

1 Running the Code

The file to run is main.m. There is *dubincircles* function that generates 4 dubin circle centers. This works as input to the 4 dubin functions named LSL, LSR, RSR and RSL. Each of this function gives an output of cost, path and the function name. Using the shortest path function, the minimum path is computed together with the minimum cost and the name of the shortest dubin path function. For allowing user to test In part A, the direction of the initial and goal position is a random orientation between 0 and 2π .

2 Dubin Paths

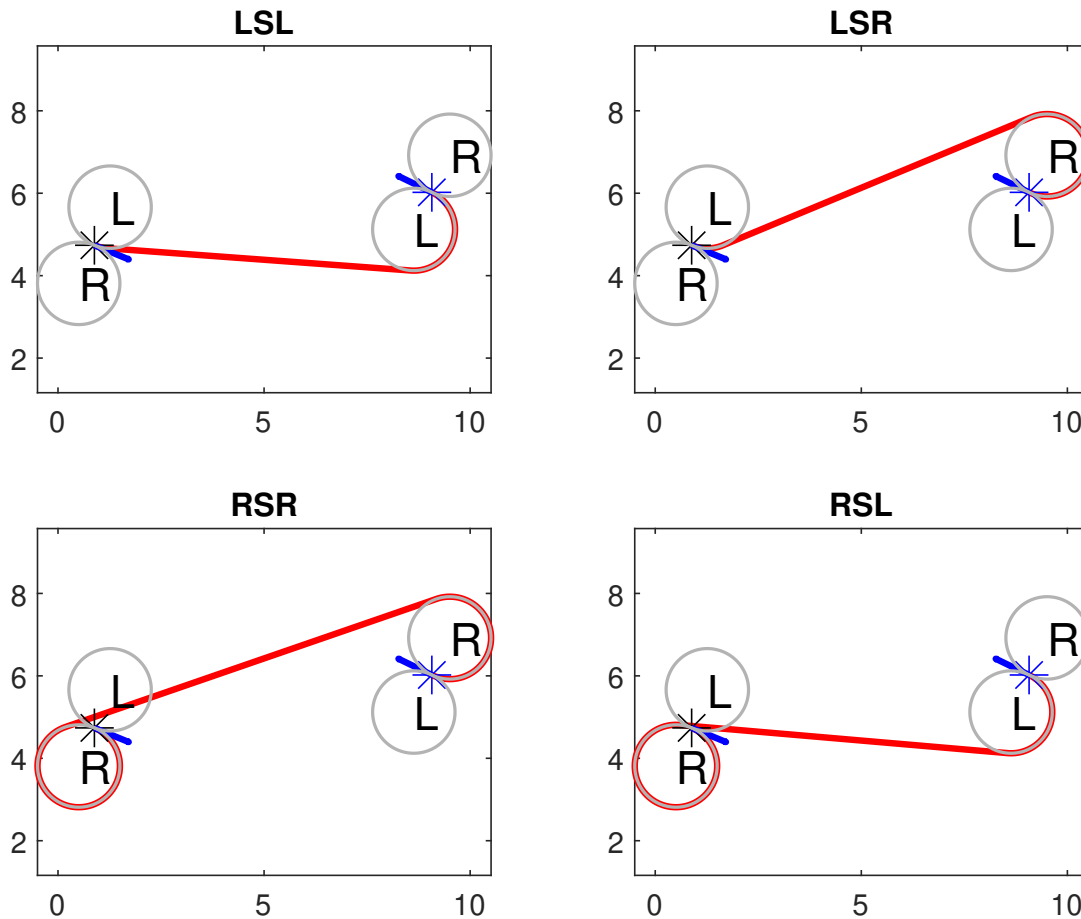


Figure 1: Different Dubin Paths between start and goal

Dubin Path	Cost
LSL	9.7543
LSR	14.0158
RSL	15.5542
RSR	19.2627

Table 1: Table showing cost of each Dubin Path

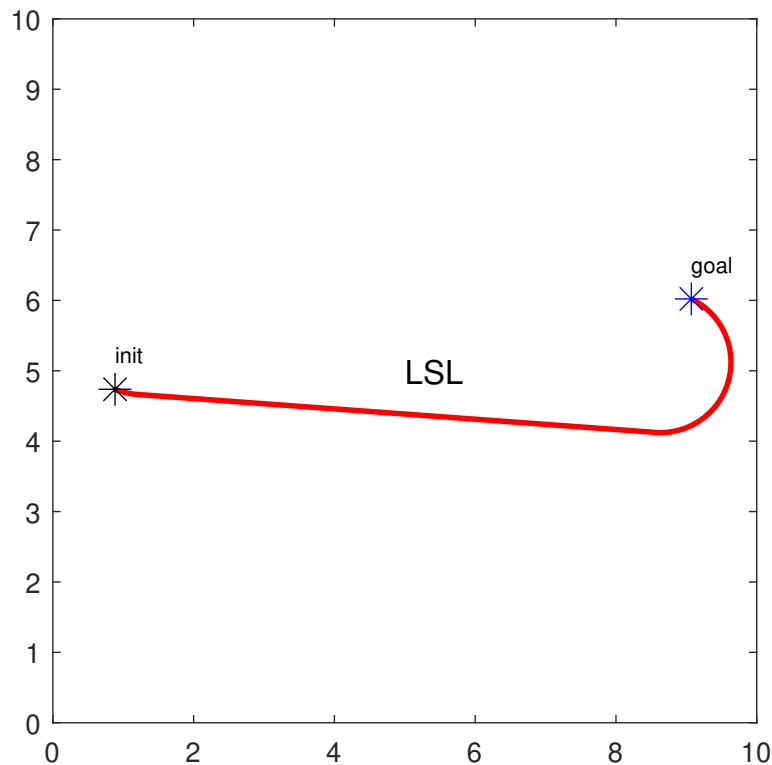


Figure 2: Path based on Dubins algorithm

3 RRT with Dubins Path and distance

Figure 3 shows the tree and path generated from RRT using dubins distance in an obstacle filled environment. The result obtained when the distance calculated is based on dubin distance and not euclidean distance is shown in Fig. 4

4 Discussion

From Table 2, it can be seen that using dubins as a local planner and using dubin distance, there is a shorter cost between initial pose and goal pose. It should be noted that for more

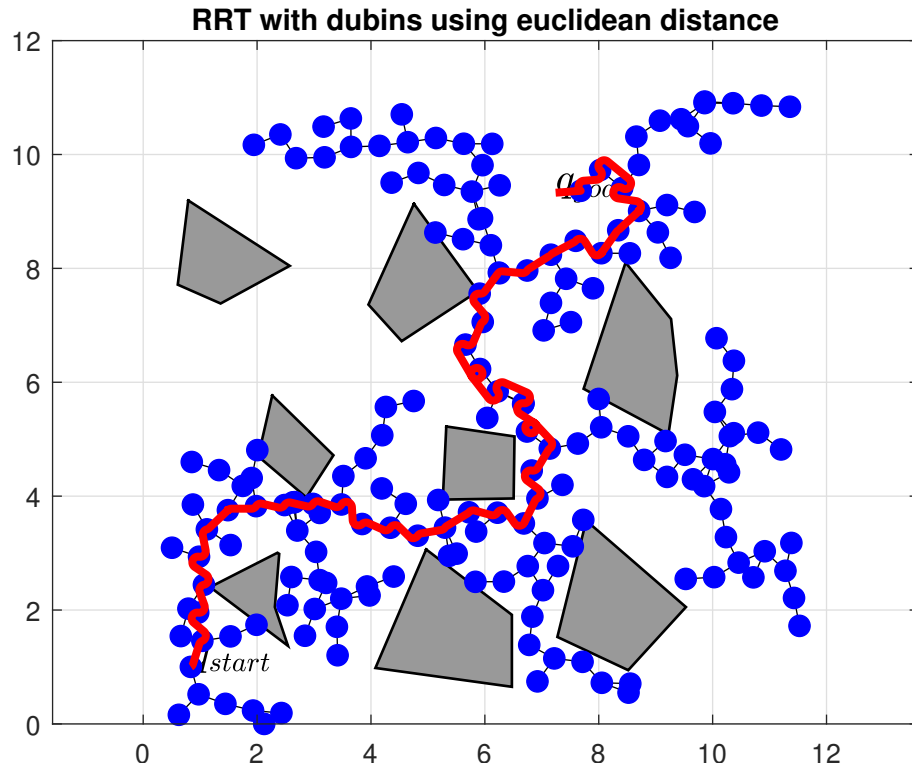


Figure 3: Basic RRT with Dubins

efficient path, the turning radius of the robot should not be too big. If it is too big, the path will be generated though, but the cost will be higher. The result obtained in such case is shown in Fig. 5 and Fig. 6. In case 3, the steering parameter for RRT is increased, without increasing the dubin turning radius, the result obtained is shown in Fig. 7 and Fig. 8. Also, the trees generated by the RRT with dubin distance and RRT with euclidean distance are different because the samples generated to decide each node and edge is a random number. Thus, no direct comparison can be made between the trees but the path generated can be compared and it is seen that RRT with dubin distance generates a shorter path.

Planner	Cost(dubin radius=0.1)	Cost(dubin radius=1)
RRT with Dubin Path	109.2043	324.36
RRT with Dubin Path and distance	74.5131	436.69

Table 2: RRT Planners with and without Dubin

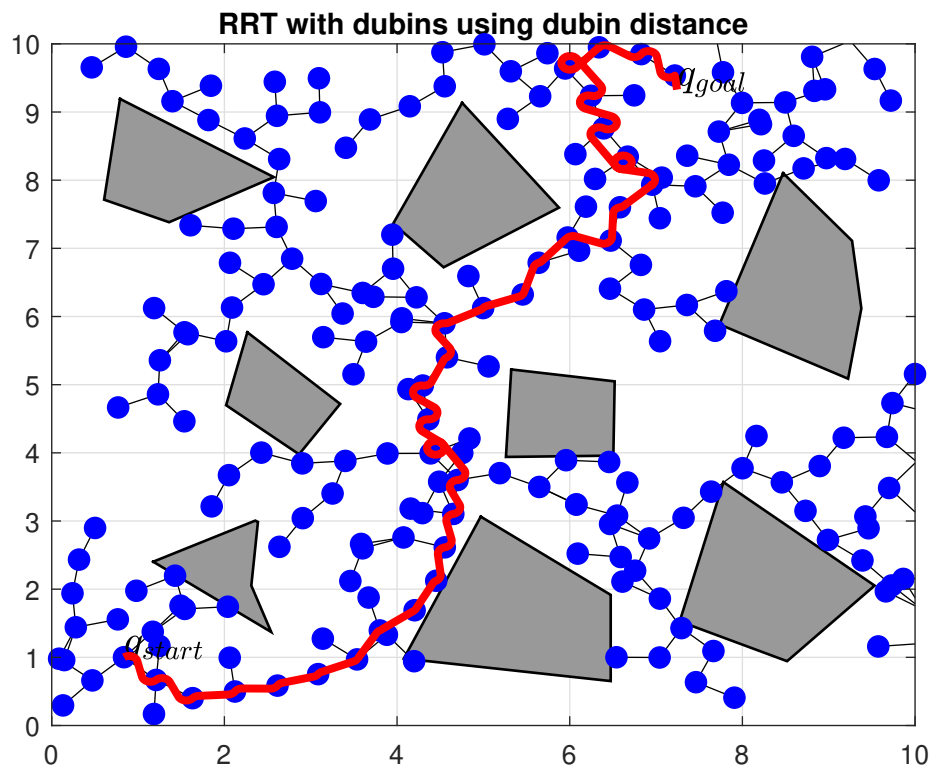


Figure 4: Optimized RRT with dubins

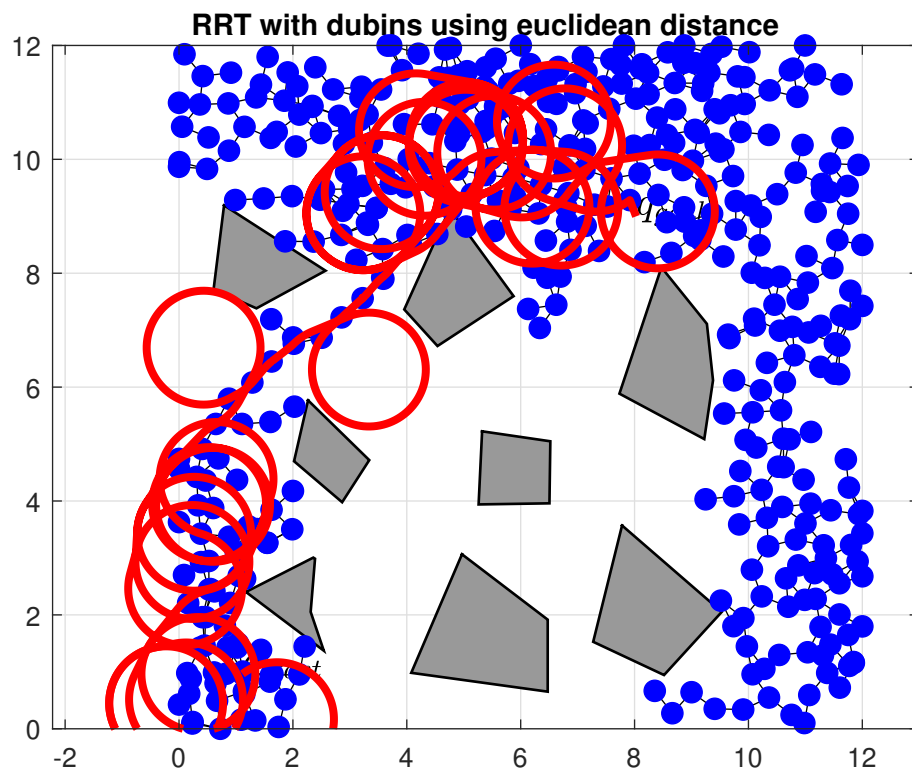


Figure 5: Basic RRT with Dubins (Case 2)

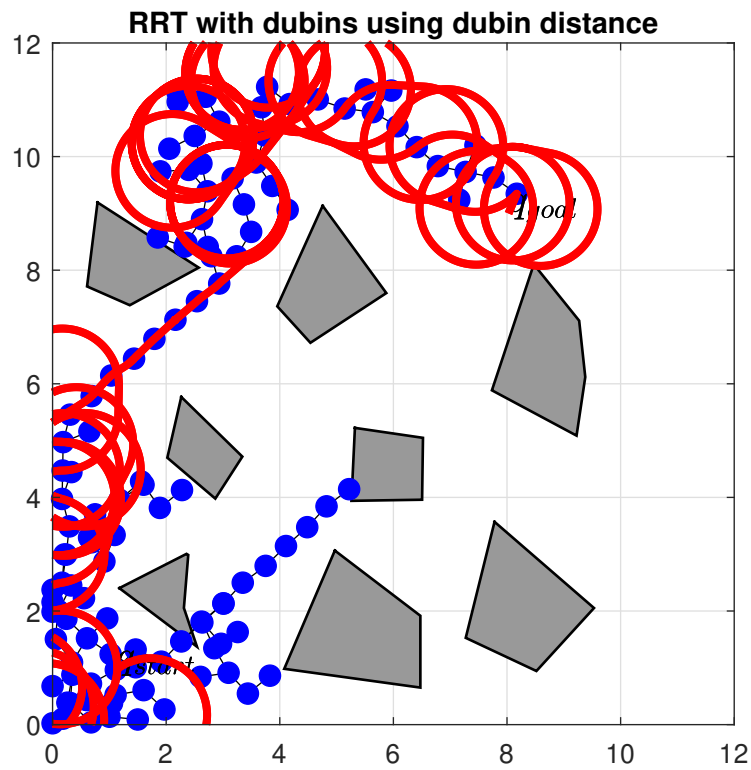


Figure 6: Optimized RRT with dubins(Case 3)

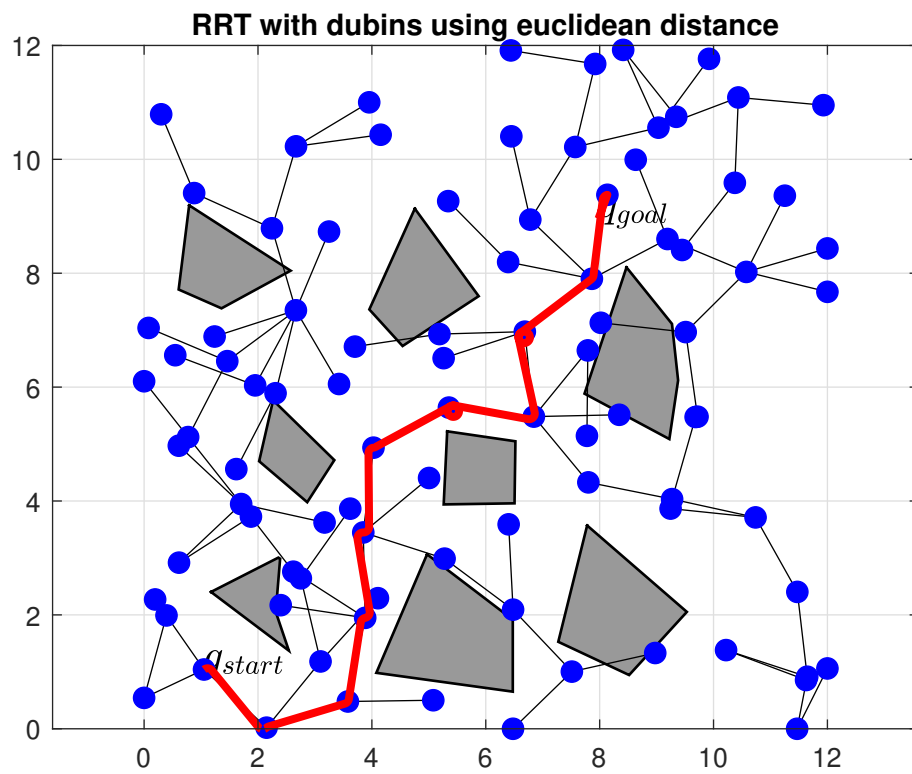


Figure 7: Basic RRT with Dubins(Case 3)



Figure 8: Optimized RRT with dubins (Case 3)