

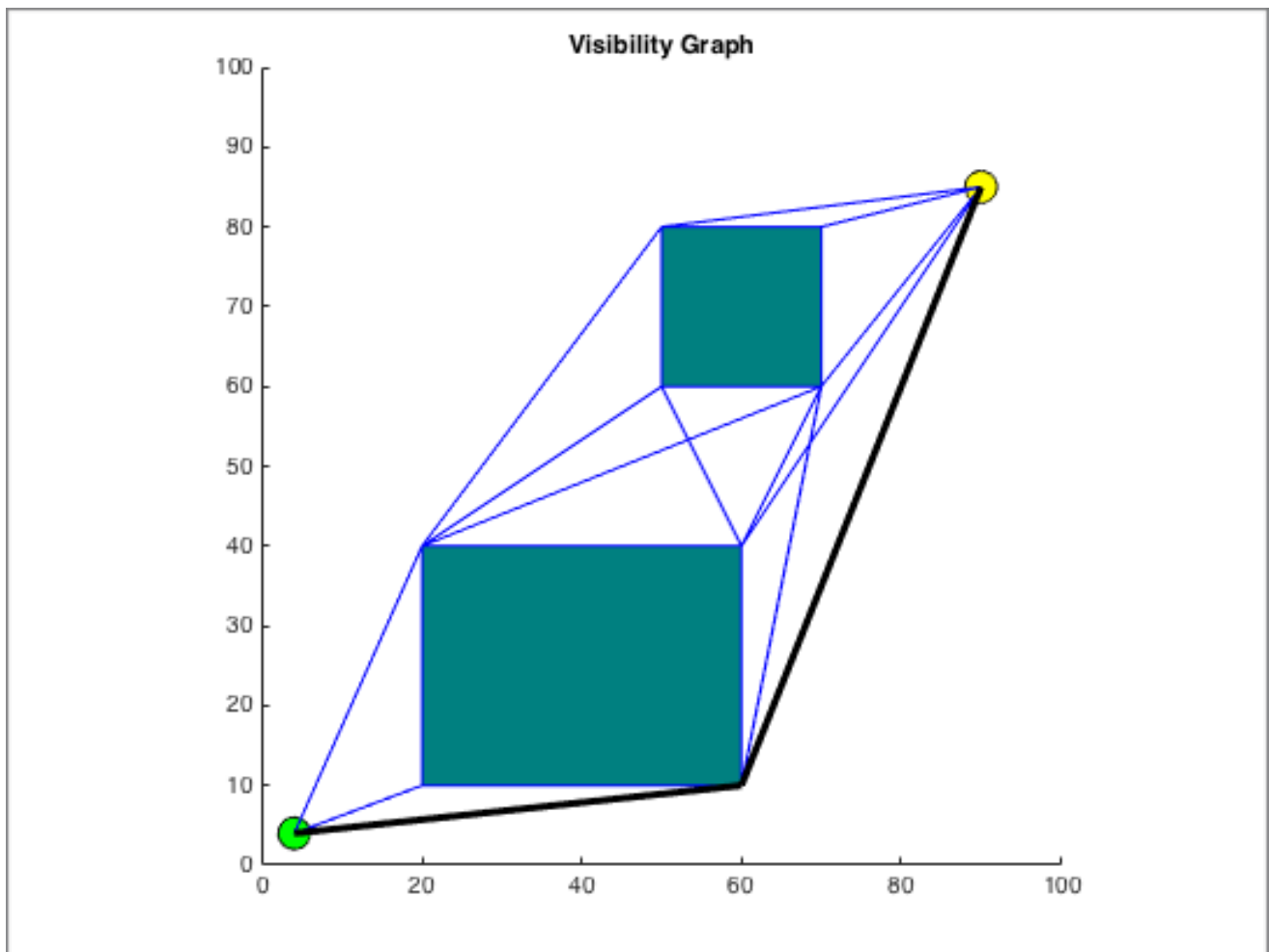
Homework 2 Report
Robotics Assignment
Aditya Jain, 2014129

Start = [4,4]; % start position
Goal = [90, 85]; % goal position

Visibility Graph

1st Configuration:

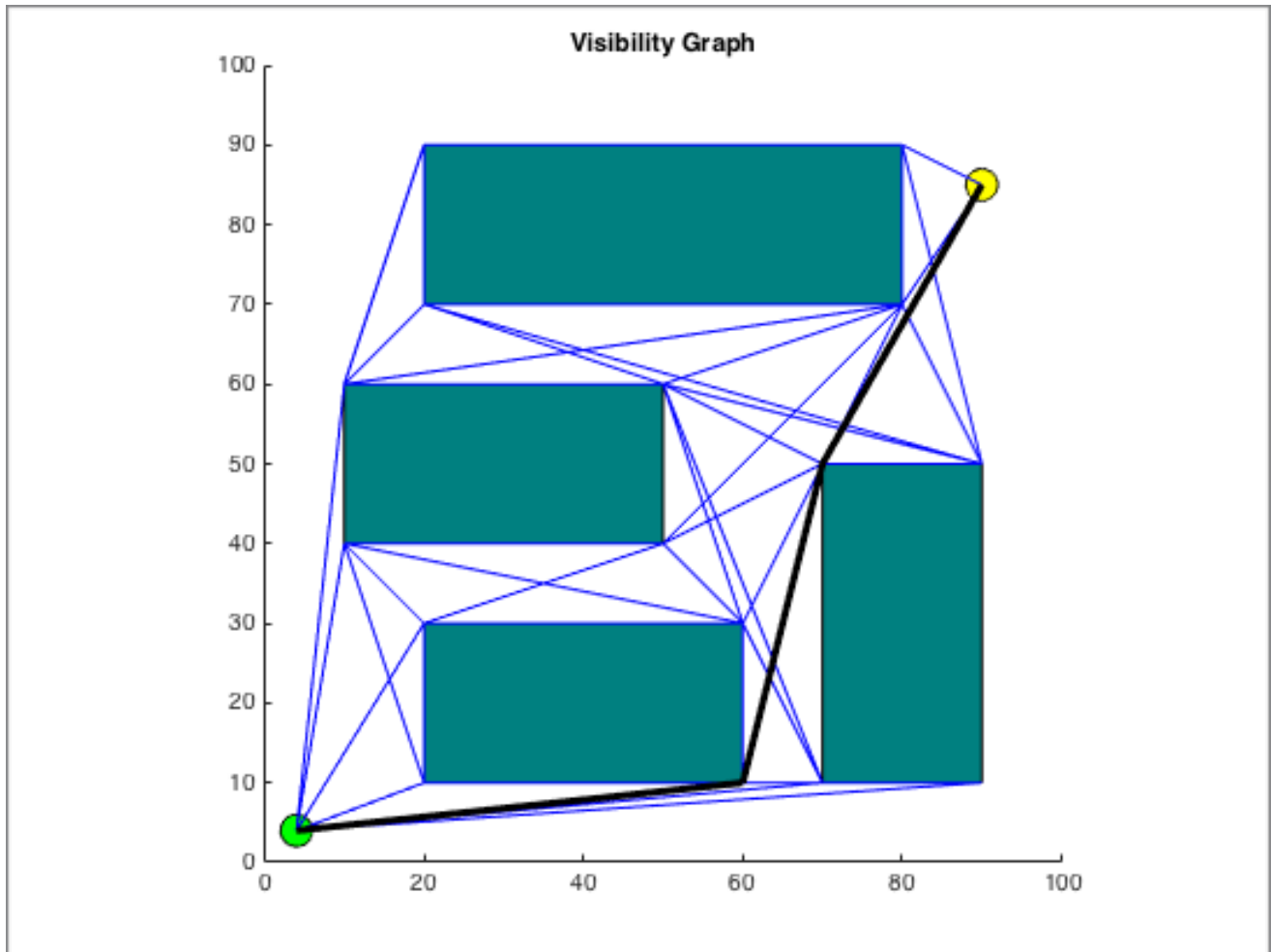
Time taken: 0.335487 seconds
Total Path: 137.0980 units



2nd Configuration:

Time taken: 0.635389 seconds

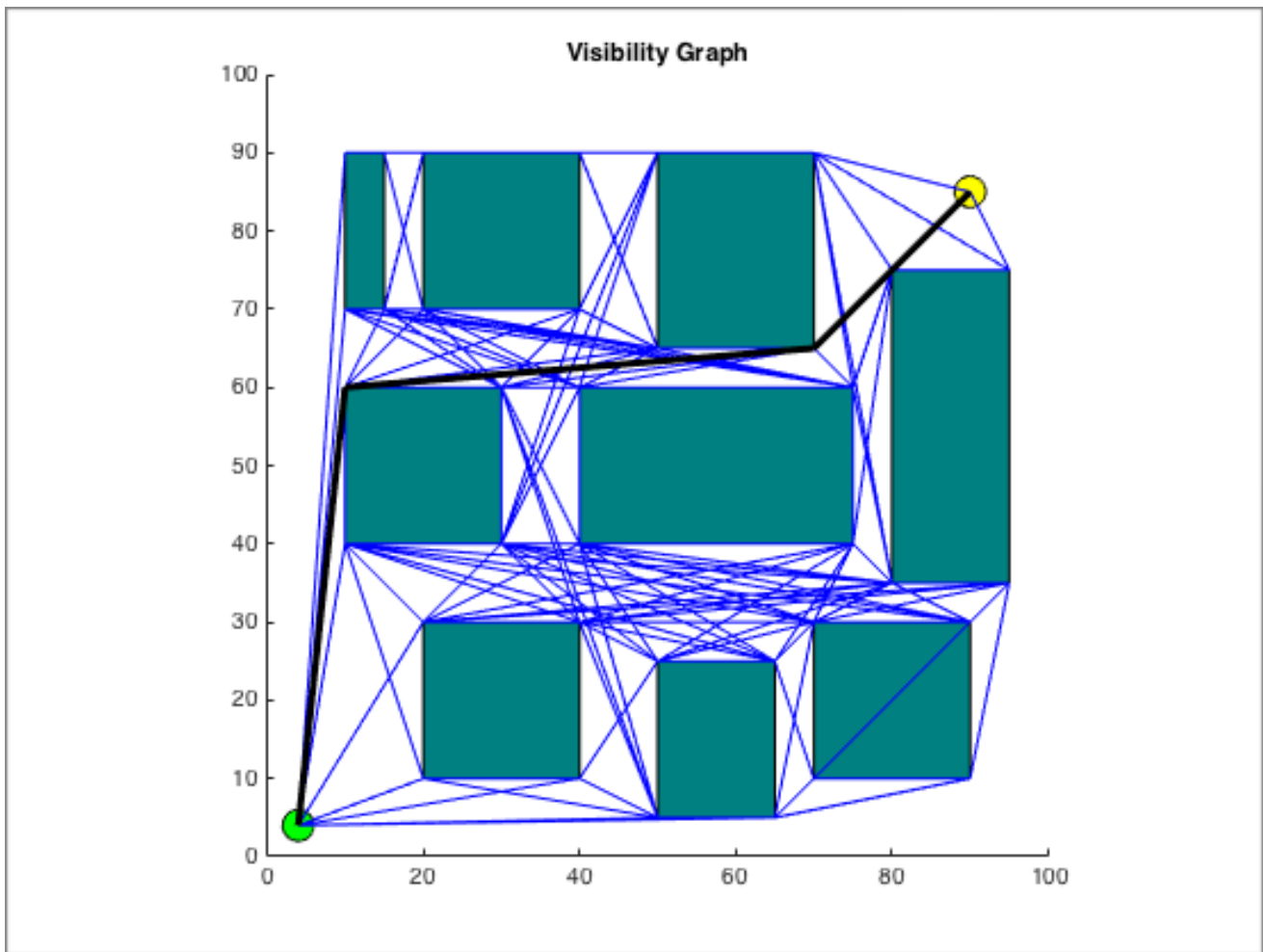
Total Path: 137.8629 units



3rd Configuration:

Time taken: 1.326453 seconds

Total Path: 144.8128 units



RRT

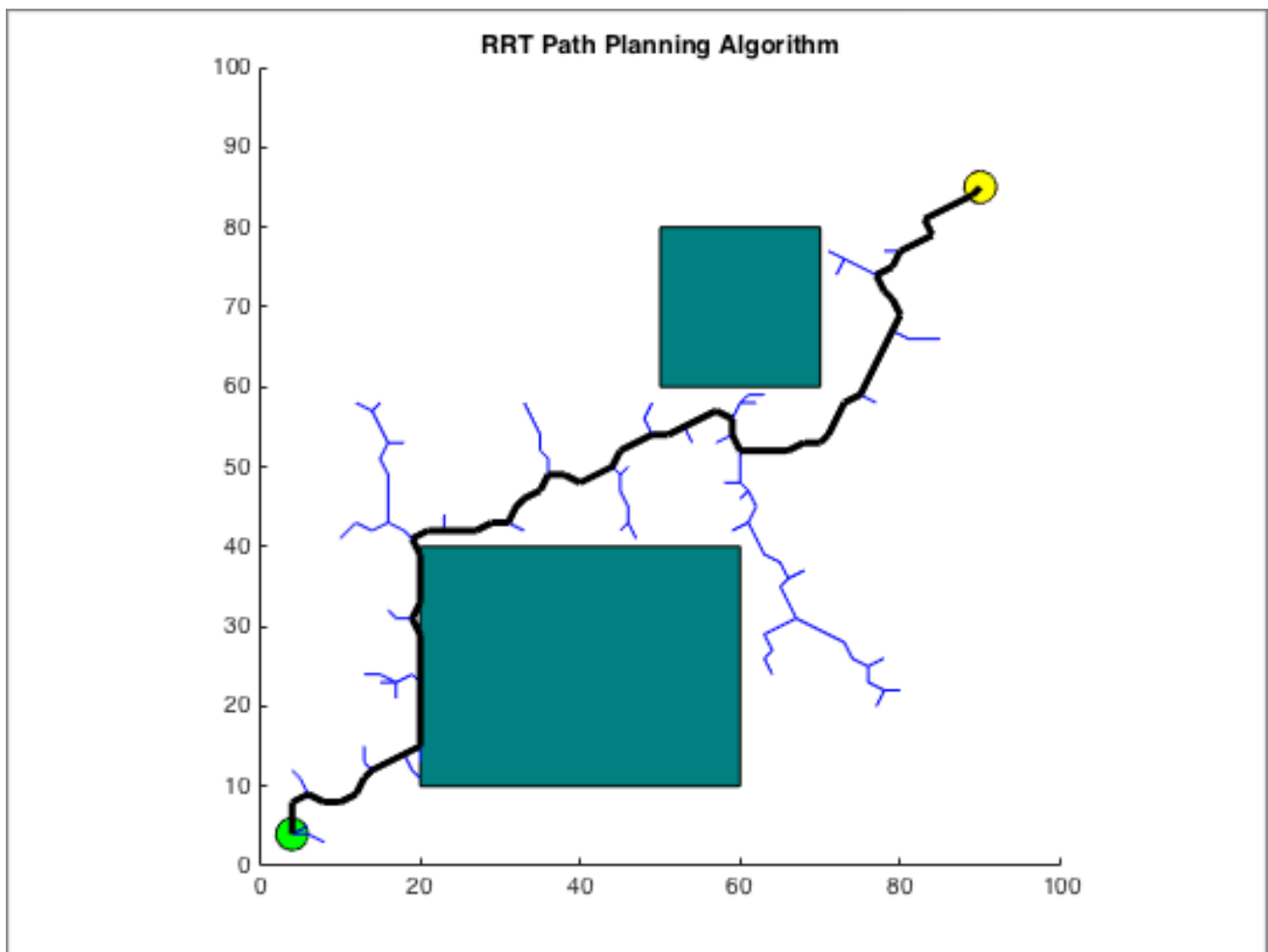
Step size: 2 units

Bias factor: 7 (every 7th random point chosen is the goal position)

1st Configuration:

Time taken: 57.063726 seconds

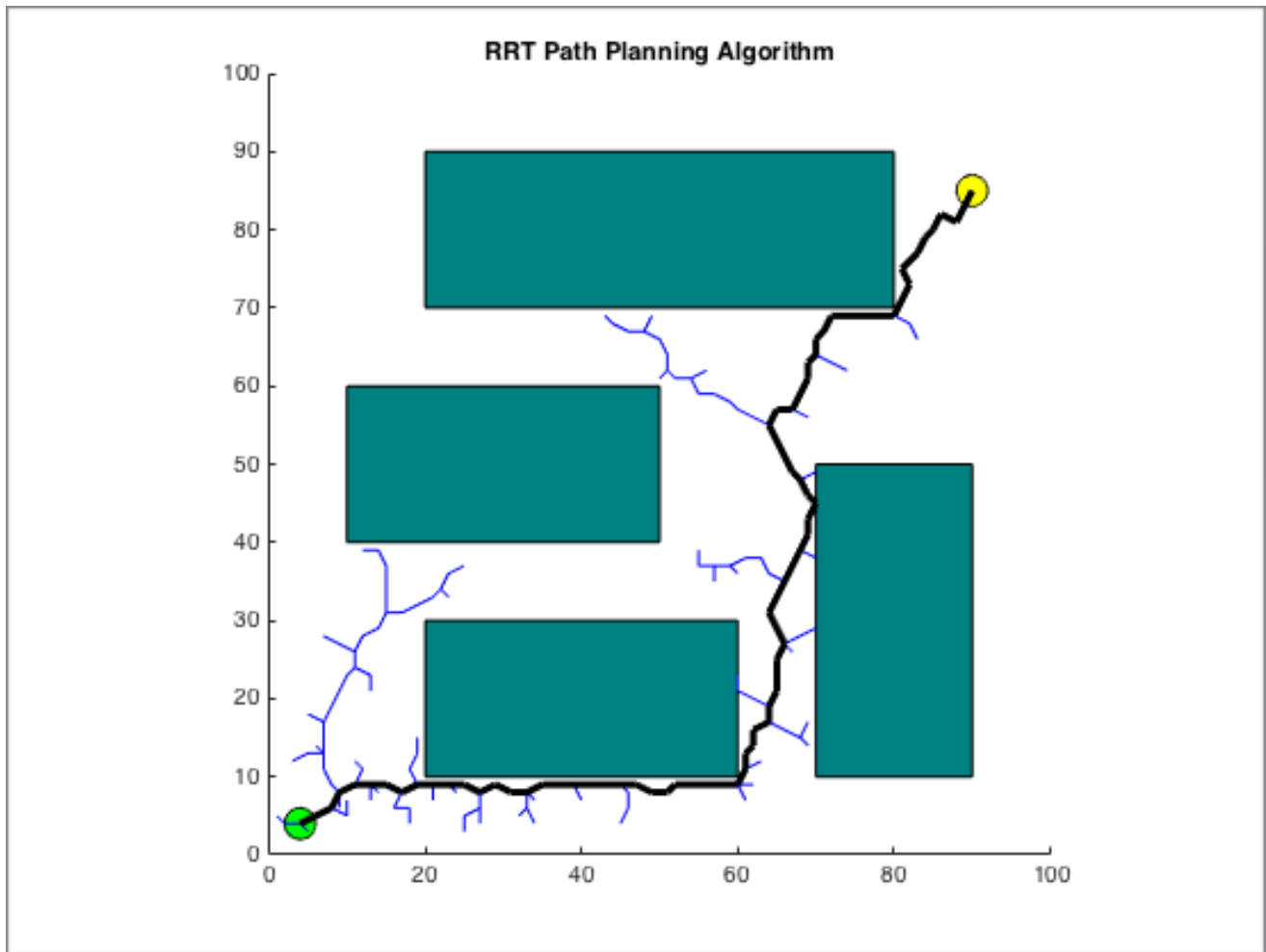
Total Path: 155.6941 units



2nd Configuration:

Time taken: 67.647765 seconds

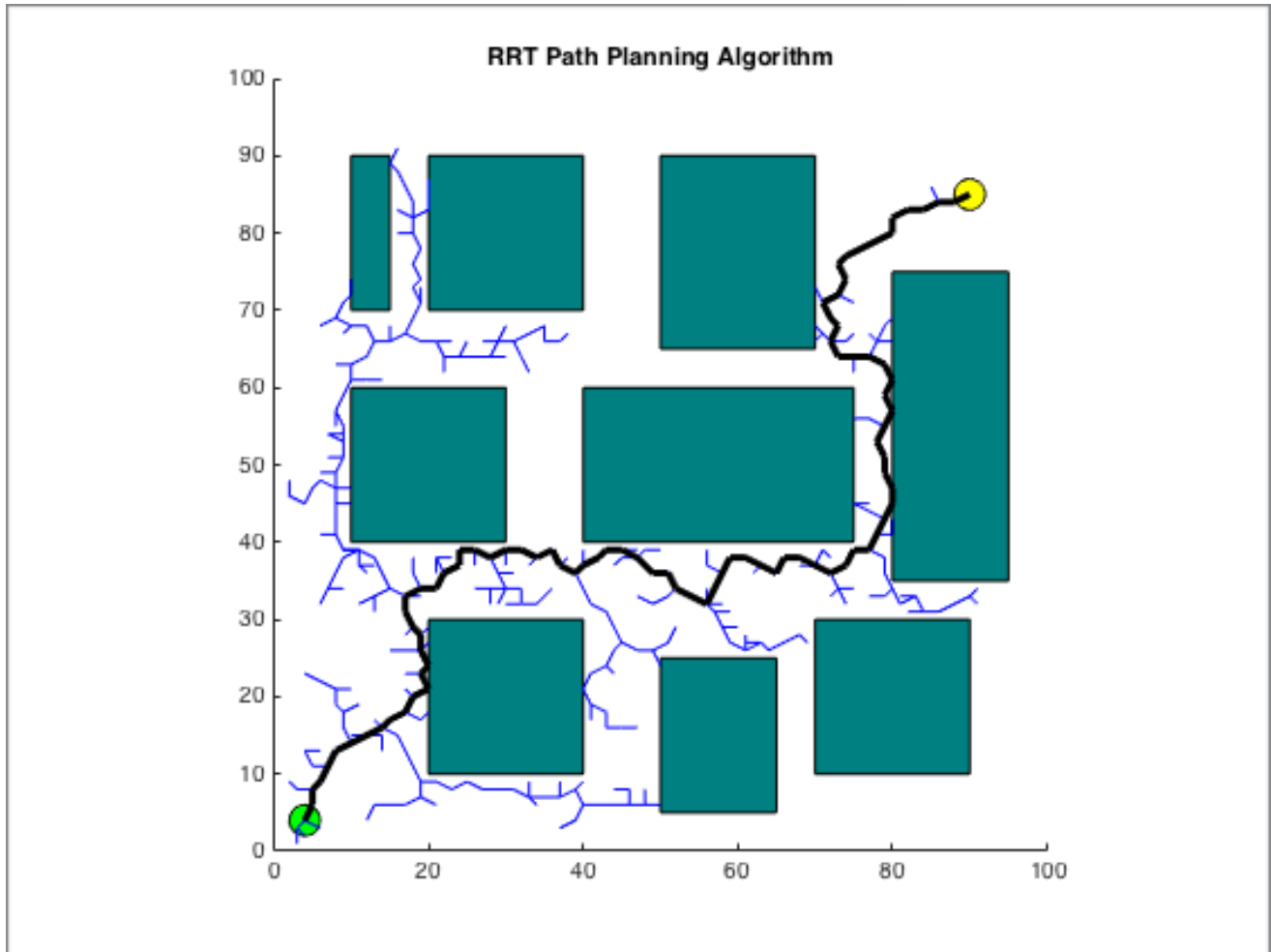
Total Path: 159.9346 units



3rd Configuration:

Time taken: 461.950626 seconds

Total Path: 184.0701 units



RRT*

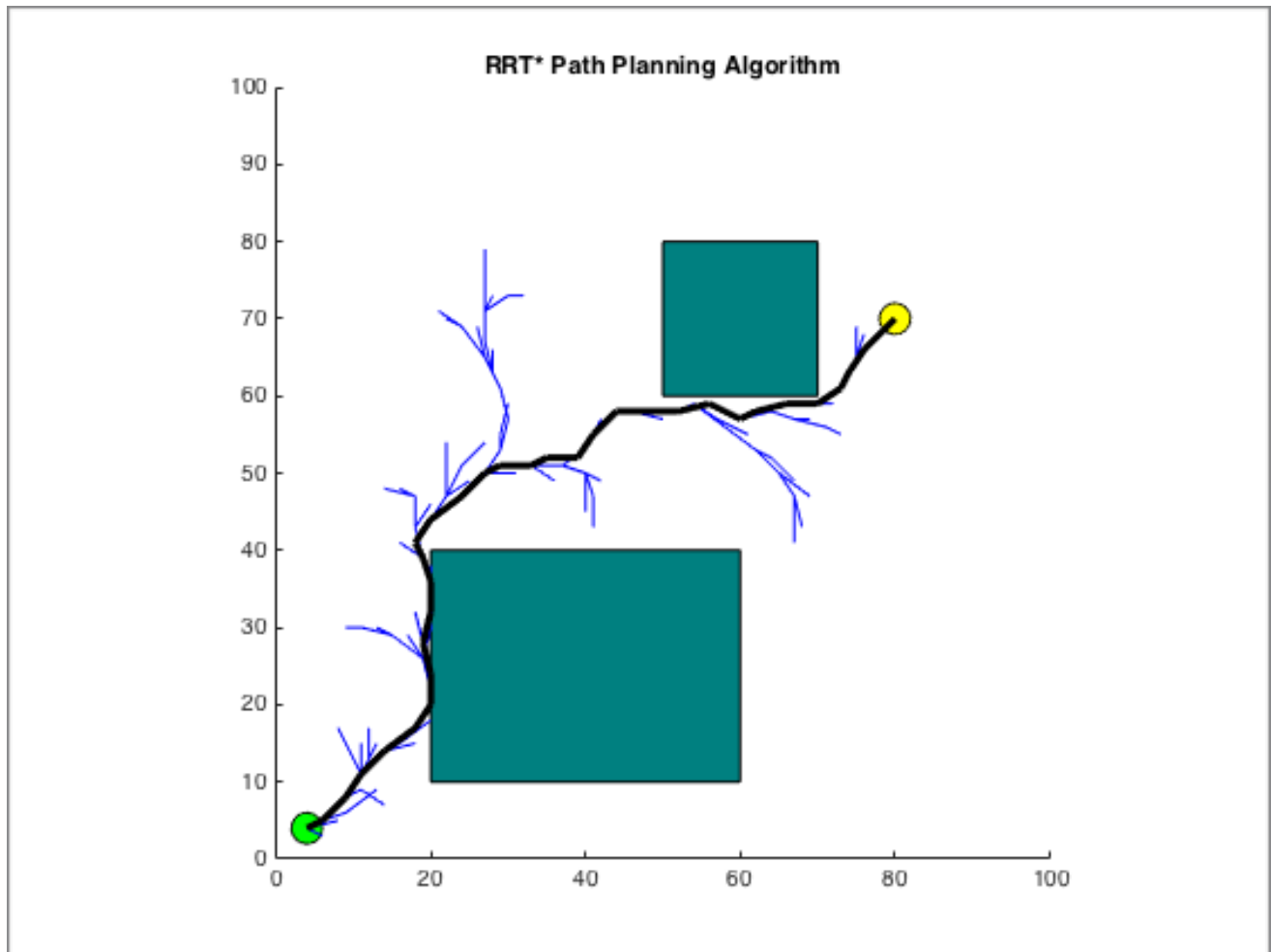
Step size: 2 units

Bias factor: 7

Neighbourhood size: 5 units

(every 7th random point chosen is the goal position)

(this is the vicinity factor in RRT*)



1st Configuration:

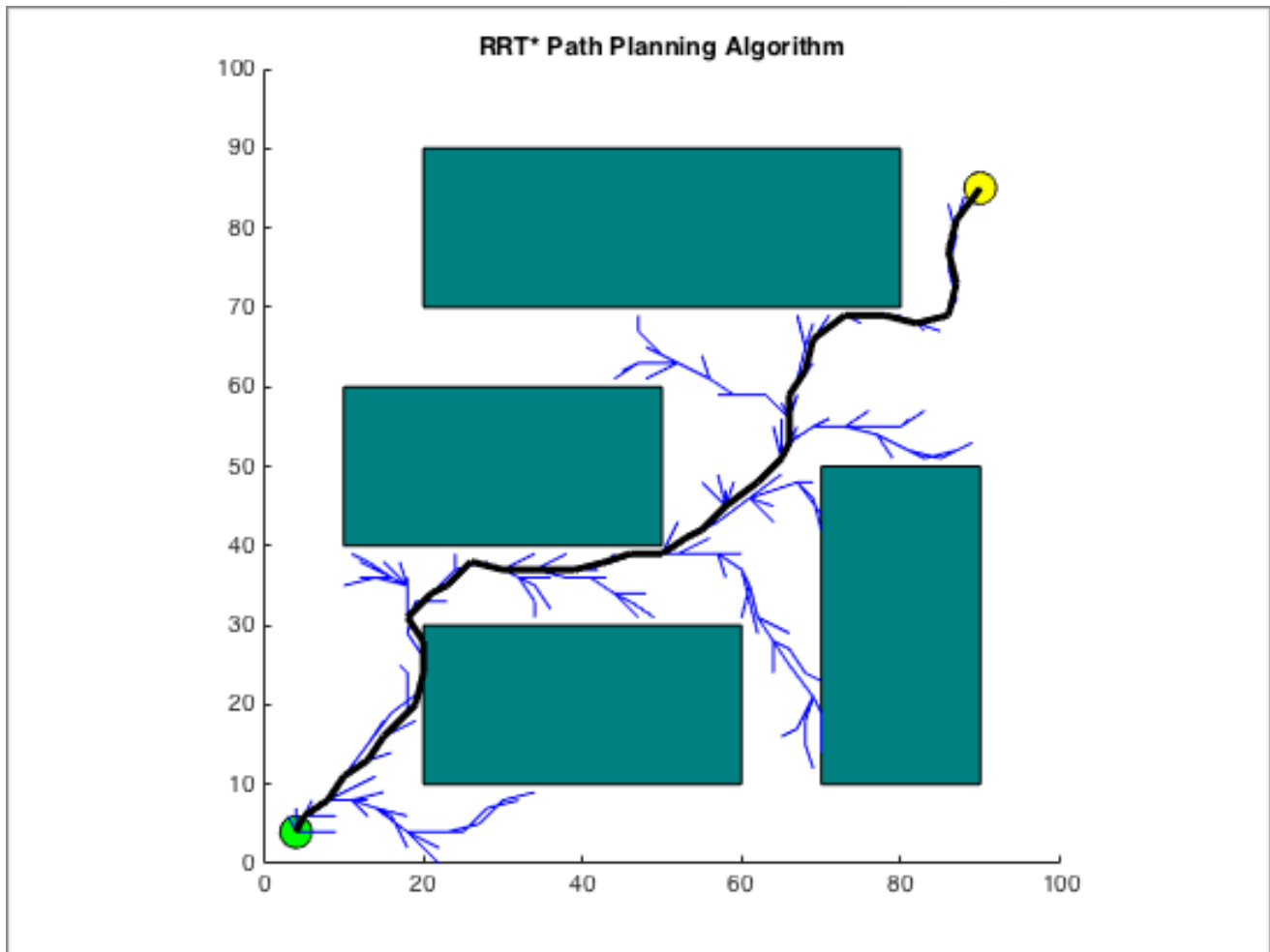
Time taken: 60.050021 seconds

Total Path: 119.8040 units

2nd Configuration:

Time taken: 240.335808 seconds

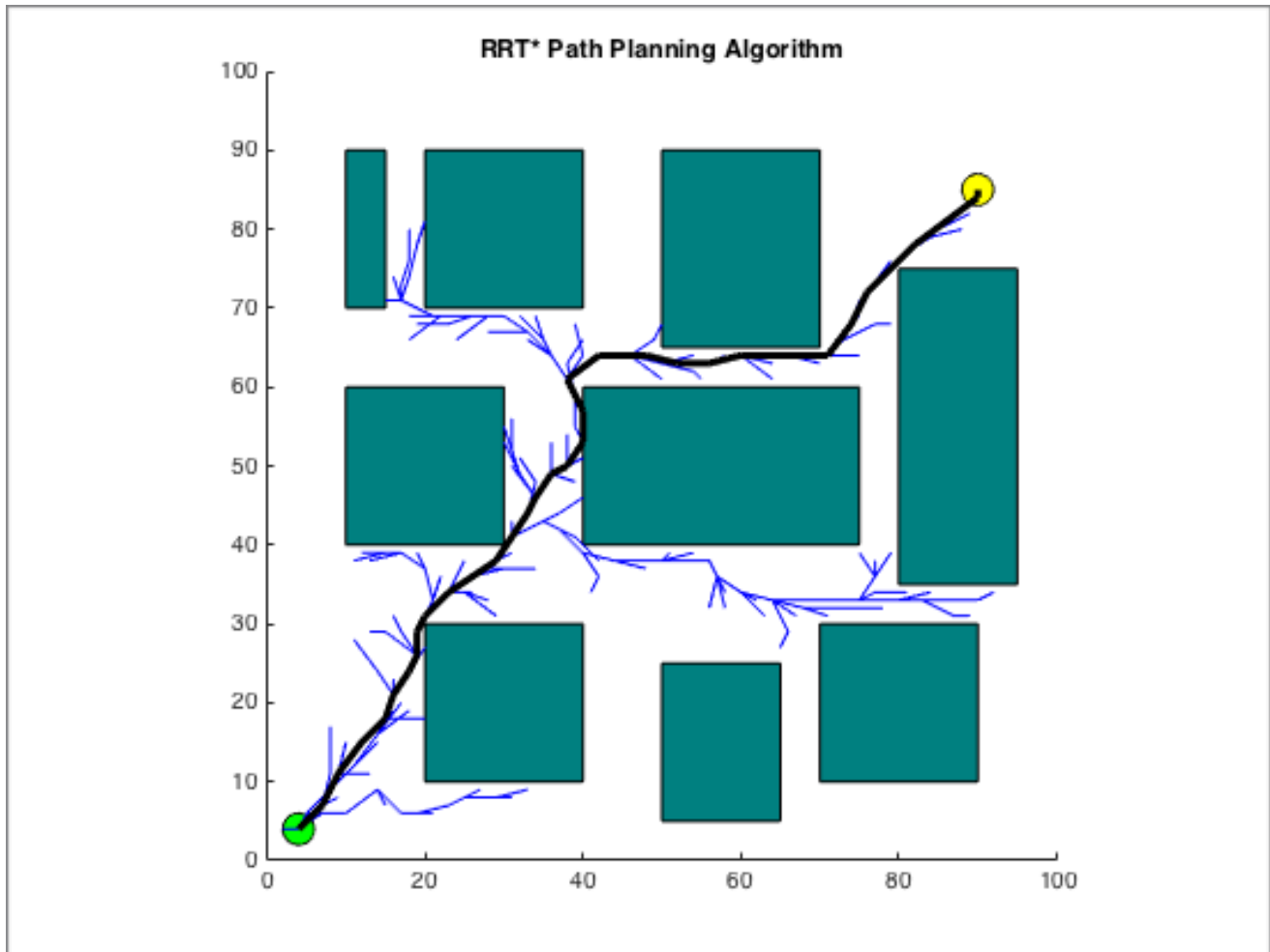
Total Path: 140.0808 units



3rd Configuration:

Time taken: 619.424038 seconds

Total Path: 134.2212 units



| | Configuration 1 | | Configuration 2 | | Configuration 3 | |
|-------------------------|---------------------------|----------------------------|---------------------------|----------------------------|---------------------------|----------------------------|
| | Path Length (in units) | Time Taken (in seconds) | Path Length (in units) | Time Taken (in seconds) | Path Length (in units) | Time Taken (in seconds) |
| Visibility Graph | 137.0980 | 0.335487 | 137.8629 | 0.635389 | 144.8128 | 1.326453 |
| RRT | 155.6941 | 57.063726 | 159.9346 | 67.647765 | 184.0701 | 461.950626 |
| RRT* | 119.8040 | 60.050021 | 140.0808 | 240.335808 | 134.2212 | 619.424038 |

Advantages:

- Visibility graph gives the path in minimal time
- Easy to follow a path given by the visibility graph, as the no of turns are less as compared to RRT and RRT* (more smooth path)
- RRT* gives the optimal (i.e. shortest) path among the others

Disadvantages:

- RRT and RRT* are computationally very expensive and take lot of time to converge
- Visibility graph has complexity of $O(n^3)$. Thus if the number of obstacles are large, it will take a lot of time to compute the path
