Rina Dechter, Fall-01

ICS 275A, Assignment 6

1. Read chapters 8 throughly and provide a review while answering the following questions.
   - Is the chapter clear? readable?
   - As far as you can see, does the chapter contain valuable information?
   - Is the chapter technically difficult?
   - Enough examples and illustrations?
   - Any typos? technical inaccuracies?
   - Are the algorithm's code clear?
   - What do you want to see more of? less of?
   - Please provide an overall evaluation

2. Consider Stochastic local search (SLS) algorithms such as GSAT and Walksat.
   (a) Apply algorithm GSAT to the 5-queen problem when your initial assignment is all the queens are on the diagonal. Give at most one page description of tracing the algorithm. Discuss
   (b) Discuss the properties of SLS algorithm.

3. Consider the constraint network over the set of variables $\{x_1, x_2, x_3, x_4, x_5\}$, where each variable has the domains D_i = {a,b,c}, $1 \leq i \leq 5$, and the relations are given by

   $R_{2,3,4,5}$ = { (a,a,a,a), (b,a,a,a), (a,b,a,a), (a,a,b,a), (a,a,a,b) },
   $R_{1,2,5}$ = { (b,a,b), (c,b,c), (b,a,c) }

   Are the constraint relational arc and path consistent? If not makes the network relational arc and path consistent.

4. Apply DRC_2 to the graph-coloring problem in Figure 1. Show a trace of performance along ordering $x_1, ...x_7$. Show primarily what functions are recorded. Your answer should be bounded to 1 page.

5. Prove that: Algorithm DLE is polynomial over the class of unary and binary inequalities of the form $x - y \leq a$, $x \leq b$. Prove also that the algorithm directionaly globally solves such inequalities, over the Integers (if a and b are integers), the Rationals and the Reals.

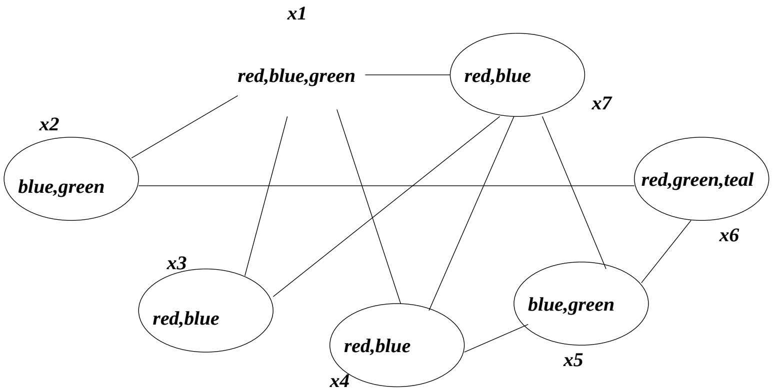

Figure 1: A modified coloring problem.

6. Consider the following cnf theory

$$\varphi = \{(A, \neg B, D), (\neg D, F, C), (\neg C), (B, F, E), (C, F, \neg A), (\neg F, \neg A)\}$$

   1. Apply directional resolution to φ along two orderings of your choice.
   2. Is φ belong to any tractable class that you are familiar with?
   3. Apply unit-propagation to φ.
   4. Show how you find a model to φ using Directional resolution and using DPLL.
   5. Find all prime implicates of φ.

7. Prove that a theory that includes all its prime implicates is globally consistent.

8. Consider the following set of linear inequalities:

$$5x_1 + x_2 + 2x_3 \leq 15$$

$$2x_2 - 7x_3 + x_4 + x_5 \leq 3$$

$$14x_3 + +x_5 - x_6 \leq 30$$

$$x_2 \geq 10, x_6 \geq 20$$

   Show the execution of algorithm DLE on this theory along ordering $d_1 = x_1, x_2, x_3, x_4, x_5, x_6$ and d_2 which is the reverse order of d_1.