PRAGMATIC ISSUES IN KNOWLEDGE ACQUISITION

6.871— Knowledge Based Systems
Lecture 11
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1995

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OUTLINE

- The intent of this lecture
- The longstanding dream
- What do we mean "learn"?
- Current state of the art
- The nature of the task
- Predictable difficulties
- Pragmatics of debriefing

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MODES OF LEARNING

- Learning by being programmed
- Learning by being told
- Learning from selected examples
- Learning from unselected examples
- Learning by discovery

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A KEY HARD PROBLEM

CREDIT (BLAME) ASSIGNMENT

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KNOWLEDGE ACQUISITION TECHNIQUES

- Interviews
- Observe (Record) Performance
- Protocol Analysis

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BASIC INTERACTION

$\boxed{\text{SYSTEM}} \Longleftrightarrow \boxed{\text{KNOWLEDGE ENGINEER}} \Longleftrightarrow \boxed{\text{EXPERT}}$

Listen
Understand
Reformulate
Explain

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NATURE OF THE TASK

KNOWLEDGE

Knowledge $\Updownarrow$ *Engineering*

KNOWLEDGE REPRESENTATIONS

Rules	Frames
Procedures	Semantic Nets

- Bridging The Gap
- Building a formal language
  * "sentences," "nouns," "verbs," ...
  * rules, attributes, objects, values
- Working from both directions
  * kinds of knowledge
  * kinds of reps

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PREDICTABLE DIFFICULTIES

- The expert ...
  * ...knows more than he says
  * ...says more than he knows
  * ...lies to you
  * ...disagrees with other experts
- Knowledge engineers ...
  * ...rush to structure
  * ...need social skills
  * ...need AI skills

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GETTING THE KNOWLEDGE: SOURCES

- Books
- People
  - Finding one.
  - Finding one.
    - Level of aspiration
  - Finding the one.
    - introspective
    - confident
    - reductionistic
    - intrigued

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GETTING THE KNOWLEDGE: WHAT REPRESENTATION TO USE?

- A medical example
- Getting out of the supermarket

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GETTING THE KNOWLEDGE: DEBRIEFING

- Signing On
- Work from examples
  - Dead center cases
  - Marginal cases
- Errors are wonderful
  - it's easier to modify than specify.
- The relevance of the computer
  - mental hygiene
  - efficiency
- Be rabidly rational

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GETTING THE KNOWLEDGE: DEBRIEFING

- Be rabidly reductionistic
- Be patient
- Get interested
- Meet the expert half way:
  - learn his language
- Talk your language
  - it will be infectious
- Come at hard problems from several directions
- The expert will "lie" to you.

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KNOWLEDGE ACQUISITION: GETTING STARTED

- Determine the size and structure of the solution space
  - How many categories of answers are there?
  - How many specific choices within each category?
- Select a category, select a specific choice
- What factors suggest that choice as the correct one?

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KNOWLEDGE ACQUISITION: GETTING STARTED

- What factors differentiate among choices in that category?
- Notice the vocabulary in use:
  - What are the attributes, objects and values?
- Notice statements like
  - "if X and Y, then the best choice is Z"
- Look for chains of reasoning

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EXAMPLE: SELECTING AN APPROPRIATE INVESTMENT

- Frank's Financial Supermarket offers 7 kinds of investments

stocks	index funds
bonds	commodities
mutual funds	coins
tax shelters	

- There are
  * 1500 stocks
  * 1000 bonds
  * 15 different mutual funds
- In the mutual funds:
  * consider the tax-free money market fund

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EXAMPLE: SELECTING AN APPROPRIATE INVESTMENT

- What factors suggest that choice as the correct one?
  "If your tax bracket is 42% or higher and you need to keep the money readily at hand, then the tax-free mm fund is a good choice"
- What factors differentiate among choices in that category?
  Why the tax free mm fund instead of the tax free bond fund?

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EXAMPLE: SELECTING AN APPROPRIATE INVESTMENT

- Notice the vocabulary in use

- Look for chains of reasoning

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