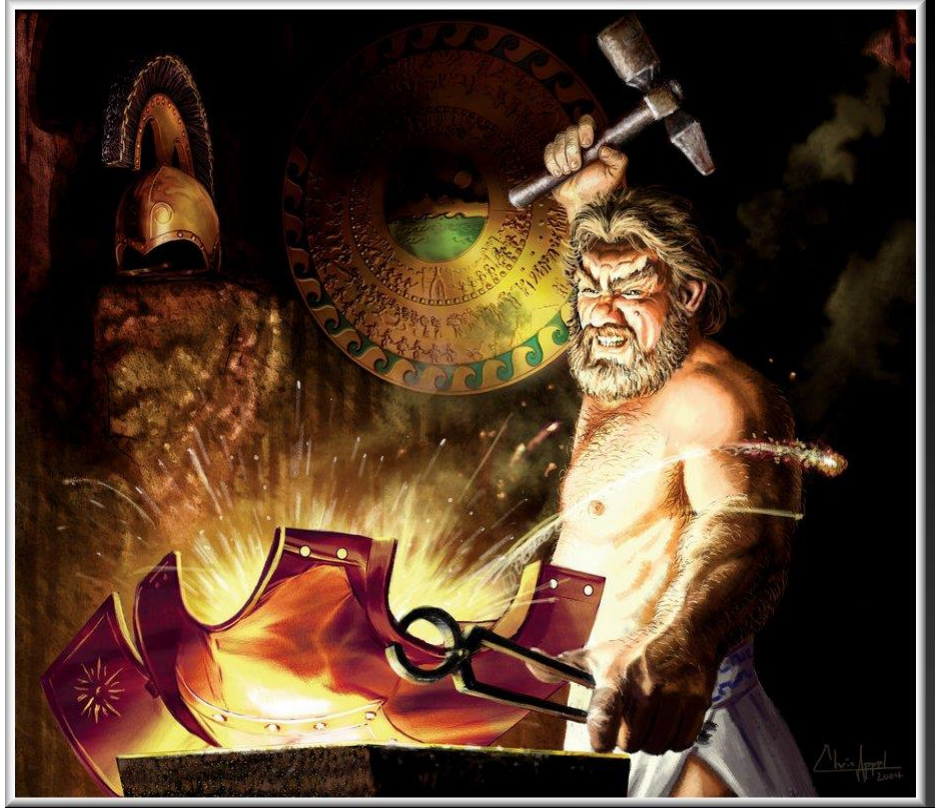
MORAVEC`S PARADOX

BURAK ADAM

CSCI 446

FALL2019

A LONG-CHASED DREAM



ARISTOTLE

START THE

FIRE

Analyzing Logical reasoning

All A`s are B

C is A

Therefore, C is B

This work resulted in the invention of the programmable digital computer in the 1940s, a machine based on the abstract essence of mathematical reasoning

A SHORT HISTORY OF AI

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The Optimism

The first generation of AI researchers made these predictions about their work:

- 1958, H. A. Simon and Allen Newell: "within ten years a digital computer will be the world's chess champion" and "within ten years a digital computer will discover and prove an important new mathematical theorem."
- 1965, H. A. Simon: "machines will be capable, within twenty years, of doing any work a man can do."
- 1967, Marvin Minsky: "Within a generation ... the problem of creating 'artificial intelligence' will substantially be solved."
- 1970, Marvin Minsky (in Life Magazine): "In from three to eight years we will have a machine with the general intelligence of an average human being."

A SHORT HISTORY OF AI

Brief Resurgence (1980-1987)

A brief resurgence in “expert systems” in the 1980s created additional excitement about AI. Expert systems are computers that mimic the decision-making abilities of humans through a series of if-then statements.

The second AI winter 1987–1993

Rodney Brooks and Hans Moravec, researchers from the related field of robotics, argued for an entirely new approach to artificial intelligence.

Rebirth of AI (1990s- Now)

Today, the field is finally achieving some of its old goals. New formulations in Bayesian probability, Markov models, information theory, stochastic modeling, and optimization brought a wealth of new tricks to the trade.

AI HAS NEVER

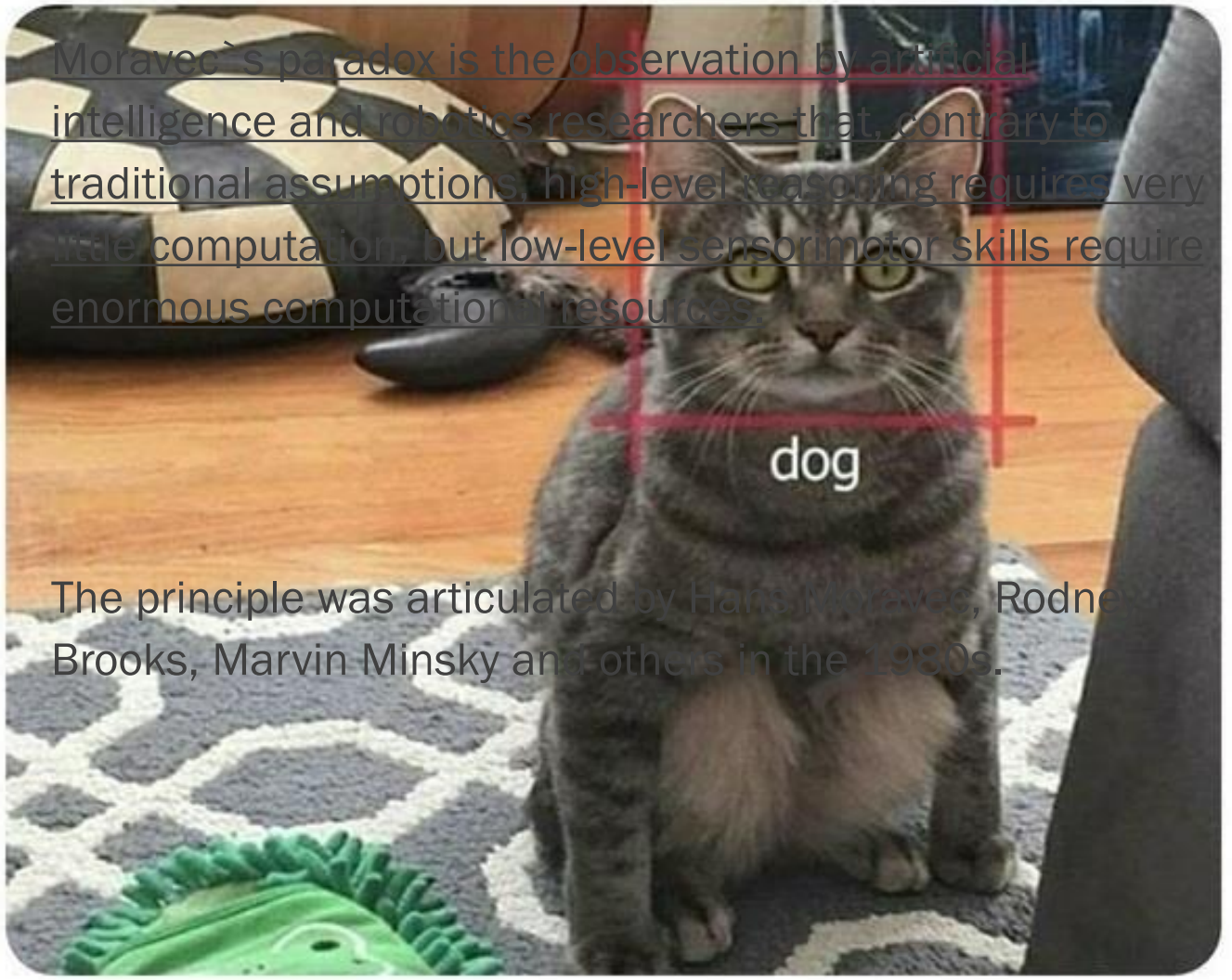
BEEN

SMARTER

BUT WHY

IS IT

SO DUMB ?



WHAT

IS

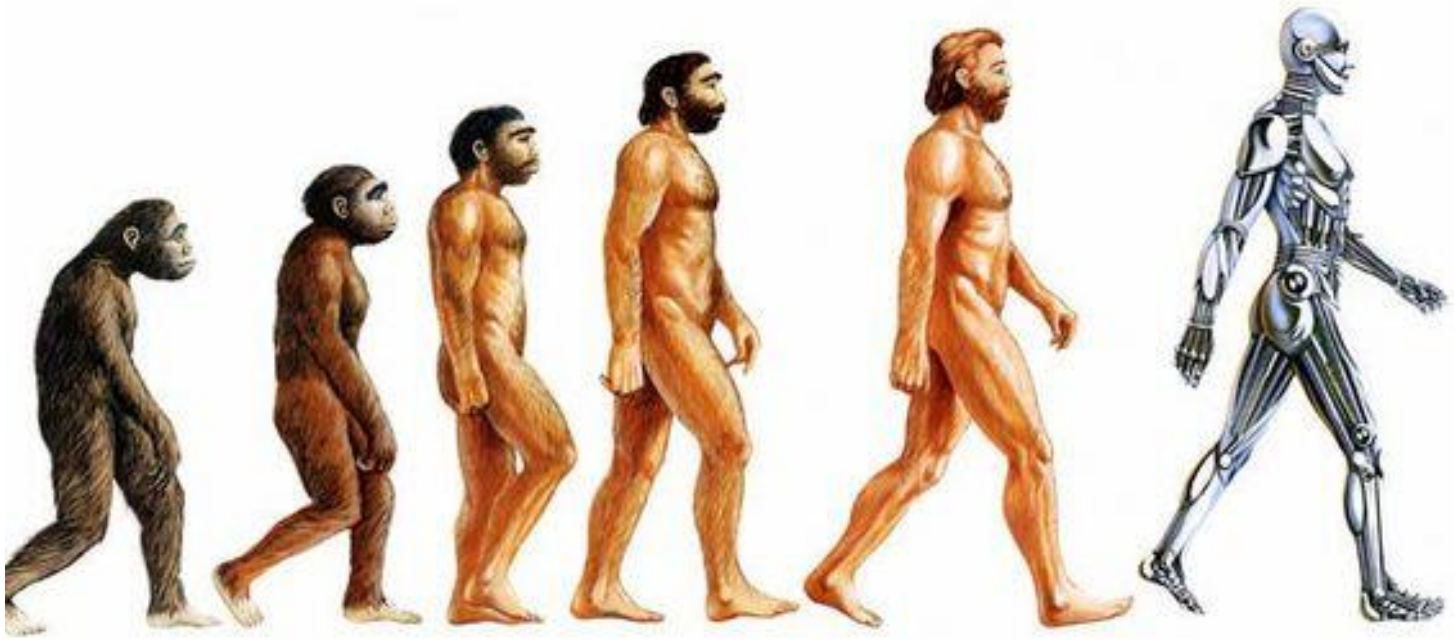
INTELLIGENCE ?

A NEW APROACH

Moravec wrote, “It is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility.”

Similarly, Minsky emphasized that the most difficult human skills to reverse engineer are those that are unconscious. "In general, we're least aware of what our minds do best, we're more aware of simple processes that don't work well than of complex ones that work flawlessly".

CAN AI BEAT EVOLUTION



"Encoded in the large, highly evolved sensory and motor portions of the human brain is a billion years of experience about the nature of the world and how to survive in it,“

The deliberate process we call reasoning is, I believe, the thinnest veneer of human thought, effective only because it is supported by this much older and much more powerful, though usually unconscious, sensorimotor knowledge."

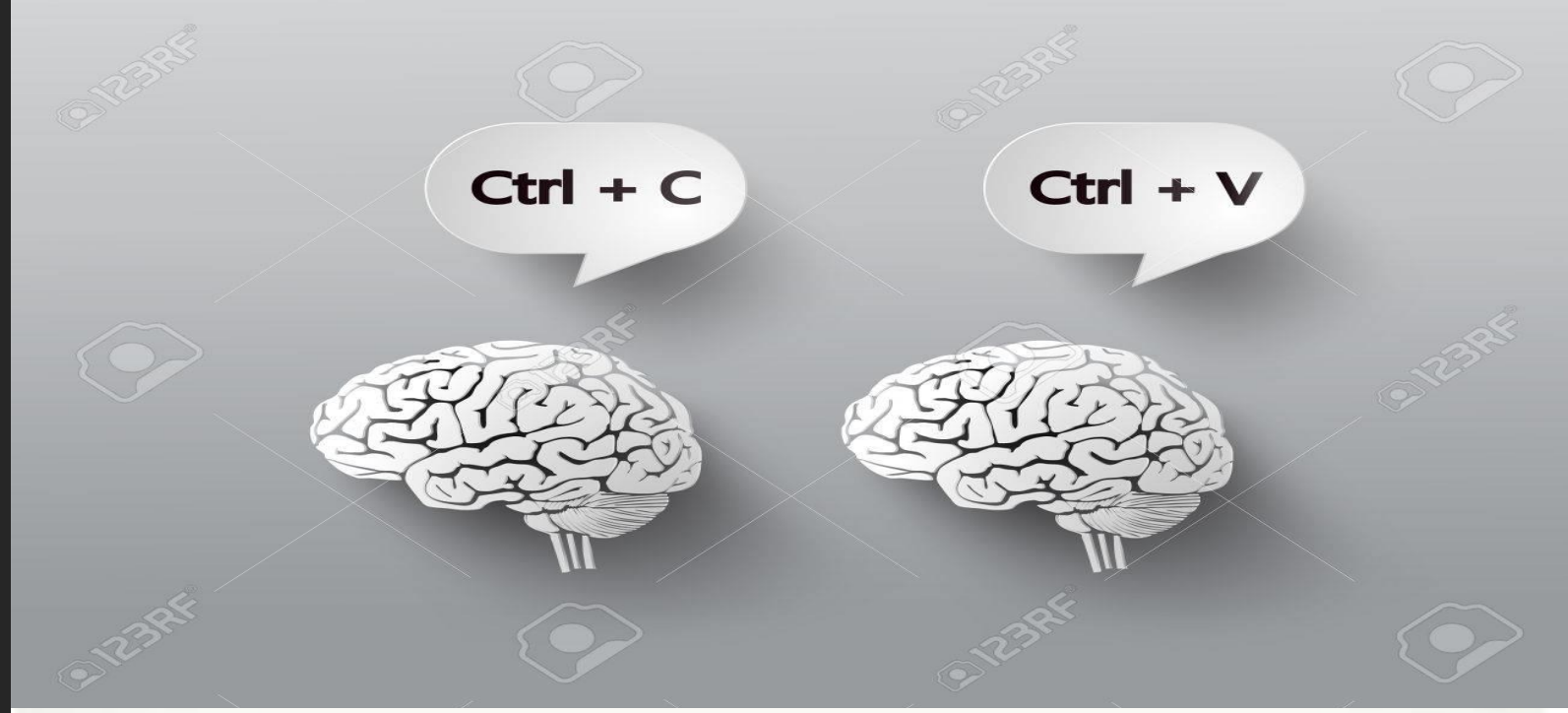
TOP TO

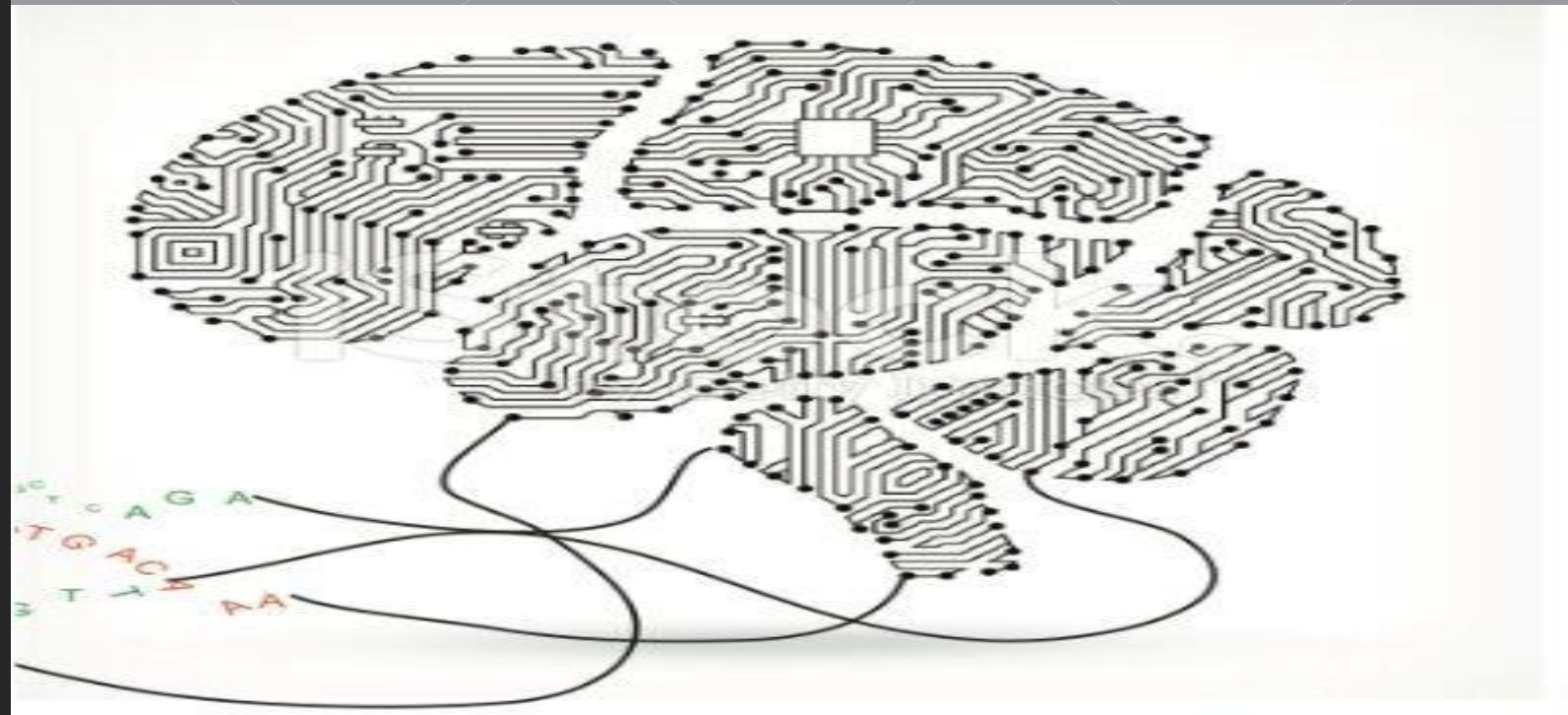
BOTTOM

OR

BOTTOM TO

TOP ?





HISTORICAL EFFECT

The AI effect is a phenomenon that has seen AI-powered tools lose their ‘AI’ label over time

AI unemployment

Nouvelle AI

NOUVELLE AI

Rodney Brooks, MIT

Nouvelle AI distances itself from traditional characterizations of AI, which emphasize human-level performance.

One aim of nouvelle AI is the relatively modest one of producing systems that display approximately the same level of intelligence as insects

Brooks' insectoid robots contained no internal models of the world. Herbert, for example, discarded a high volume of the information received from its sensors and never stored information for more than two seconds.

HERBERT

FRAME PROBLEM

AI researchers call the problem of updating, searching, and otherwise manipulating, a large structure of symbols in realistic amounts of time the frame problem.

The frame problem is endemic to symbolic AI.

Nouvelle systems do not contain a complicated symbolic model of their environment.

BBAI

Behavior-**B**ased **A**rtificial **I**ntelligence

It is extremely popular in robotics and to a lesser extent to implement intelligent virtual agents

Real-time dynamic systems that can run in complex environments

Intelligence situated in a given environment

Braitenberg vehicle

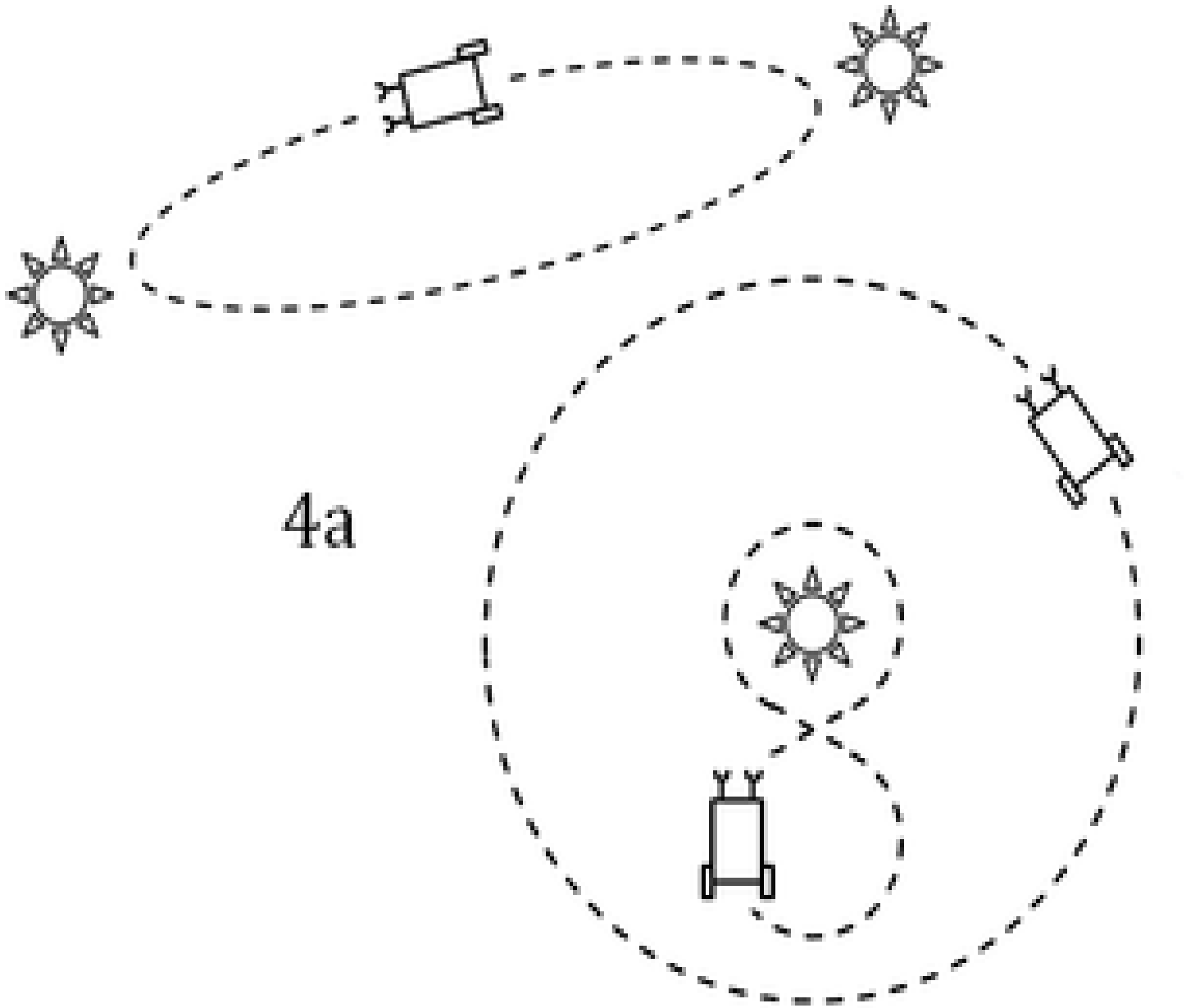
Simply wired sensor/motor connections

Result in some complex-appearing behaviors, fear and love

Minimal intelligence is attributed to a cockroach.

Yet, the functioning of the agent is purely mechanical, without any information processing or other apparently cognitive processes.

Braitenberg vehicle



BBAI

AIBO robot has more than a thousand behaviors built into it.

CONCLUSION

To be able to teach the machines first we need to understand.

We are not sure what intelligence is

An insect is intelligent?

Can we beat the evolution?

Frame problem seems insolvable

BONUS:

STRANGE

LOOPS

Gödel, Escher, Bach: An Eternal Golden Braid

1979 book by [Douglas Hofstadter]