

# Knowledge-Based Agents

Part 3: wrap up

# Inference, Soundness, Completeness

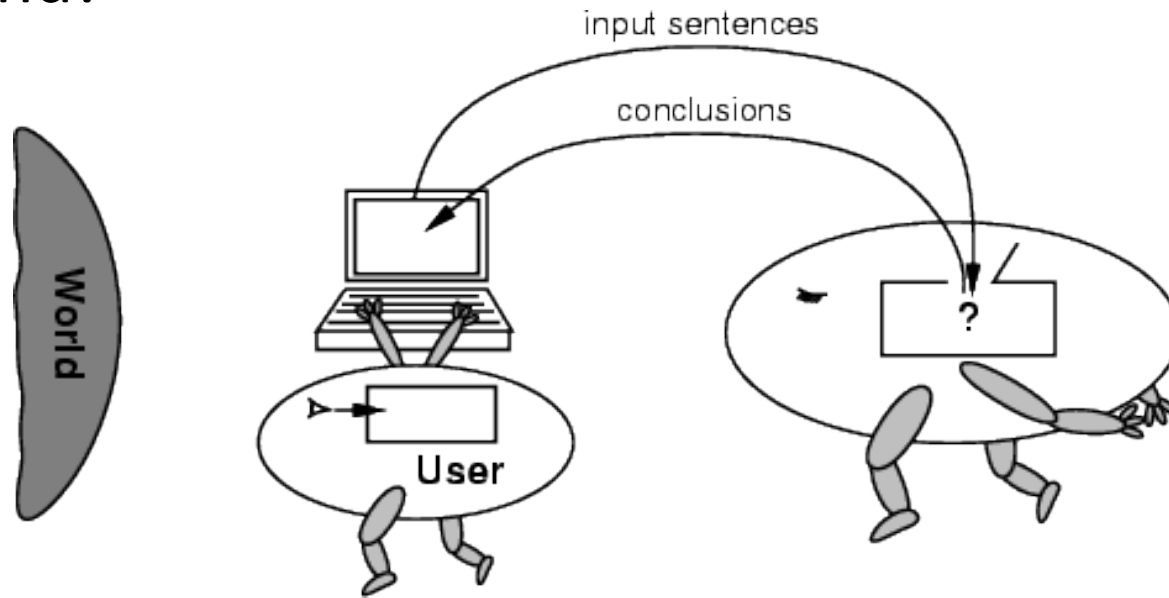
- $KB \vdash_i \alpha$  = sentence  $\alpha$  can be derived from  $KB$  by procedure  $i$
- **Soundness:**  $i$  is sound if whenever  $KB \vdash_i \alpha$ , it is also true that  $KB \models \alpha$
- **Completeness:**  $i$  is complete if whenever  $KB \models \alpha$ , it is also true that  $KB \vdash_i \alpha$
- Preview: **first-order logic** is expressive enough to say almost anything of interest and has a **sound** and **complete** inference procedure

# Soundness and completeness

- A *sound* inference method derives only entailed sentences
- Analogous to the property of *completeness* in search, a *complete* inference method can derive any sentence that is entailed

# No independent access to the world

- Reasoning agents often get knowledge about facts of the world as a sequence of logical sentences and must draw conclusions only from them w/o independent access to world
- Thus, it is very important that the agents' reasoning is sound!



# Summary

- Intelligent agents need knowledge about world for good decisions
- Agent's knowledge stored in a knowledge base (KB) as **sentences** in a knowledge representation (KR) language
- Knowledge-based agents needs a **KB & inference mechanism**. They store sentences in KB, infer new sentences & use them to **deduce** which actions to take
- A **representation language** defined by its syntax & semantics, which specify structure of sentences & how they relate to facts of the world
- **Interpretation** of a sentence is fact to which it refers. If fact is part of the actual world, then the sentence is true

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