Rina Dechter, Fall-2020

ICS 275, Assignment 6

This homework is based on Chapters 7, 9 and 13.

1. (10 pts. question 3, chapter 7) Analyze the complexity of SLS local search step.
2. (10 pts. question 4, chapter 7, extra credit) Analyze the complexity of walksat step
3. (15 pts.) Apply SLS to the problem in Figure 1. You can write your own code, or show a number of local steps. Terminate if you found a solution or if you executed up to 5 local search steps.
4. (15 pts. question 4, chapter 9) Consider a 3x3 grid problem with binary constraints. Describe a join-tree decomposition created by JTC.
   (a) What is the tree-width, hyper-width and separators of your decomposition.
   (b) What is the time and space complexity of CTE on the tree-decomposition.
   (c) Show schematically how CTE will work on this problem.
5. (20 pts. Question 2 chapter 13). The combinatorial auction problem was described in chapter 13 and in exercise 13 of chapter 5.
   (a) Provide one way of formulating this problem as a constraint optimization problem. Demonstrate your formulation over a small problem (5 variables).
   (b) Discuss the pros and cons of solving this problem by Branch and Bound algorithms vs bucket elimination.
6. (10 pts. extra credit, question 4 chapter 13) consider a graph-coloring problem that has 5 variables (A, B, C, D, E), where the domains of A and C are $\{1, 2, 3\}$ and the domains of B and D and E are $\{1, 2, \}$. The constraints are not equal constraints between adjacent variables. Apply the elim-count algorithm to this problem and show the schematic computation and the answer. Discuss its performance in comparison with a simple search algorithm for counting. Do this for the structure: A tree graph structure where A is connected to B, A is connected to C, C is connected to D and C is connected to E.

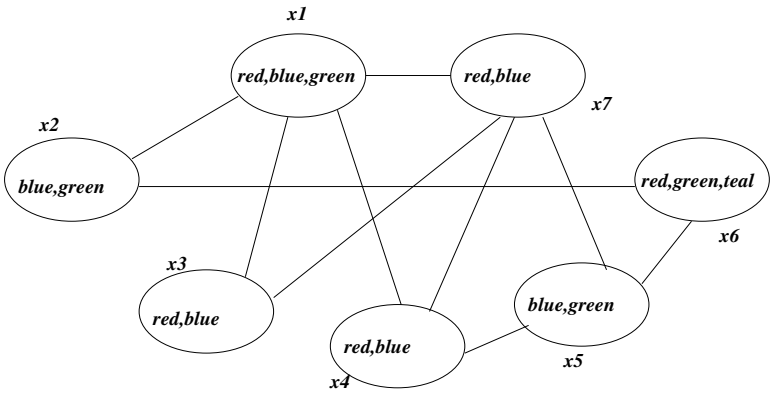

Figure 1: A modified coloring problem.