

## Constraint Satisfaction Problems

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### Exercise Sheet 7

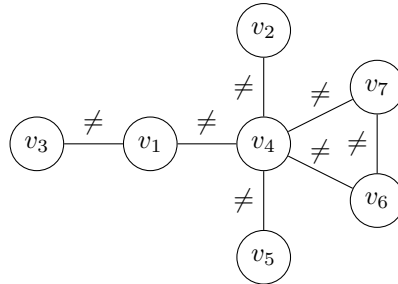
Due: 10.12.2014

#### Exercise 7.1 (3 + 3 + 3 points)

Consider the following network  $N = \langle V, D, C \rangle$  with:

- $D_1 = \{2, 3\}$ ,
- $D_2 = \{0\}$ ,
- $D_3 = \{3\}$ ,
- $D_4 = \{1, 2\}$ ,
- $D_5 = \{3, 4\}$ ,
- $D_6 = \{0, 1\}$ .
- $D_7 = \{1\}$ ,

The constraints  $C$  are provided by the following graph:



In the following use lexicographic orderings, i.e., the variable ordering  $v_1 \prec v_2 \prec \dots \prec v_8$  and for value ordering  $0 \prec 1 \prec \dots \prec 4$ . Do not use any look-ahead strategies. It is sufficient to provide the *jumps* and the identified *internal* and *leave dead ends* in the order they appear during search.

- Apply backtracking search with Gaschnig's backjumping to  $N$ .
- Apply backtracking search with graph-based backjumping to  $N$ . Provide the sets of relevant variable where used.
- Apply backtracking search with conflict-directed backjumping to  $N$ . Provide the jump-back sets where used.

#### Exercise 7.2 (3 points)

Show that jumping back further than the culprit variable for Gaschnig's Backjumping is incorrect. To this end, let  $(a_1, \dots, a_i)$  be a leaf dead-end,  $v_b$  its culprit variable, and construct an example where jumping back to  $(a_1, \dots, a_j)$ ,  $j < b$  skips solutions.