Zadání 1. úkolu do předmětu IZU

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Pomocí metody A* najděte nejkratší cestu v mapě složené z pravidelných buněk, kde cena přechodu mezi dvěma stavy (buňkami) je dána číslem, uvedeným v Tabulce 1 (a je stejná pro všechny přechody ze sousedních míst do příslušné buňky). Nepřekročitelné buňky mají hodnotu "Z"(jako "zeď"). Po každém kroku vypište nové hodnoty seznamů Open a Closed. Do pomocné tabulky s ohodnocením uzlů zapisujte aktuálně zkoumaný uzel, cenu cesty do aktuálního uzlu „g", heuristiku „h" a celkovou cenu cesty „f". Heuristiku počítejte jako přímou

vzdálenost středů dvou buněk, kde velikost strany jedné buňky je rovna jedné. Uzly generujte v pořadí zleva doprava a shora dolů, uvažujte 8-okolí buňky (tzn. operátory ↖, ↑, ↗, ←, →, ↙, ↓, ↘). Výslednou cestu zapište do tabulky Výsledná cesta. Uzel se skládá ze souřadnic, z ohodnocení f a souřadnic uzlu, ze kterého byl vygenerován nebo z operátoru, který byl použit (aby bylo možné nalézt cestu od startu k cíli).

Uzly zapisujte: ([sloupec, řádek], celkové ohodnocení f, [souřadnice otcovského uzlu nebo operátor])

Start: ([6, 4], 5.0, [null])
Cíl: ([2, 7], X, [?, ?])

Výsledná cesta: [6, 4], [6, 5], [5, 6], [4, 5], [3, 6], [2, 7]

y/x	0	1	2	3	4	5	6	7	8	9
0	8	8	6	7	Z	9	9	9	9	9
1	8	8	8	8	Z	9	7	7	8	9
2	7	7	7	5	Z	8	7	8	7	9
3	6	6	5	7	Z	Z	Z	Z	7	8
4	9	9	8	8	Z	9	2	8	8	9
5	3	3	3	3	3	9	4	7	9	7
6	9	Z	5	4	Z	3	3	3	3	3
7	9	Z	2	6	Z	8	9	9	9	6
8	9	Z	Z	Z	Z	Z	Z	Z	9	7
9	9	9	9	9	Z	9	9	9	9	9

Tabulka 1: Mapa přechodů. Např. cena přechodu do cílové buňky je rovna 2 pro všechny buňky s cílovou buňkou sousedící.

Pomocná tabulka:

	Uzel	g	h	f		Uzel	g	h	f
01.	[6, 4]	0.00	5.00	5.00	16.	[8, 7]	16.00	6.00	22.00
02.	[5, 4]	9.00	4.24	13.24	17.	[8, 4]	15.00	6.71	21.71
03.	[7, 4]	8.00	5.83	13.83	18.	[3, 4]	18.00	3.16	21.16
04.	[5, 5]	9.00	3.61	12.61	19.	[3, 5]	13.00	2.24	15.24
05.	[6, 5]	4.00	4.47	8.47	20.	[3, 6]	14.00	1.41	15.41
06.	[7, 5]	7.00	5.39	12.39	21.	[8, 3]	15.00	7.21	22.21
07.	[5, 6]	7.00	3.16	10.16	22.	[2, 4]	21.00	3.00	24.00
08.	[6, 6]	7.00	4.12	11.12	23.	[2, 5]	16.00	2.00	18.00
09.	[7, 6]	7.00	5.10	12.10	24.	[2, 6]	18.00	1.00	19.00
10.	[4, 5]	10.00	2.83	12.83	25.	[2, 7]	16.00	0.00	16.00
11.	[5, 7]	15.00	3.00	18.00	26.	[3,7]	20.00	1.00	21.00
12.	[6, 7]	16.00	4.00	20.00	27.				
13.	[7, 7]	16.00	5.00	21.00	28.				
14.	[8, 5]	16.00	6.32	22.32	29.				
15.	[8, 6]	10.00	6.08	16.08	30.				

1. iterace

Open: [([6, 4], 5.00, [NULL])]

Closed: []

2. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([6, 5], 8.47, [6, 4]), ([7, 5], 12.39, [6, 4])]

Closed: [([6, 4], 5.00, [NULL])]

3. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([7, 5], 12.39, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4])]

4. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([7, 5], 12.39, [6, 4]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([4, 5], 12.83, [5, 6]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5])]

5. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([7, 5], 12.39, [6, 4]), ([7, 6], 12.10, [6, 5]), ([4, 5], 12.83, [5, 6]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5])]

6. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([7, 5], 12.39, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5])]

7. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4])]

8. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4])]

9. iterace

Open: [([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5]), ([3, 4], 21.16, [4, 5]), ([3, 5], 15.24, [4, 5]), ([3, 6], 15.41, [4, 5])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6])]

10. iterace

Open: [([7, 4], 13.83, [6, 4]), ([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5]), ([3, 4], 21.16, [4, 5]), ([3, 5], 15.24, [4, 5]), ([3, 6], 15.41, [4, 5])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 4], 13.24, [6, 4])]

11. iterace

Open: [([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5]), ([3, 4], 21.16, [4, 5]), ([3, 5], 15.24, [4, 5]), ([3, 6], 15.41, [4, 5]), ([8, 3], 22.21, [7, 4])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4])]

12. iterace

Open: [([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5]), ([3, 4], 21.16, [4, 5]), ([3, 5], 15.24, [4, 5]), ([3, 6], 15.41, [4, 5]), ([8, 3], 22.21, [7, 4])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4])]

13. iterace

Open: [([5, 7], 18.00, [5, 6]), ([6, 7], 20.00, [5, 6]), ([7, 7], 21.00, [6, 6]), ([8, 5], 22.32, [7, 6]), ([8, 6], 16.08, [7, 6]), ([8, 7], 22.00, [7, 6]), ([8, 4], 21.71, [7, 5]), ([3, 4], 21.16, [4, 5]), ([8, 3], 22.21, [7, 4]), ([2, 4], 24.00, [3, 5]), ([2, 5], 18.00, [3, 5]), ([2, 6], 19.00, [3, 5]), ([2, 7], 16.00, [3, 6]), ([3, 7], 21.00, [3, 6])]

Closed: [([6, 4], 5.00, [NULL]), ([6, 5], 8.47, [6, 4]), ([5, 6], 10.16, [6, 5]), ([6, 6], 11.12, [6, 5]), ([7, 6], 12.10, [6, 5]), ([7, 5], 12.39, [6, 4]), ([5, 5], 12.61, [6, 4]), ([4, 5], 12.83, [5, 6]), ([5, 4], 13.24, [6, 4]), ([7, 4], 13.83, [6, 4]), ([3, 5], 15.24, [4, 5]), ([3, 6], 15.41, [4, 5])]

14. iterace

Open:

Closed: