

Group D and Group E Homework Credit Task

to be presented Th., September 25, 2025

Group D Task: Heuristic Search With Backtracking

a) Assume you apply backtracking with depth bound 5 and uses the following operator selection function O to the 8 puzzle:

O selects the operator first/next which leads to a state s for which h'(s):= "The number of incorrect positions of s with respect to the goal state g (not counting ‘\*’)" has the lowest value. Ties are broken using S>E>W>N.

For example for the search problem below; north, south and west are applicable in the initial state ini:

North leads to a state s1 with h(s1)=4 “2,8,6,4 are misplaced

South leads to a state s2 with h(s2)=6 “6, 2, 3, 7 ,4,8” are misplaced

West leads to a state s3 with h(s3)= 6 “6,2,3,8,5,4” are misplaced

Consequently, backtracking applies operator north in the initial state first…

6 2 3 8 6 2
8 5 \* 4 5 3
4 1 7 \* 1 7
 ini goal state g

a) Will backtracking with the described operator selection function, assuming ini is the initial state and g is the goal state find the goal state quickly?

b) Now assume the initial state is changed to ini’

6 5 3
8 2 7
1 4 \*

ini’

Assume backtracking is applied starting in position ini’; how does the search tree of the states backtracking searched look like after 10 operators have been applied?

c) Compare Backtracking with Best First Search; what are advantages/disadvantages of each search technique?

Group E Task Centering on Game Theory

a) What is a Nash Equilibrium?

b) What is the Nash Equilibrium for the following parallel game, whose payoff matrix is depicted below? Player 1 has actions A, B, and C whereas Player 2 has actions D, E and F.

 D E F

A 5,2 3,5 1,4

B 9,2 4,4 3,6

C 1,7 5,5 7,1

c) Demonstrate that the computed Nash Equilibrium1 has the “expected characteristics”!