Artificial intelligence

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C O N N E X I O N S

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Chapter 1

Deduction, reasoning, problem solving[1]

For difficult problems, most of these algorithms can require enormous computational resources — most experience a "combinatorial explosion": the amount of memory or computer time required becomes astronomical when the problem goes beyond a certain size. The search for more efficient problem solving algorithms is a high priority for AI research.[41]

Human beings solve most of their problems using fast, intuitive judgments rather than the conscious, step-by-step deduction that early AI research was able to model.[42] AI has made some progress at imitating this kind of "sub-symbolic" problem solving: embodied agent approaches emphasize the importance of sensorimotor skills to higher reasoning; neural net research attempts to simulate the structures inside human and animal brains that give rise to this skill.

[1] This content is available online at <http://cnx.org/content/m35294/1.1/>.

Chapter 2

Knowledge representation[1]

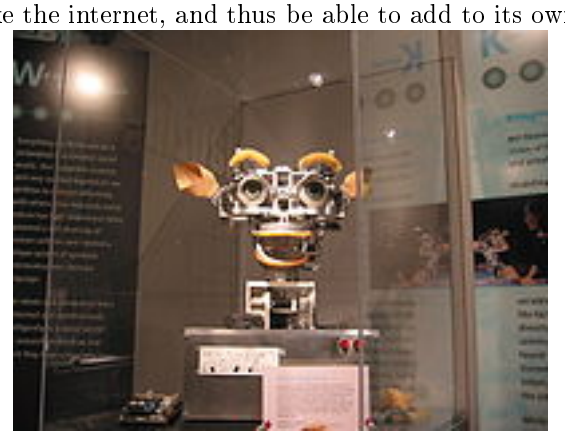
Among the most difficult problems in knowledge representation are:

Default reasoning and the qualification problem

Many of the things people know take the form of "working assumptions." For example, if a bird comes up in conversation, people typically picture an animal that is fist sized, sings, and flies. None of these things are true about all birds. John McCarthy identified this problem in 1969[50] as the qualification problem: for any commonsense rule that AI researchers care to represent, there tend to be a huge number of exceptions. Almost nothing is simply true or false in the way that abstract logic requires. AI research has explored a number of solutions to this problem.[51]

The breadth of commonsense knowledge

The number of atomic facts that the average person knows is astronomical. Research projects that attempt to build a complete knowledge base of commonsense knowledge (e.g., Cyc) require enormous amounts of laborious ontological engineering — they must be built, by hand, one complicated concept at a time.[52] A major goal is to have the computer understand enough concepts to be able to learn by reading from sources like the internet, and thus be able to add to its own ontology.



The subsymbolic form of some commonsense knowledge

Much of what people know is not represented as "facts" or "statements" that they could actually say out loud. For example, a chess master will avoid a particular chess position because it "feels too exposed"[53] or an art critic can take one look at a statue and instantly realize that it is a fake.[54] These are intuitions or tendencies that are represented in the brain non-consciously and sub-symbolically.[55] Knowledge like this informs, supports and provides a context for symbolic, conscious knowledge. As with the related problem of sub-symbolic reasoning, it is hoped that situated AI or computational intelligence will provide ways to represent this kind of knowledge.[55]

[1] This content is available online at <http://cnx.org/content/m35629/1.1/>.

Index of Keywords and Terms

Keywords are listed by the section with that keyword (page numbers are in parentheses). Keywords do not necessarily appear in the text of the page. They are merely associated with that section. *Ex.* apples, § 1.1 (1) **Terms** are referenced by the page they appear on. *Ex.* apples, 1

C Commonsense knowledge, § 2(3)

D Deduction, § 1(1)

K Knowledge representation, § 2(3)

P problem solving, § 1(1)

R reasoning, § 1(1)

Attributions

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Artificial intelligence

Artificial intelligence (AI) is the intelligence of machines and the branch of computer science that aims to create it. AI textbooks define the field as "the study and design of intelligent agents"[1] where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.[2] John McCarthy, who coined the term in 1956,[3] defines it as "the science and engineering of making intelligent machines."[4]

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