CSCI-630 Found Artificial Intelligence

HW3-2 Solutions

Gautam Gadipudi - gg7148@rit.edu

Question 1:

Submitted as *knowledge.pl*

Usage:

- Open gprolog console in this directory
- [knowledge].

Then perform following queries:

```
| ?- grand_children_list('Elizabeth').
```

```
| ?- brother_in_law_list('Diana').
```

```
| ?- great_grand_parent_list('Zara').
```

```
| ?- ancestor_list('Eugenie').
```

Question 2:

(a)

$$Action(Move(loc1, loc2, r),$$
$$PRECOND: At(loc1, r) \wedge Room(r) \wedge Hallway(r) \wedge Location(loc1) \wedge Location(loc2)$$
$$EFFECT: \neg At(loc1, r) \wedge At(loc2, r))$$
$$Action(Push(b, loc1, loc2, r),$$
$$PRECOND: At(loc1, r) \wedge BoxAt(loc1, r) \wedge Location(loc1) \wedge Location(loc2) \wedge Room(r) \wedge Hallway(r) \wedge Box(b)$$
$$EFFECT: \neg At(loc1, r) \wedge At(loc2, r) \wedge \neg BoxAt(loc1, r) \wedge BoxAt(loc2, r))$$
$$Action(TurnOn(s),$$
$$PRECOND: At(s, r) \wedge Off(s) \wedge Switch(s) \wedge Room(r)$$
$$EFFECT: On(s))$$
$$Action(TurnOff(s),$$
$$PRECOND: At(s, r) \wedge On(s) \wedge Switch(s) \wedge Room(r)$$
$$EFFECT: Off(s))$$

(b)

$$Init(At(P, R_2) \wedge BoxAt(B_1, R_1) \wedge BoxAt(B_2, R_1) \wedge BoxAt(B_3, R_3)$$
$$Robot(P) \wedge Box(B_1) \wedge Box(B_2) \wedge Box(B_3) \wedge Room(R_1)$$
$$Room(R_2) \wedge Room(R_3))$$

(c)

[Move(Room2Center, $Door_2$, R_2),
TurnOff(s),
Move($Door_2$, $HallwayDoor_2$, Hallway),
Move($HallwayDoor_2$, $HallwayDoor_1$, Hallway),
Move($HallwayDoor_1$, $Door_1$, Hallway),
TurnOn(s),
Move($Door_1$, Room1Center, R_1),
Push(B_1, Room1Center, $Door_1$, R_1),
TurnOff(s),
Push(B_1, $Door_1$, $HallwayDoor_1$, Hallway),
Push(B_1, $HallwayDoor_1$, $HallwayDoor_3$, Hallway),
Push(B_1, $HallwayDoor_3$, $Door_3$, Hallway),
TurnOn(s),
Push(B_1, $Door_3$, Room3Center, R_3)]

(d)

The maximum branching factor will be when the robot is in the hallway.
Branching factor = 3 * 3 * 2 = 18

When there are k rooms and m boxes, the branching factor will be k * m * 2.