Semantic Engines : An Introduction to Mind Design

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발표 : 이동주

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Cognitive Science (1)

- Hobbes(1651)
  - “Reasoning is but reckoning”
- Cognitive Science : 인지 과학
  - information processing
  - symbol manipulation
  - Artificial Intelligence

Cognitive Science (2)
- Philosophical Dilemmas

1) metaphysical problem of mind interacting with matter
2) theoretical problem of explaining the relevance of meanings, without appealing to a question-begging homunculus
3) methodological issue over the empirical testability of mentalistic explanations

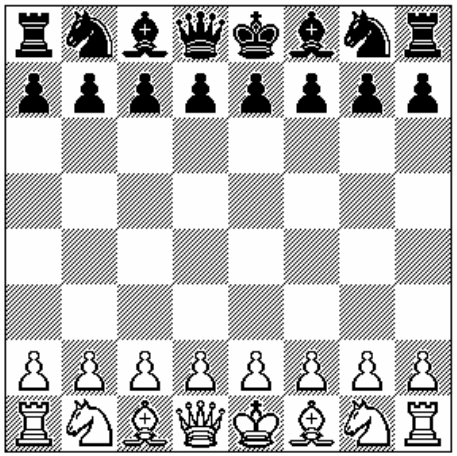
Formal Systems (1)

- What a computer is?
  - Automatic Formal System
- Formal System
  - just like a token moving game to goal position
    - what the tokens are
    - what the starting position is
    - what moves are allowed in any given position
  - self-defined (no relationship with outside world)
  - perfectly definite
  - finitely checkable

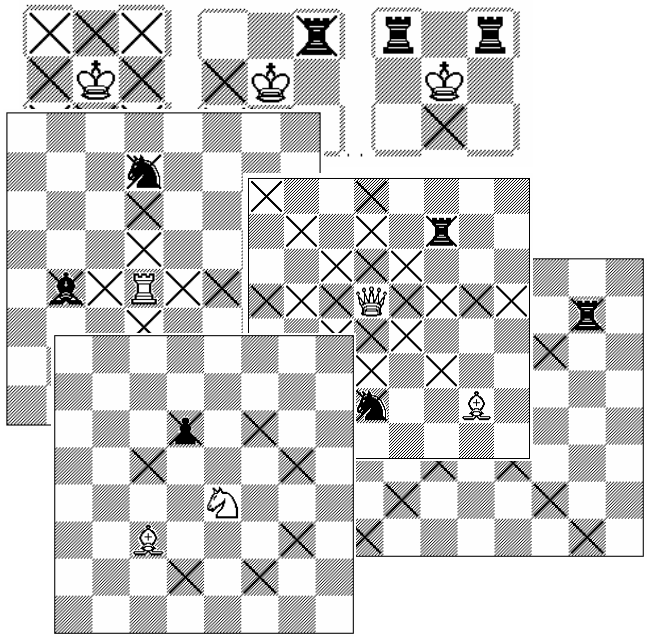
  => digital!!
  - ex)
    - chess game, mathematical and logical system
- Formal Equivalence!

Formal Systems (2)
- chess game

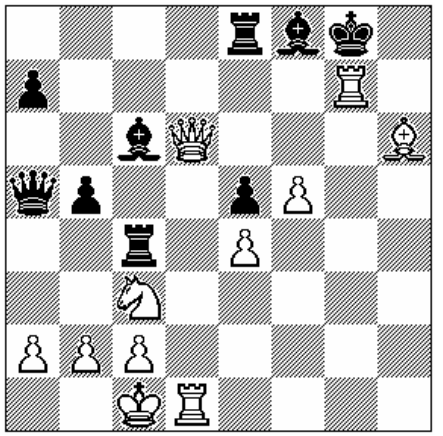
starting position



possible movements



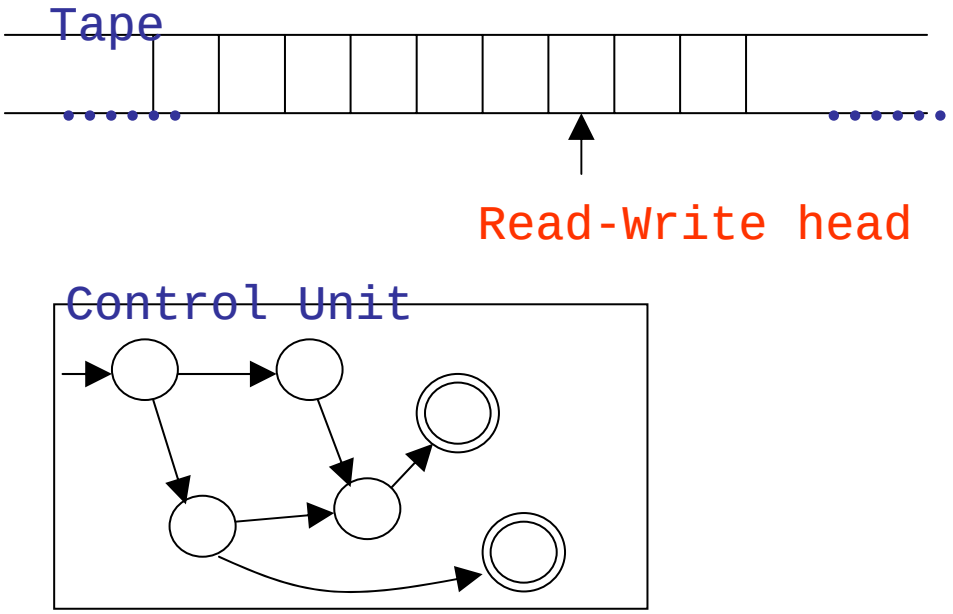
goal



Automatic Formal Systems (Turing Machines and Computers)

- automatically manipulates the tokens of some formal system according to the rules of that system
- Turing machine
  - an unlimited number of storage bin
  - a finite number of execution units
  - one indicator unit
- any automatic formal system can be formally imitated by some Turing Machine => virtual machine, program

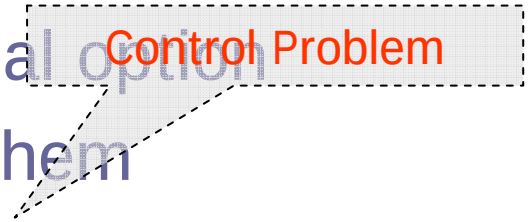
Turing Machine



- universal Turing Machine
  - can be programmed to imitate any other Turing Machine
  - interpreter, compiler
- not a computer but “automatic formal system”

The Control Problem

- each step has to be made “automatically”
- two submachine
  - one generate a number of legal option
  - another choose from among them
- which is the relevant action or move
  - heuristics
  - algorithms



Digital and Analog

- Digital system
  - self-contained, perfectly definite, finitely checkable
- Analog system
  - not clearly defined move, rule, position
- analog can be digitally simulated
- but digital simulation is limited to special cases only certain few variables and relationships are relevant

Semantics

- tokens sometimes means something
- what they are "*about*"
- Semantic Properties
  - what any token means or says, hence whether it is true or false, and so on

"A machine can handle meanings"

is the basic inspiration of cognitive science

and artificial intelligence

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- g

and truth-preserving rules, if we take care of the syntax, the semantics will take care of itself => *semantic engine* (Daniel Dennett 1981)

Interpretation and Truth (1)

−5−1÷ =÷3−1−8 +1−5940

Interpretation 1

1 : equals
2 : plus
3 : minus
4 : times
5 : div. by

9÷9=8
1=83+7

6 **Interpretation 2** ve

1 : equals	6 : zero	+ : five
2 : div. by	7 : nine	− : four
3 : times	8 : eight	× : three
4 : minus	9 : seven	÷ : two
5 : plus	0 : six	= : one

1+1=2 12×4=48 5=4+7−6
9=27÷3 10=16−6 8−4=3+1

Interpretation and Truth (2)

- formal tokens in themselves never intrinsically favor one interpretation scheme over any other
- if we regard an interpretation as relating or connecting a formal system to the outside world, then the distinctiveness of the preferred interpretation should lie in that relation – truth preserving
- interpreting is "making sense of"

Interpretation and Pragmatics

- conditions on “making sense”
  - rationality
  - reliable interaction with the world via transducer
  - conversational cooperation
- Interpreting an automatic formal system is finding a way of construing its outputs such that they consistently make reasonable sense in the light of the system’s prior inputs and other outputs

Cognitive Science!!

- intelligent beings = semantic engines
  - automatic formal systems with interpretations under which they consistently make sense
- it is possible that all is wrong
  - hollow shell
    - consciousness, original intentionality, caring
  - poor substitute
    - deals with defined problem