Declarative Programming

Main concepts & Exam questions

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Main concepts

1.1 Clausal Logic

A logic system consists of:

1. **Syntax**: which sentences are legal
2. **Semantics**: what is the truth value of a sentence
3. **Proof theory**: how to derive new sentences (theorems) from assumed ones (axioms) by means of inference rules.

A logic system should be:

1. **Sound**: anything you can prove is true.
2. **Complete**: anything true can be proven.

There are different clausal logic systems (in order of increasing expressiveness):

1. **Propositional clausal logic**:

   Only composed by atoms with are statements with a value of true or false.

   e.g.: married; bachelor :- man, adult.

2. **Relational clausal logic**:

   Introduces relations between these atoms (constants or variables).

   e.g.: likes(Declarative, S) :- crazy(S).

3. **Full clausal logic**:

   To avoid explicit listing of clauses, we introduce function symbols and complex terms (*functors*)

   e.g.: loves(X, person_loved_by_(X)).

4. **Definite clausal logic**:

   This is what Prolog uses. Clauses only have one true litteral.

   e.g.: A :- B_1 , ... B_n

1.2 Cut

Once you reached me, stick with all variable substitutions you've found after you entered my clause.

1.3 Graphs

1.4 Backward chaining & Forward chaining

1.5 Definite clause grammar

1.6 Reasoning

1.6.1 Default Reasoning

1.6.2 Abductive Reasoning

1.6.3 Inductive Reasoning

1.7 Program completion

1.8 Closed world assumption

Everything that is not known to be true is false.

1.9 Bottom up induction & Top down induction