HW1

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1 Problem One

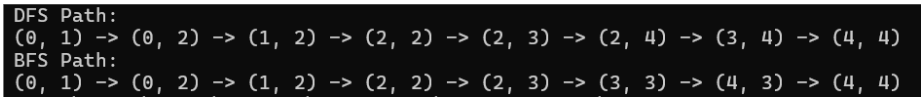

Figure 1: For Problem One

2 Problem Two

	Step	Expanded Node	Fringe / Frontier	Visited
	0	–	[B]	B
	1	B	~~[B, A]~~, [B, E]	A, E
DFS	2	A	~~[B, A, D]~~	D
	3	D	[B, A, D, G], ~~[B, A, D, F]~~	G,F
	4	F	–	–
	5	G	[B, A, D, G]	–

Path: [B, A, D, E] Cost: 6 Expansion Order: B, A, D, G

	Step	Expanded Node	Fringe / Frontier	Visited
	0	–	[B]	B
	1	B	~~[B, E]~~, ~~[B, A]~~	A, E
	2	A	~~[B, A, D]~~	D
BFS	3	E	~~[B, E, C]~~ ~~[B, E, F]~~	F, C
	4	D	[B, A, D, F], [B, A, D, G]	F, G
	5	C	–	–
	6	F	–	–
	7	G	–	–

Path: [B, A, D, G], Cost: 6, Expansion: B, A, D, F, F, G

	Step	Expanded Node	Fringe / Frontier	PQ
	0	–	[B, 0]	(B,0)
	1	B	[B, E, 1] [B, A, 2]	(E, 1) (A, 2)
	2	E	[B, E, F, 4] [B, E, C, 5]	(A,2) (F,4) (C,5)
UCS	3	A	[B, A, D, 5]	(F, 4) (C, 5) (D, 5)
	4	F	–	(C, 5)
	5	C	–	(D, 5)
	6	D	[B, A, D, G, 6] [B, A, D, F, 7]	(G, 6)
	7	G	[B, A, D, G, 6]	

Path: B, A, D, G Expanded; B,E,A,F,C,D,G Cost: 6

3 Problem 3

DFS Path: S, A, D, G Cost: 9

BFS Path S, A, D, G Cost: 9

UCS S, B, D, G Cost: 6

A* Path S, B, D, G F(n) cost: 6

4 Problem 4

Expanded	G(n)	F(n)	Expanded List
M	0	5	(M)
	1	5	(M,N)
O	3	4	(M,O)
N	1	5	(M,N)
	8	8	(M,O,P)
	5	6	(M,O,Q)
O	2	3	(M,N,O)
	10	10	(M,N,P)
	8	8	(M,O, P)
	5	6	(M, O, Q)
	7	7	(M,N,O,P)
Q	4	5	(M,N,O,Q)
	10	10	(M,N,P)
	8	8	(M,O,P)
	5	6	(M,O,Q)
	7	7	(M,N,O,P)
P	5	5	(M,N,O,Q,P)
	10	10	(M,N,P)
	8	8	(M,O,P)
	5	6	(M,O,Q)

Path: M,N,O,Q,P F(n) Cost: 5

5 Problem 5

```
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l tinyMaze -p SearchAgent -a fn=dfs
readCommand argv {argv}
[SearchAgent] using function dfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 10 in 0.0 seconds
Search nodes expanded: 21
You Lose. Your Pacman Need To Hit The Walls At Least Once Time!
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l mediumMaze -p SearchAgent -a fn=dfs
readCommand argv {argv}
[SearchAgent] using function dfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 132
Pacman emerges victorious! Score: 394
Average Score: 394.0
Scores:        394.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l bigMaze -p SearchAgent -a fn=dfs
readCommand argv {argv}
[SearchAgent] using function dfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 382
Pacman emerges victorious! Score: 304
Average Score: 304.0
Scores:        304.0
Win Rate:      1/1 (1.00)
Record:        Win
```

Figure 2: DFS Maze Results

```
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l tinyMaze -p SearchAgent -a fn=bfs
readCommand argv {argv}
[SearchAgent] using function bfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 34
Pacman emerges victorious! Score: 502
Average Score: 502.0
Scores:        502.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l mediumMaze -p SearchAgent -a fn=bfs
readCommand argv {argv}
[SearchAgent] using function bfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 367
Pacman emerges victorious! Score: 452
Average Score: 452.0
Scores:        452.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l bigMaze -p SearchAgent -a fn=bfs
readCommand argv {argv}
[SearchAgent] using function bfs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 432
Pacman emerges victorious! Score: 436
Average Score: 436.0
Scores:        436.0
Win Rate:      1/1 (1.00)
Record:        Win
```

Figure 3: BFS Maze Result

```
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l tinyMaze -p SearchAgent -a fn=ucs
readCommand argv {argv}
[SearchAgent] using function ucs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 34
Pacman emerges victorious! Score: 502
Average Score: 502.0
Scores:        502.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l mediumMaze -p SearchAgent -a fn=ucs
readCommand argv {argv}
[SearchAgent] using function ucs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 367
Pacman emerges victorious! Score: 452
Average Score: 452.0
Scores:        452.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l bigMaze -p SearchAgent -a fn=ucs
readCommand argv {argv}
[SearchAgent] using function ucs
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 432
Pacman emerges victorious! Score: 436
Average Score: 436.0
Scores:        436.0
Win Rate:      1/1 (1.00)
Record:        Win
```

Figure 4: UFS Maze Result

```
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l tinyMaze -p SearchAgent -a fn=astar,heuristic=manhattanHeuristic
readCommand argv {argv}
[SearchAgent] using function astar and heuristic manhattanHeuristic
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 34
Pacman emerges victorious! Score: 502
Average Score: 502.0
Scores:        502.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l mediumMaze -p SearchAgent -a fn=astar,heuristic=manhattanHeuristic
readCommand argv {argv}
[SearchAgent] using function astar and heuristic manhattanHeuristic
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 367
Pacman emerges victorious! Score: 452
Average Score: 452.0
Scores:        452.0
Win Rate:      1/1 (1.00)
Record:        Win
PS C:\Users\micha\gitDirs\ClassStuff\46130Homework\HomeworkOne\search> python pacm
an.py -l bigMaze -p SearchAgent -a fn=astar,heuristic=manhattanHeuristic
readCommand argv {argv}
[SearchAgent] using function astar and heuristic manhattanHeuristic
[SearchAgent] using problem type PositionSearchProblem
Path found with total cost of 999999 in 0.0 seconds
Search nodes expanded: 432
Pacman emerges victorious! Score: 436
Average Score: 436.0
Scores:        436.0
Win Rate:      1/1 (1.00)
Record:        Win
```

Figure 5: A Star Maze Result