

NONMONOTONIC REASONING—HISTORY REMARKS

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Nonmonotonic reasoning was needed for situation ca

PREHISTORY—NONMONOTONIC REASONING TREATED EXPLICITLY

Predicate completion—Keith Clark

Closed world assumption—Reiter

Microplanner—Sussman and Winograd

Prolog with negation as failure—Colmerauer

Grumble about logic—Minsky

HISTORY—NONMONOTONIC REASONING TR EXPLICITLY

My 1977 paper had domain circumscription in it. [No minimal model, but a minimal model. Ashok Chandra pointed it out to me.]

There was a workshop in 1978 at Stanford.

1980 special issue of AIJ.

- Non-monotonic logic—McDermott and Doyle
- Logic of defaults—Reiter

- Circumscription—-McCarthy

Auto-epistemic logic—Moore

“Applications of circumscription to formalizing common sense”
McCarthy 1986

The early history ends in 1986.

Reiter’s work on diagnosis. McIlraith also.

PREDICATE CIRCUMSCRIPTION—1986

$$\forall x. \neg ab\ aspect1\ x \supset \neg flies\ x.$$
$$\forall x. bird\ x \supset ab\ aspect1\ x.$$
$$\forall x. bird\ x \wedge \neg ab\ aspect2\ x \supset flies\ x.$$
$$\forall x. ostrich\ x \supset ab\ aspect2\ x.$$
$$\forall x. ostrich\ x \wedge \neg ab\ aspect3\ x \supset \neg flies\ x.$$
$$ostrich(Tim) \wedge bird(Tweety).$$

Afterthought (2004): Need to circumscribe what c
what are birds and ostriches separately.

USES OF NONMONOTONIC REASONING

1. As a communication convention. Suppose A tells B a situation involving a bird. If the bird cannot fly, this is relevant, then A must say so. Whereas if the bird can fly, there is no requirement to mention the fact.

The proposed Common Business Communication Language (McCarthy 1982) must include nonmonotonic conventions for what may be inferred when a message leaves out such as the method of delivery.

2. As a database or information storage convention. It is a convention of a particular database that certain predicates have their minimal extension.

3. As a rule of conjecture.
4. As a representation of a policy. The example is “The meeting will be on Wednesday unless another decision is made”.
5. As a very streamlined expression of probabilistic information when numerical probabilities, especially conditional probabilities, are unobtainable.
6. Auto-epistemic reasoning. “If I had an elder brother, I would know it”.
7. Both common sense physics and common sense psychology use nonmonotonic rules. An object will continue in a straight line if nothing interferes with it. A person will eat what is offered unless something prevents it.

HUMAN NONMONOTONIC REASONING

- Human reasoning compared to human speech. In speech, we skate at the edge of ambiguity. That's why description is hard. Many ambiguities of speech are not reflective of human's internal reasoning. Van Benthem's student's description to treat exhaustive sentences.
- Most non-mathematical human reasoning is partly non-monotonic.
- I arrived in Vancouver at 6:30 pm, **but** didn't leave for Seattle until 10 pm. That was **because** the road was closed until 10 pm. Is this the same as "I would have left earlier, **but** the road was closed."

- Is “but” just used in communication or should sent “but” be included in an AI systems internal knowledge
- An argument: Taking into account only facts X, you would infer the conclusion that A, but if you also took into account Y, you would infer B.

PART OF A DIFFERENT SPEECH

- Computer scientists, through not paying attention to mathematical logic, are confused about many matters that they got right many decades ago.
- Ontology concerns what exists and does not include relations. Common ontologies include individuals and unary predicates as objects but not relations as objects. The hierarchies of objects are not hierarchical.
- The notation of first order logic is superior to the notations that have been invented. Decidable subsets of first order logic are readily designated.
- XML isn't a language but a notation. A language is a set of predicate symbols that are intended to be given meaning.