

CSC361

Bridge and Flashlight problem

Contents

1

Code Overview

2

Visualizations

3

Performance

Code Overview

`Solution.bridge_problem.Metrics`

```
m __init__(self, solution_cost=0, search_cost=0, space_requirement=0)
m __repr__(self)
m space_requirement(self)
p space_requirement(self, value)
p space_requirement(self)

f search_cost
f _space_requirement
f solution_cost
f max_space_requirement
```

`Solution.bridge_problem.BridgeProblem`

```
m __init__(self, inputs: test_case)
m successor(self, node: BridgeNode)
m expand(self, node: BridgeNode)
m goal_test(node: BridgeNode)
m get_ancestors(node: BridgeNode)
m h(self, state: State)
```

```
f _costs
f max_num_ppl_crossing
f min_num_ppl_crossing
f _to_cost
f initial_node
f k
```

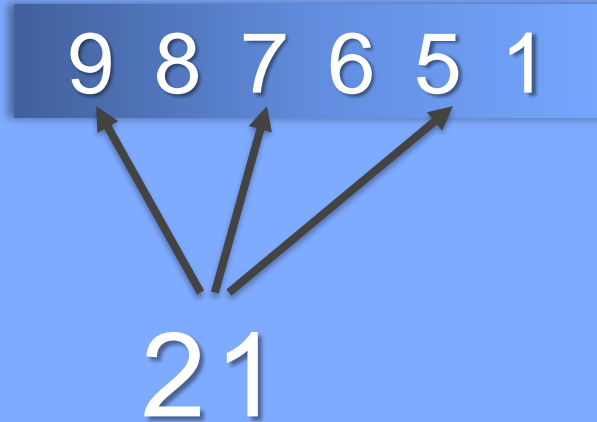
`Solution.bridge_problem.BridgeNode`

```
m __init__(self, state: State, depth: int = None, path_cost: int = None, parent=None, action="")
m __le__(self, other)
m __eq__(self, other)
m __hash__(self)
m __repr__(self)
```

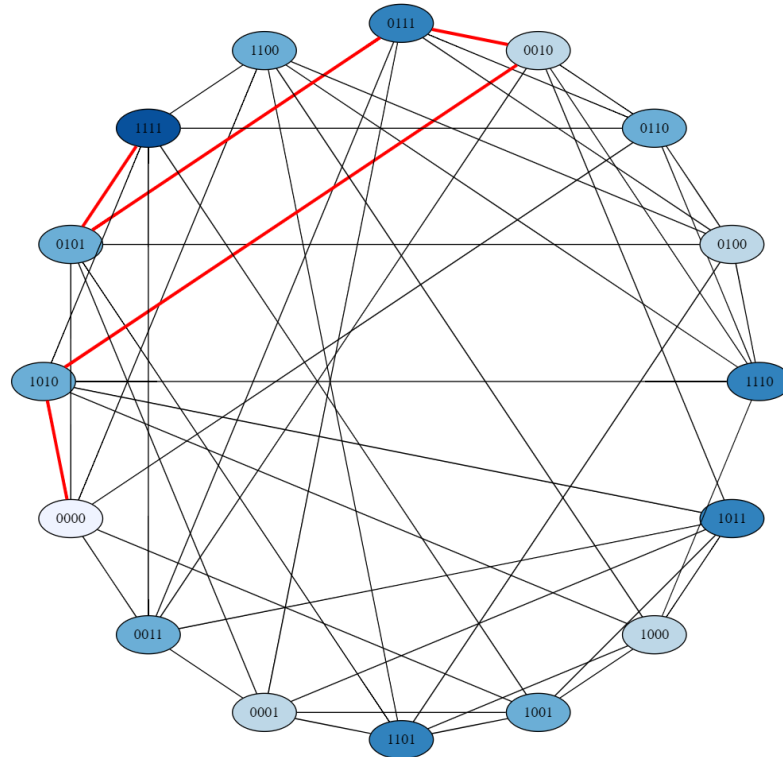
```
f parent
f path_cost
f depth
f action
f state
```

Heuristic

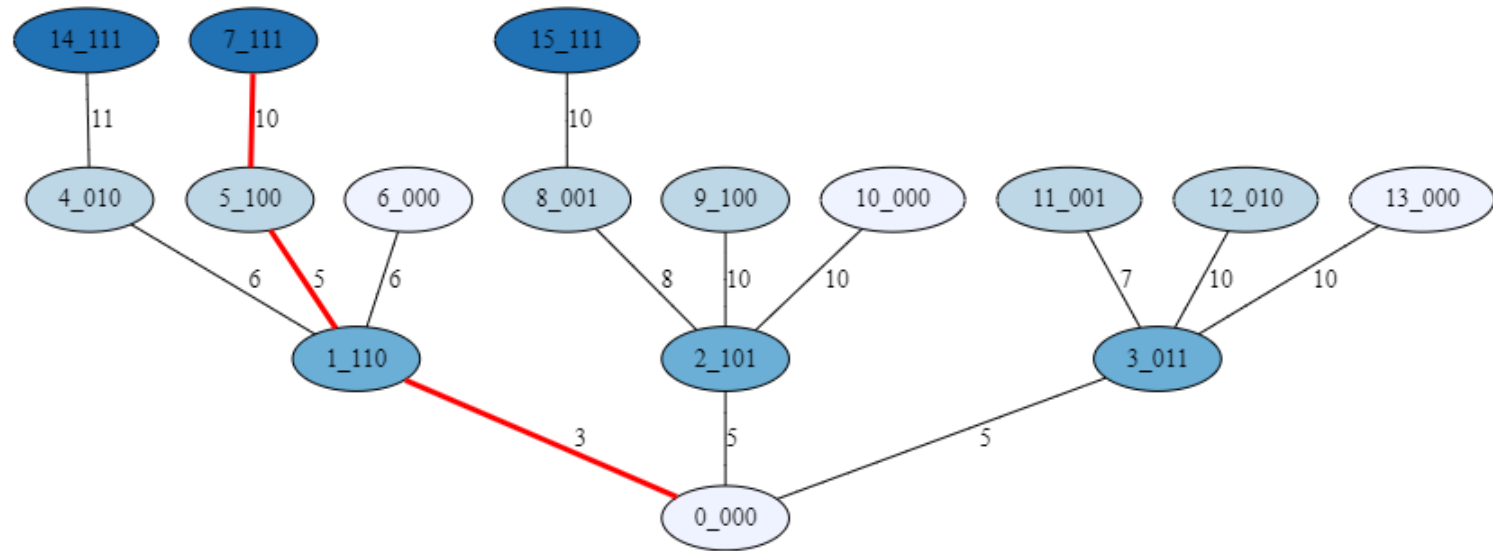
We obtain A^* 's
heuristic by
relaxing the
Flashlight rule



State Space of a
 $k=4$ problem
represented by
booleans



Visualization of UCS Search



Performance

4.1.2.1 UCS

	(1 2)	(3 2 5)	(1 3 2 5)	(1 9 2 1)	(3 3 3 3)
0	Move a0, a1	Move a0, a1	Move a0, a2	Move a0, a3	Move a0, a2
1		Return a1	Return a0	Return a3	Return a2
2		Move a1, a2	Move a0, a1	Move a1, a2	Move a1, a2
3			Return a0	Return a0	Return a1
4			Move a0, a3	Move a0, a3	Move a1, a3

4.1.2.2 IDS

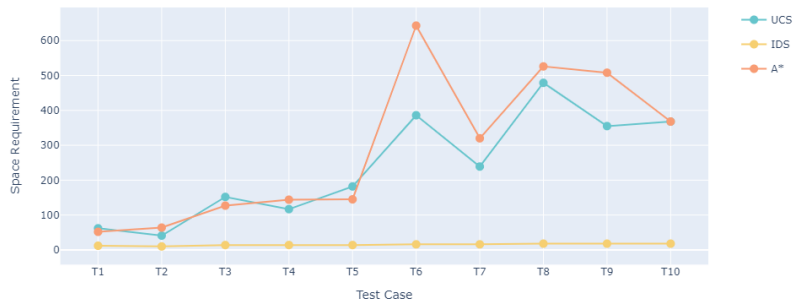
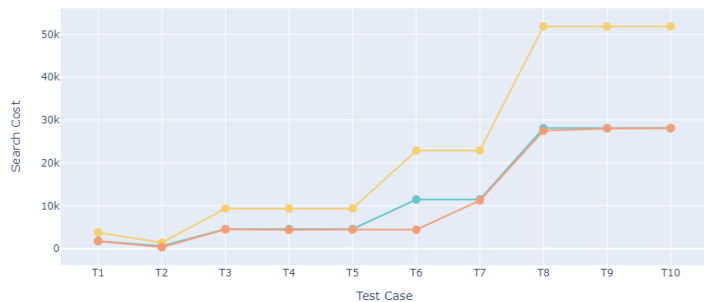
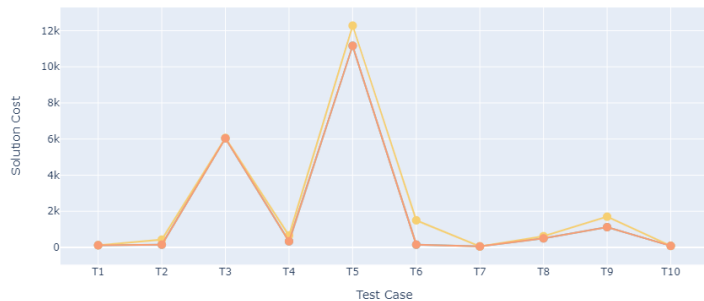
	(1 2)	(3 2 5)	(1 3 2 5)	(1 9 2 1)	(3 3 3 3)
0	Move a0, a1	Move a0, a1	Move a0, a1	Move a0, a1	Move a0, a1
1		Return a0	Return a0	Return a0	Return a0
2		Move a0, a2	Move a0, a2	Move a0, a2	Move a0, a2
3			Return a0	Return a0	Return a0
4			Move a0, a3	Move a0, a3	Move a0, a3

4.1.2.3 A*

	(1 2)	(3 2 5)	(1 3 2 5)	(1 9 2 1)	(3 3 3 3)
0	Move a0, a1	Move a0, a1	Move a0, a2	Move a0, a3	Move a0, a2
1		Return a1	Return a0	Return a0	Return a2
2		Move a1, a2	Move a0, a1	Move a1, a2	Move a1, a2
3			Return a0	Return a3	Return a1
4			Move a0, a3	Move a0, a3	Move a1, a3

Test Case	Metric	UCS	IDS	A*
(1 2)	Solution Cost	2	2	2
	Search Cost	1	3	1
	Space Requirement	1	2	1
	Time (s)	3.82e-05	3.49e-05	4.71e-05
(3 2 5)	Solution Cost	10	11	10
	Search Cost	15	22	14
	Space Requirement	4	4	4
	Time (s)	0.0001595	0.000154	0.0001857
(1 3 2 5)	Solution Cost	12	12	12
	Search Cost	66	122	63
	Space Requirement	9	6	8
	Time (s)	0.0004984	0.0007511	0.0007958
(1 9 2 1)	Solution Cost	13	14	13
	Search Cost	66	122	61
	Space Requirement	9	6	9
	Time (s)	0.0005281	0.0008551	0.0006944
(3 3 3 3)	Solution Cost	15	15	15
	Search Cost	66	122	66
	Space Requirement	7	6	7
	Time (s)	0.0005001	0.0007254	0.0008629

Performance



Thank you

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