Principles of AI Planning
Summer 2004

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Exercise 7

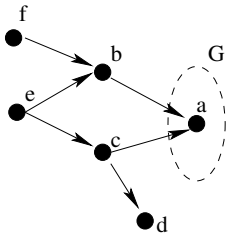
To be returned on Monday, June 28, 2004

Assignment 7.1

Consider the procedure *prune* (from the lecture notes, with numbering for S and W corresponding to the iterations).

procedure prune(O,W,G);
$i := 0$;
$W_0 := W$;
repeat
  $i := i + 1$;
  $k := 0$;
  $S_0 := G$; *(* States from which G is reachable with 0 steps. *)*
  repeat
    $k := k + 1$; *(* States from which G is reachable with k steps. *)*
    $S_k := S_{k-1} \cup \bigcup_{o \in O}(wpreimg_o(S_{k-1}) \cap spreimg_o(W_{i-1}))$;
  until $S_k = S_{k-1}$; *(* States that stay within W_{i-1} and eventually reach G. *)*
  $W_i := W_{i-1} \cap S_k$;
until $W_i = W_{i-1}$; *(* States in W_i stay within W_i and eventually reach G. *)*
return W_i;

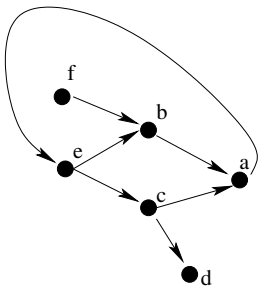
Consider the following transition graph (only one action o, which is nondeterministic in states e and c.)



Simulate the computation of *prune* when it is called with the following parameters: prune($\{o\}$, $\{a, b, c, d, e, f\}$, $\{a\}$). List the values of S_k and W_i for different values of k and i.

Assignment 7.2

Simulate the computation of the algorithm for maintenance goals for the following graph (there is only one action) and $G = \{a, b, c, d, e, f\}$.



Assignment 7.3

1. Let there be 3 state variables A, B and C. Construct the transition matrix of the probabilistic operator
$$\langle B \rightarrow C, 0.5(A \rhd B) | 0.5(0.5(B \rhd C) | 0.5(A \rhd C)) \rangle.$$

2. Outline an algorithm that constructs from any transition matrix a corresponding operator (assume that rows and columns correspond to valuations of state variables $x_1, \ldots, x_n$ for some n).

   A brief outline of the idea of how the algorithm works suffices.

You may work on these assignments and submit your results ***in groups of two students****. Make sure to clearly indicate both names on your work.* ***You may write your answers in English or German.***