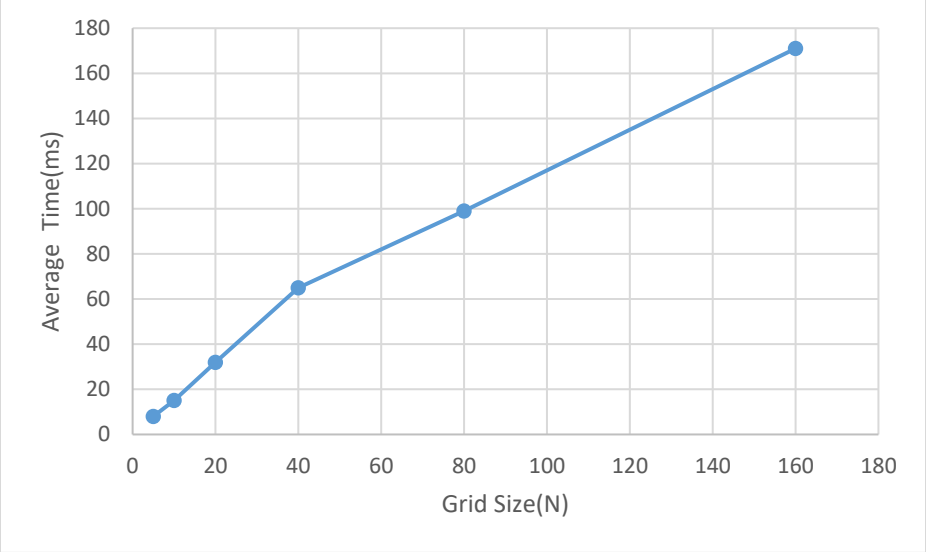
Name: Raveen Savinda Rathnayake Date: 2017-04-03

Analysis of A* algorithmic design and implementation

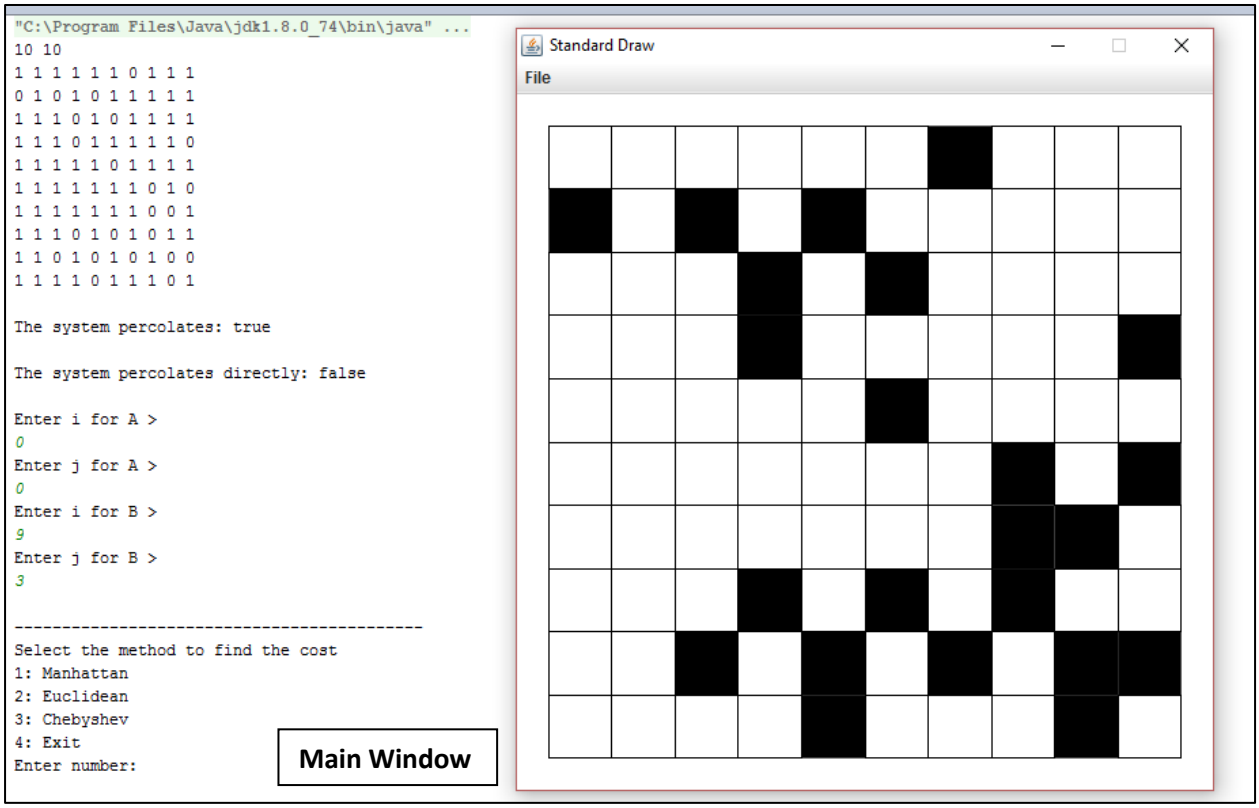
- Chebyshev method was used to calculate the time to find the shortest path.
- As the methodology **Doubling Hypothesis** was used since it is easy to use.

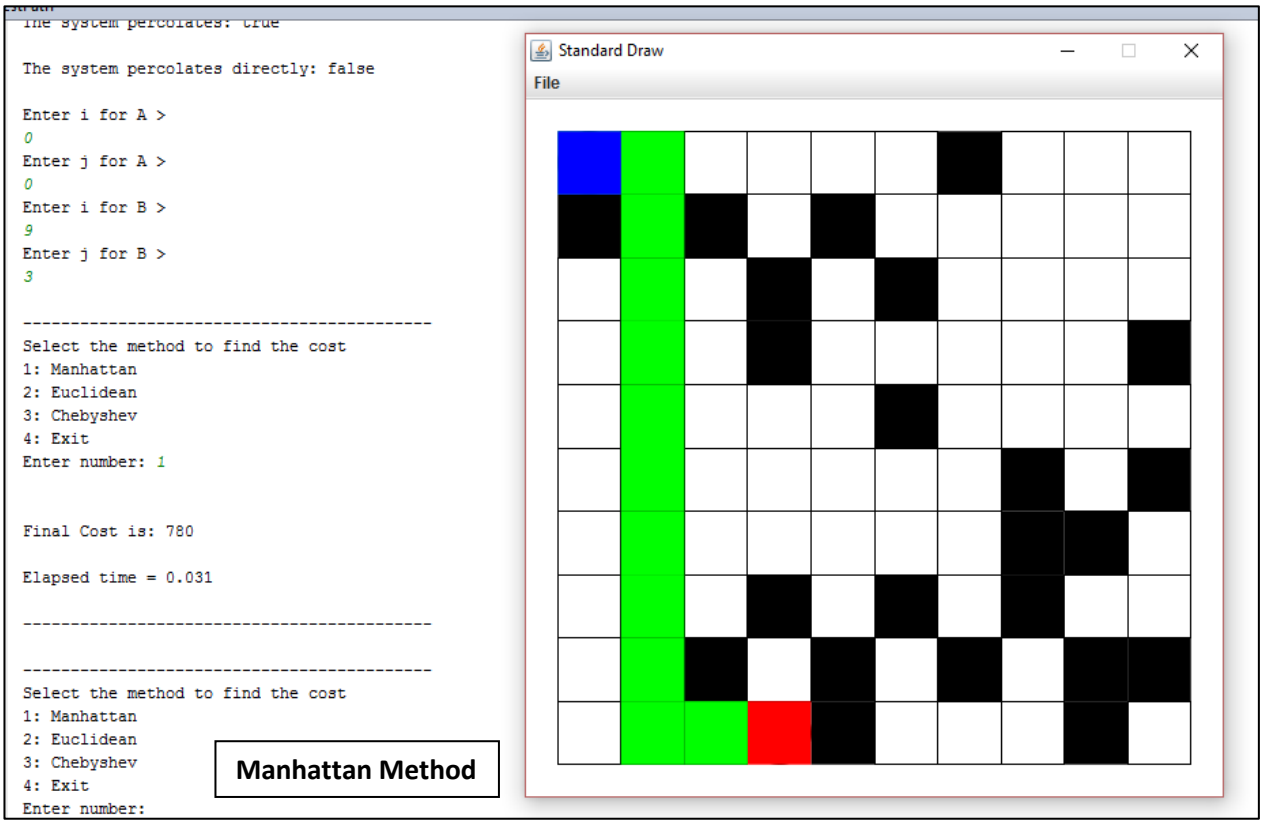
Grid Size(N)	Attempt 1 Time(s)	Attempt 2 Time(s)	Attempt 3 Time(s)	Average Time(s)	Average Time(ms)	Ratio	Log ratio (base 2)
5	0.008	0.007	0.009	0.008	8		
10	0.016	0.015	0.015	0.015	15	1.86	0.90
20	0.032	0.031	0.033	0.032	32	2.13	1.01
40	0.066	0.064	0.065	0.066	65	2.03	1.02
80	0.109	0.109	0.110	0.109	109	1.68	0.75
160	0.172	0.187	0.156	0.171	171	1.73	0.80



The estimated time complexity in N is linear. Since the ratio of change converges towards 2, two times more time spent once the grid size is doubled. So, the Big-O notation will be O(N).

Appendix:


"C:\Program Files\Java\jdk1.8.0_74\bin\java" ...
10 10
1 1 1 1 1 1 0 1 1 1
0 1 0 1 0 1 1 1 1 1
1 1 1 0 1 0 1 1 1 1
1 1 1 0 1 1 1 1 1 0
1 1 1 1 1 0 1 1 1 1
1 1 1 1 1 1 1 0 1 0
1 1 1 1 1 1 1 1 0 1
1 1 1 0 1 0 1 0 1 1
1 1 0 1 0 1 0 1 0 0
1 1 1 1 0 1 1 1 0 1
The system percolates: true
The system percolates directly: false
Enter i for A >
0
Enter j for A >
0
Enter i for B >
9
Enter j for B >
3
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number:
Main Window
Standard Draw
File


The system percolates: true
The system percolates directly: false
Enter i for A >
0
Enter j for A >
0
Enter i for B >
9
Enter j for B >
3
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number: 1
Final Cost is: 780
Elapsed time = 0.031
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number:
Manhattan Method
Standard Draw
File

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```
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number: 1


Final Cost is: 780

Elapsed time = 0.031

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Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number: 2


Final Cost is: 468

Elapsed time = 0.016

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-----------------------------------------
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number:
```
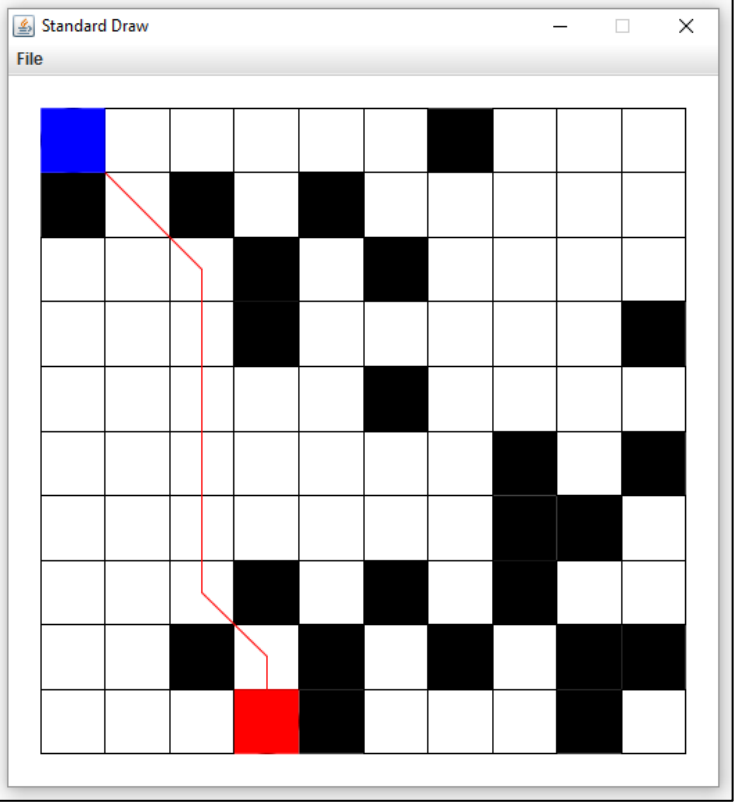

Euclidean Method




```
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number: 2


Final Cost is: 468

Elapsed time = 0.016

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-----------------------------------------
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number: 3


Final Cost is: 450

Elapsed time = 0.016

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-----------------------------------------
Select the method to find the cost
1: Manhattan
2: Euclidean
3: Chebyshev
4: Exit
Enter number:
```

Chebyshev Method