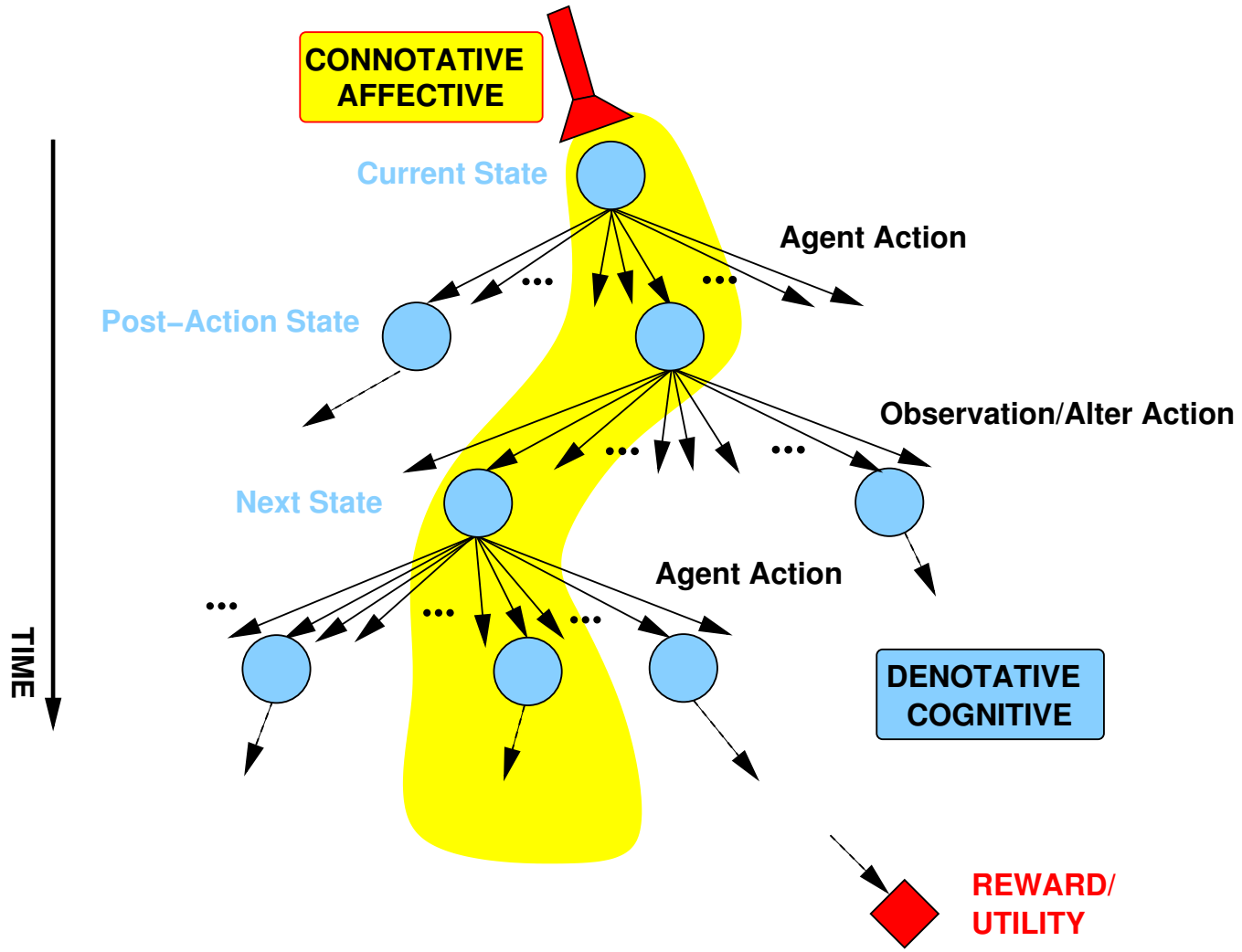
- Jesse Hoey, Tobias Schröder and Areej Alhothali. Affect control processes: Intelligent affective interaction using a partially observable Markov decision process. *Artificial Intelligence*, 230, 2016.

- Tobias Schröder, Kimberly B. Rogers and Jesse Hoey. Modeling Dynamic Identities and Uncertainty in Social Interactions: Bayesian Affect Control Theory. *American Sociological Review*, 81, 4, 2016.

Artificial Intelligence: Decision Theoretic



Artificial Intelligence: Socio-Cultural



next lecture: WEIRDness

- We (some of us) are WEIRD: Western, Educated, Industrialized, Rich and Democratic
- Language is Metaphorical
- Embodiment, society and culture are integral to mind
- Joseph Henrich *et al. The Weirdest People in the World* BEHAVIORAL AND BRAIN SCIENCES (2010) 33, 61–135