Topic 3.5

Advantages and Disadvantages of Rule-based Reasoning

Esquema de llamadas entre las funciones de backward.lisp (MAL)
3.5 Advantages and Disadvantages of Rule-based Reasoning

**Advantages:**

The reasoning and knowledge representation with rules very is used in KBSs due to the following advantages:

- **Modularity:** each rule can be seen like a "unit of knowledge"
- **Uniformity:** all the knowledge is expressed in the same format, that facilitates the development of Base de Conocimiento.
- **Naturalness:** the rules are a natural format to express knowledge in a dominion.

**Disadvantages:** *Infinite chaining*

Rule-based systems need to be specially crafted to avoid infinite loops:

- **Forward** can enter an infinite loop with rules like:
  
  IF all-ones(Xs)
  THEN all-ones([1|Xs])

- **Backward** can enter an infinite look with rules like:
  
  IF all-ones([1|Xs])
  THEN all-ones(Xs)
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Disadvantages: **possibility of contradictions**

The modification of Knowledge Base can be complicated:

- Sometimes, when introducing new knowledge to solve some specific problem (for example adding a new rule), we might introduce contradictions with the previous rules.
- Equally, if we want to change some existing rule (because it does not work well in some cases, for example), we must consider how it affects the change to all the rules that depend on her.

RULE 1: IF it is raining
THEN not (weather is sunny)

RULE 2: IF location is Florida
THEN not (weather is cloudy)

RULE 3: IF time of day is late afternoon
THEN weather is sunny or weather is cloudy

**FACTS:** (Time of day is late afternoon; Location is Florida)

**Inference:** Facts with R2 and R3 imply that it is sunny.

But if we add a new rule:

RULE 4: IF time of day is late afternoon
and location is Florida
THEN it is raining
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Disadvantages: **Inefficiency**
Because rules require pattern matching, computational cost of rule-based systems can be very high.

Disadvantages: **Opacity**
It is very difficult to examine a rule-based system to determine what actions are going to happen, and when.

Disadvantages: **Complex Domains**
Some domains are so complex that tens of thousands of rules would be needed to represent the large number of possible situations, e.g. Flight Control.