Logic: Propositional Logic

(Project3)

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Method

Research Design

Objective: Understand the basic concepts of knowledge, logic, reasoning, and associated terminology of propositional logic, such as syntax and semantics.

Results

Knowledge

- Agents can acquire knowledge through perception, learning, and language.
- Knowledge base = set of sentences in formal language.
- Building an agent: an approach: learn the knowledge then it can ask itself what to do and answers follow the knowledge base.
- Knowledge level: what they know, regardless of how implemented
- Inference engine: a generic code
- A knowledge-based agent can perform logical inference to draw new conclusions.

Logic

- Syntax: allowed sentences.
- Semantics: all possible worlds in which sentences are true (definition of truth).

Inference: entailment

- a |= b: a entails b or b follows from a if in every world where a is true, b is also true
- a-worlds are a subset of the b-worlds (i.e. a's model is a subset of b's model)

Inference: proofs

- A proof is a demonstration of entailment between a and b.
- Algorithm: sound and complete.
- Method: model-checking and theorem-proving.

Entails vs Implies

- Entails: a |=b: a fact about sets of models where sentences are true (guarantee that with all possible worlds in which a is true, b is true too.)

- Implies: a => b: a well-formed sentence in proposition logic (an intuitive connection).

Reasoning

- The ability to apply logical rules and learned knowledge (knowledge + inference = new conclusion) to draw a new conclusion.

- Logical inference computes entailment relations among sentences.