Universität Zürich[UZH]

Introduction to Artificial Intelligence
Exercise Sheet 1

Laurin van den Bergh, 16-744-401
Yufeng Xiao, 19-763-663
Nora Beringer, 19-734-227

Universität Zürich
Institut für Informatik

Due: April 27, 2022

Exercise 7.1

(a) Predicates: Properties of objects that we are interested in; can be true or false:
$\forall$ b $\in$ SetOfBridges B, where SetOfBridges B = {Krämerbrücke, Schmiedbrücke, Honigbrücke, Holzbrücke, Grüne Brücke, Köttelbrücke, Hohe Brücke}
V = {crossedAtLeastOnce(b)| $\forall b \in B$} $\cup$ {crossedAtMostOnce(b) | $\forall b \in B$}

(b) Initial state (only predicates which are true are listed):
I = crossedAtMostOnce(b), $\forall b \in B$

(c) Goal state (both predicates have to be true in order to ensure that each Bridge is crossed exactly once):
G = crossedAtLeastOnce(b) $\wedge$ crossedAtMostOnce(b), $\forall b \in B$

(d) A is a finite set of actions a = $\langle$pre, eff$\rangle$ with pre(a) and eff(a)
A = {crossFirstTime(b), crossAgain(b)}, $\forall b \in B$

action a crossFirstTime(b):
pre(crossFirstTime(b)) = $\neg$ crossedAtLeastOnce(b) $\wedge$ crossedAtMostOnce(b)
eff(crossFirstTime(b)) = crossedAtLeastOnce(b) $\wedge$ crossedAtMostOnce(b)
When the action crossFirstTime(b) is executed exactly once for every bridge the Goal state is reached.

action crossAgain(b):
pre(crossAgain(b)) = crossedAtLeastOnce(b)
eff(crossAgain(b)) = crossedAtLeastOnce(b)
We can ignore crossedAtMostOnce in the action crossAgain(b) as its state is
$crossedAtMostOnce \rightarrow false$ when crossing the same bridge numerous times.
The Goal state won't be reached when action crossAgain(b) is used.

Exercise 7.2

(a) *Insert graph*
(b) *Insert graph*
(c) PDB:
$\{ \text{loc} \rightarrow \text{B}, \text{treasure} \rightarrow \bot\} = \infty$
$\{ \text{loc} \rightarrow \text{A}, \text{treasure} \rightarrow \bot\} = \infty$
$\{ \text{loc} \rightarrow \text{C}, \text{treasure} \rightarrow \bot\} = \infty$
$\{ \text{loc} \rightarrow \text{A}, \text{treasure} \rightarrow \top\} = 2$
$\{ \text{loc} \rightarrow \text{B}, \text{treasure} \rightarrow \top\} = 1$
$\{ \text{loc} \rightarrow \text{C}, \text{treasure} \rightarrow \top\} = 0$

Exercise 7.3

(a) (b) (c) (d)