Knowledge Representation & Processing

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Knowledge, Representation, Reasoning

What is Knowledge?

"Knowledge": dates back to Ancient Greek

- not totally demystified
- a relation between a knower and a proposition
  - e.g., John knows that P
- a proposition is a declarative sentence that can be true or false
  - e.g., John knows that P = John knows that it is true that P

"Belief": related notion of "Knowledge"

- John believes that P vs. John knows that P
- more prop. attitudes: "hopes", "regrets", "doubts", "is absolutely certain that", "is confident that", "is of the opinion that"...
- basic idea: John takes the world to be one way and not another

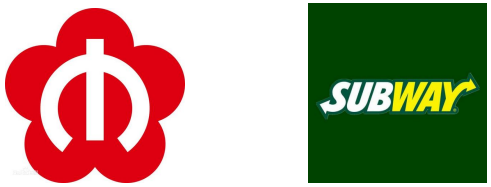
Types of "Knowledge"

- from an individual's view (may vary)
- common knowledge (may change/evolve)

What is Representation?

"Representation": as philosophically vexing as that of "Knowledge"

- not totally demystified
- a relation between two domains
  - one domain (representor) stands for/takes place of the other
  - the representor: more concrete, immediate, accessible in some way
  - e.g., a drawing of a milkshake and a hamburger on a sign might stand for a less immediately visible fast food restaurant



"Symbolic Representation"

- a character or group of characters from predetermined alphabet
  - e.g., the digit "7" stands for the number 7, as does the group of letters "VII"
- easier to deal with symbols (display/recognise them, distinguish from each other) that with what the symbols represent

What is Knowledge Representation?

Formal Definition

- the field of study concerned with using formal symbols to represent a collections of propositions believed by some putative agents

Symbolic Representation for Propositions

- e.g., the symbols "John loves Mary" stands for the proposition that John loves Mary
- the symbolic English sentence is fairly concrete: it has distinguishable parts involving the three words, for example, a recognisable syntax
- the proposition is abstract
- the same proposition can be represented by means of symbols, images, behaviours, or others

What is Reasoning?

Basics of Reasoning

- the formal manipulation of the symbols representing a collections of believed propositions to produce representations of new ones
- based on the assumption: the symbols are more accessible than the propositions they represent
- the role of reasoning: to bridge the gap between what is represented and what is believed

Analogy with Arithmetic

- e.g., think of binary addition as being a certain formal manipulation: we start with symbols like "1011" and "10", and end up with "1101"
- e.g., we might start with the sentences "John loves Mary" and "Mary is coming to the party", and after a certain amount of manipulation produce the sentence "Someone John loves is coming to the party"
- this form of reasoning is called logical inference, so reasoning is a form of computing.