MA410 Artificial Intelligence - Tutorial 21st Oct 2010

1. Given clauses $c_1 - c_6$, use a (i) top-down, (ii) bottom-up proof; to show `?- ace_exam` is true.

   $\mathbf{c_1}$: `ace_exam` $\leftarrow$ `practice` $\wedge$ `study`.
   $\mathbf{c_2}$: `study` $\leftarrow$ `work_hard` $\wedge$ `reading`.
   $\mathbf{c_3}$: `practice` $\leftarrow$ `do_sums` $\wedge$ `reading`.
   $\mathbf{c_4}$: `work_hard`.
   $\mathbf{c_5}$: `do_sums`.
   $\mathbf{c_6}$: `reading`.

2. (a) What does it mean to say that a clause C logically follows from hypotheses $H_1, ..., H_k$?

   (b) Given the following interpretations:

   $T(x)$, $P(x)$: x studies, practises respectively.
   $E(x)$: x does well in AI exams.

   (i) Write the sentences H_1, H_2, C in predicate calculus.

   H_1: All who study and practise do well in AI exams.
   H_2: Student studies and practises.
   C: Student does well in AI exams.

   (ii) Convert each of H_1, H_2 and $\neg C$ into clause form.

   (iii) Hence, use resolution to show that C follows logically from H_1, H_2.

3. Give a MGU of the prolog code or state why one doesn't exist:

   (i) `g(d(F), B, C, d(E)), g(E, a(F), b(B), d(d(t))).`

   (ii) `g(a,X), g(a,b), g(X).`

   (iii) `studies(student, T, very(A)), studies(X, ai, B), studies(X, Y, very(very(well))).`

4. Given the following clauses

   $\mathbf{c_1}$: `g(E,b,t(E)).`
   $\mathbf{c_2}$: `f(L,L,R)` $\leftarrow$ `g(L,R,T).`
   $\mathbf{c_3}$: `g(B,C,A)` $\leftarrow$ `g(A,B,C).`

   Find all solutions to the query

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   ?- f(X,Y,t(a)).
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   giving all substitutions for each step.