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Artificial Intelligence
Assignment 2

23. November 2020

A1	A2	A3	Σ

Task 1 Search spaces

a)

i.

The state space is $\binom{n}{k}$, where n is the amount of possible positions and k is the amount of queens to be placed. So $\binom{25}{5} = \frac{25!}{5!*20!} = 53130$. It can be compared to 'Urn model', 'Ziehen ohne Zurücklegen'-Combinatorics in German.

ii.

The state space is now n^k where n denotes the amount of possible rows, and k the amount of queens to be placed. Which would be $5^5 = 3125$

b)

Description

- States: any arrangement of position and orientation of player character and food available / eaten
- Actions: Orientation{North, East, West, South}, Move, (Consume)
- Goal test: No tile with food left

State Space

- Possible positions of player with orientation: $3 \cdot 10 \cdot 4 = 120$
- Possible states of food available: $\sum_{i=0}^{n} \binom{15}{15-i} = 32768$.
  i.e. for $i = 3$ those are all possible positions of the field to contain 3 food.
- State space of food and player is then $120 * 32768 = 3932160$

State Space with ghosts

The field is now 3x11 tiles large.

- Possible positions of player with orientation: $3 * 11 * 4 = 132$

- Possible states of food available: $\sum_{i=0}^{n} \binom{15}{15-i} = 32768$.
  The tiles that can contain food are still the same.
- Possible positions of ghosts: $\binom{3*11}{2} = 528$
  If one takes into account that the ghosts are different, the number should be multiplied by 2:
  $2 \cdot 528 = 1056$
- State space of food, ghosts and player is then $132 \cdot 32768 \cdot 1056 = 4.567.597.056$

Task 2 Search strategies

a)

Breadth-first search

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, **11**

Depth-first search

1, 2, 4, 8, 9, 5, 10, **11**

Depth-limited search with limit 2

Assuming the root has a level of 0:

1, 2, 4, 5, 3, 6, 7 NOT FOUND

b)

This tree shows the order the nodes are visited in, always choosing the leftmost node as tie-breaker:

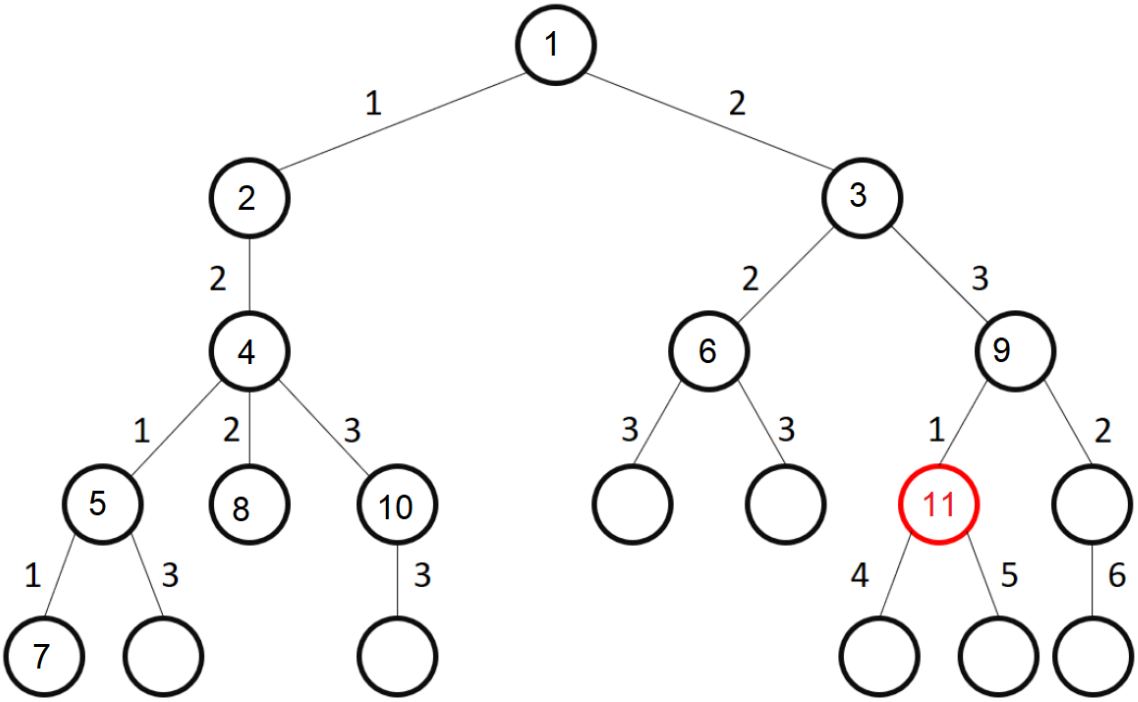

Abbildung 1: Order of visiting

Task 3 Programming in python

See assignment_02.py

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Space for comments