

Description Logics

Notations designed to make it easier to describe relationships between categories.

We can view as an outgrowth of semantic networks where we are formalizing the graphical diagrams in logic and are also added slightly more powerful constructs like limited disjunctive types (you're a member of a category if you belong to one of these categories) and also limited counting quantifiers.

Tasks want to be able to do in description logic

1. Subsumption – check if one category is a subcategory of another.
2. Classification – Check if a given object belongs to a given category.
3. Consistency – check if a category is non-empty.

Example: Classic (a well known description logic)

On HW, we might have

Rules

check(X, na) :-

check(X, nb) :-

concept ->

Thing | ConceptName | And(Concept, ...) | All(RoleName, Concept) | AtLeast(Integer,

RoleName) | AtMost(Integer, RoleName) | Fills(RoleName, IndividualName) |

SameAs(Path, Path) | oneOf(IndividualName,)

Path -> [RoleName, ...,]

Example: Bachelor

Bachelor = And(Unmarried, Adult, Male)

In prolog written as

Bachelor(X) :- UnMarried(X), Adult(X), Male(X).

Example:

NACountry = one of(Canada, USA, Mexico)

In prolog written as

nacountry(canada).

nacountry(usa).

nacountry(mexico).

More on Planning

Recall planning was the problem in the situation calculus of finding a sequence of actions which map current state to a state with a given set of consequences.

What are some algorithms for planning?

Forward state space search (aka progression planning).

Idea: Start from initial state work towards a goal state a.

at each step do:

1. Look at each possibility axiom and see which ones have all their preconditions met (add these to a list of things to expand, pick one from this list).
For this possible action look at all the relevant effect axioms
 - a. Copy current state into a new state variable
 - b. add all positive literals implied by effect axioms to the new state.
 - c. Delete all negative literals implied by effect axioms.
Check if new state satisfies goal test, if no continue.
- 2.

Example on page 383 in book