Grundlagen der Artificial Intelligence und Logik SS 2021, Übungsblatt 1

Group BG

Beispiel 1 (1 P.)

Which search approach would you use for solving the "Travelling Salesman Problem (TSP)" within 1 second with 1000 different connection points? Why would you use this approach?

To solve the "Traveling Salesman Problem" (TSP) within 1 second for 1000 different nodes, the Local Search method should be used. This is because there are too many possible permutations in the TSP, therefore a Uniformed Search approach would take way longer than 1 second. Local Search is able to find a good solution within this time.

Beispiel 2 (2 P.)

Given the Constraint Satisfaction Problem $x1[1..3], x2[1..3], c1 : x1 > x2, c2 : x2 = 2$. Exemplify solution search on the basis of backtracking and forward checking.
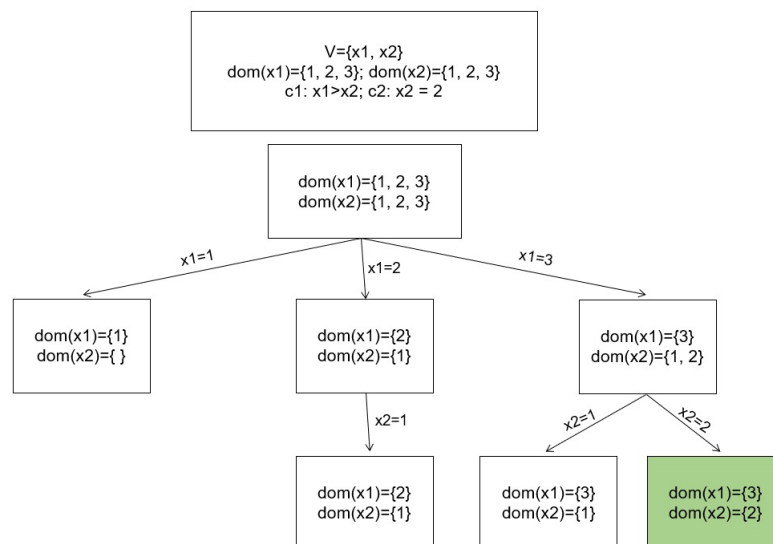
Beispiel 3 (2 P.)

Implement the configuration knowledge base of slide #18 (slide set on "Constraint Satisfaction") in MiniZinc.

var 0..1: $type_city$; $var 0..1 : type_limo$; $var 0..1 : type_combi$; $var 0..1 : type_xdrive$; $var 0..1 : fuel_4$; $var 0..1 : fuel_6$; $var 0..1 : fuel_10$; $var 0..1 : skibag$; $var 0..1 : four_wheel$; $var 0..1 : pdc$;

constraint $type_city + type_limo + type_combi + type_xdrive = 1$;

constraint $fuel_4 + fuel_6 + fuel_10 = 1$;

constraint $four_wheel = 1 -> type_xdrive = 1$; $constraint skibag = 1 -> type_city = 0$; $constraint fuel_4 = 1 -> type_city = 1$; $constraint fuel_6 = 1 -> type_xdrive = 0$; $constraint type_city = 1 -> fuel_10 = 0$;

constraint $four_wheel = 1$; $constraint fuel_6 = 1$; $constraint type_city = 1$; $constraint skibag = 1$; $constraint pdc = 1$;

Beispiel 4 (6 P.)

Implement the TSP in MiniZinc for 10 connection points denoted as cp1, cp2, .., cp10. Assure that cp2 is always the first point (of the round trip) and cp5 follows cp3 in each solution.

Beispiel 5 (9 P.)

Implement a solution search for the configuration knowledge base of slide #18 (see above) on the basis of a genetic algorithm.