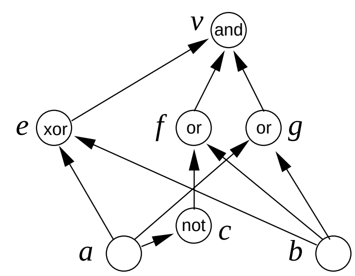
**T-79.4201** **Autumn 2007**
**Search Problems and Algorithms**
**Tutorial 6, 1 November**
**Problems**

1. Give a set of clauses $S$ that is equivalent to the circuit $C$ below with the constraint $\alpha(v) = \mathbf{true}$ in the sense that (i) for every satisfying truth assignment $T$ of $C$ there is a satisfying truth assignment $T'$ of $S$ such that $T'(x) = T(x)$ for every variable $x$ corresponding to an input gate of $C$ and (ii) for every satisfying truth assignment $T$ of $S$ there is a satisfying truth assignment $T'$ of $C$ such that $T'(x) = T(x)$ for every variable $x$ corresponding to an input gate of $C$.




2. Consider the CSP

$$\langle C_1(x,y,z), C_2(x,z); x \in \{1,2,3\}, y \in \{1,2,3\}, z \in \{1,2,3\}\rangle$$

where $C_1 = \{(1,1,2),(1,1,3),(1,2,3),(2,1,3)\}$, and
$C_2 = \{(1,1),(1,2),(2,1),(2,2),(3,1),(3,2)\}$

Apply the Projection rule introduced in Lecture 6 until the CSP becomes hyper-arc consistent.

3. Simulate the behaviour of the Solve procedure (introduced in Lecture 6) when the CSP

$$\langle C_1(z,y,x), C_3(x,z), C_3(y,z), C_3(x,y); x \in \{1,2,3\}, y \in \{1,2,3\}, z \in \{1,2,3\}\rangle$$

is given as input, the goal is to find one solution, Constraint Propagation is based on the Projection rule, splitting is based on labeling and search (Proceed by Cases) on depth first backtracking search.

Here $C_1$ is as given in the previous assignment and
$C_3 = \{(1,2),(1,3),(2,1),(2,3),(3,1),(3,2)\}$.

4. Simulate the behaviour of the basic DPLL procedure when the set of clauses

$$\{x_1 \vee x_2, \neg x_1 \vee x_2, \neg x_1 \vee \neg x_2, x_1 \vee \neg x_3 \vee \neg x_4, x_1 \vee x_3 \vee \neg x_4, \neg x_2 \vee \neg x_3 \vee x_4, \neg x_2 \vee x_3 \vee x_4\}$$

is given as input and the function simplify implements unit propagation but the search heuristics can be decided freely.