TU Clausthal

Department of Informatics

Prof. Dr. J. Dix
Lic. F. Schlesinger

Artificial Intelligence

– Sheet 2: Search –

Date: 18. April 2012

Points:

_____ of 35

Group / Tutor:

Name(s) & Matr. no.:

Exercise 1 (4 Points, Search algorithms)

Show that breadth-first search is a special case of uniform-cost search.

Exercise 2 (4 Points, Best-first search)

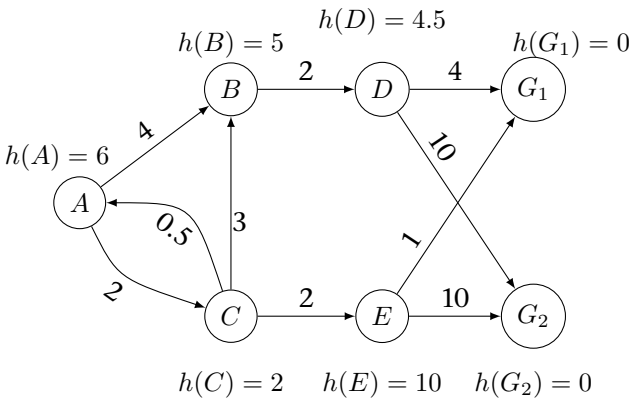
The *heuristic path algorithm* is a best-first-search in which the objective function is $f(n) = (2-w)g(n) + wh(n)$. For which values of w is this algorithm guaranteed to be optimal? What kind of search does this perform when $w = 0$ (resp. $w = 1$, or $w = 2$)?

Exercise 3 (12 Points, Informed Search)

1. Use the **Tree-search**-Algorithm and give the order in which the nodes are expanded in the resulting search tree with respect to the two specified search strategies. Give also the cost of the found path.

   State A represents the initial state and G_1, G_2 are Goal-states. Edges include the step-cost and states are labeled with the heuristic $h(\cdot)$.

   If the algorithm generates more than one path (Indeterminism!), select any of these.



   (a) Best-first search:

A,	Kosten:

   (b) A* search:

A,	Kosten:

2. Use now **Graph-search**-Algorithm and proceed as in 1.

   (a) Best-first search:

A,	Kosten:

To be submitted:

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before class

(b) A* search:

A,	Kosten:

Exercise 4 (4 Points, Completeness of A*)

Theorem 2.8 says that there has to be a $\delta > 0$ to ensure completeness of A*. Prove that this cannot be weakened to $\delta \geq 0$

Exercise 5 (6 Points, Monotony, consistency, and admissibility)

Let h be a heuristic function and $f(n) = g(n) + h(n)$ the evaluation function of A^* search. Prove or disprove the following statements (Give proofs or counterexamples!):

1. Consistency of h implies that f is monotonically increasing.
2. Monotony of f implies monotony of h.
3. Admissibility of h implies consistency of h.
4. Consistency of h implies admissibility of h.

Exercise 6 (5 Points, A* and consistency)

Let h be consistent. When A^* expands a node n at the first time (with respect to `Tree-Search`) the located path to n is already optimal. Prove the statement!
What is an important consequence with respect to `Graph-Search`?