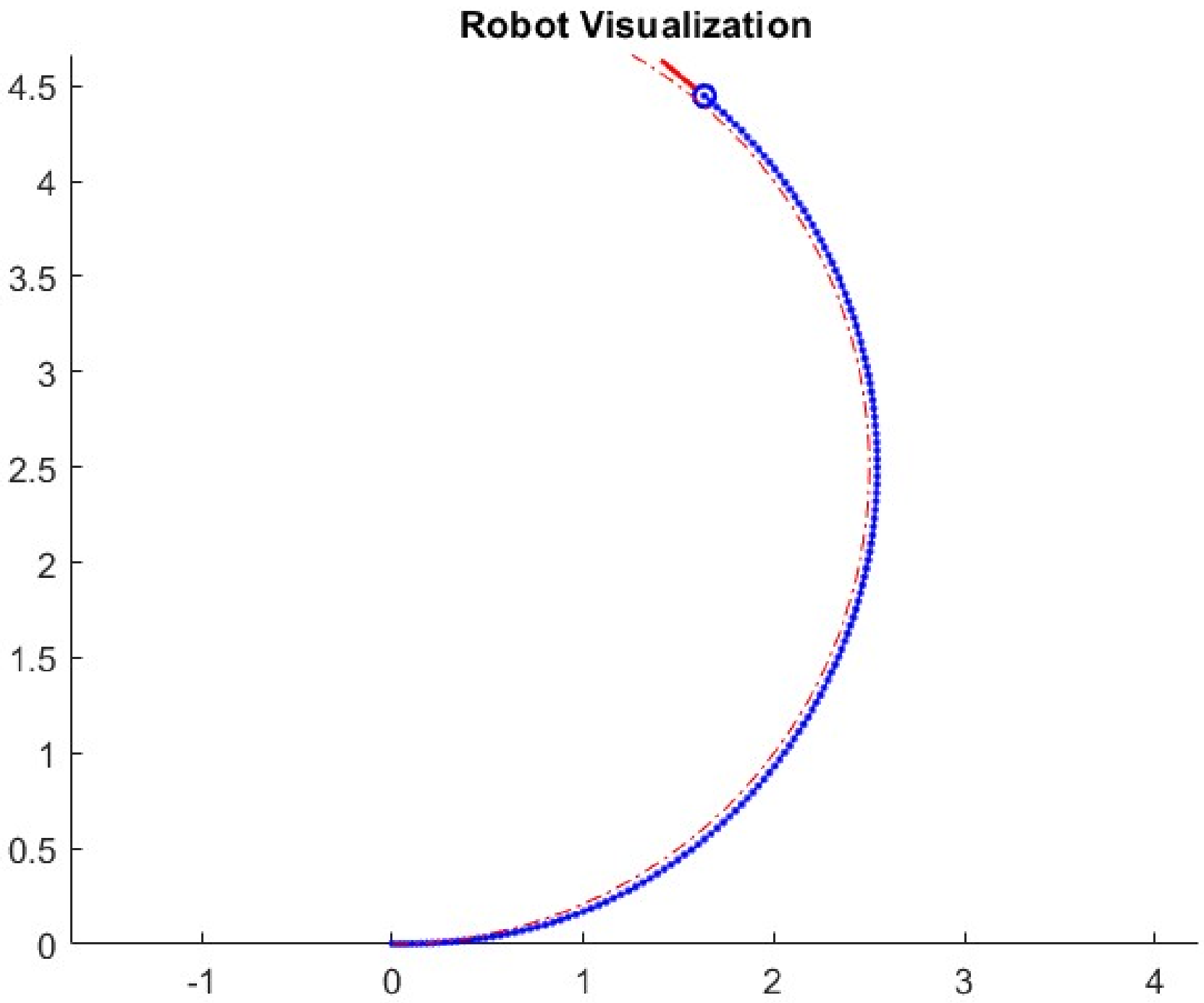
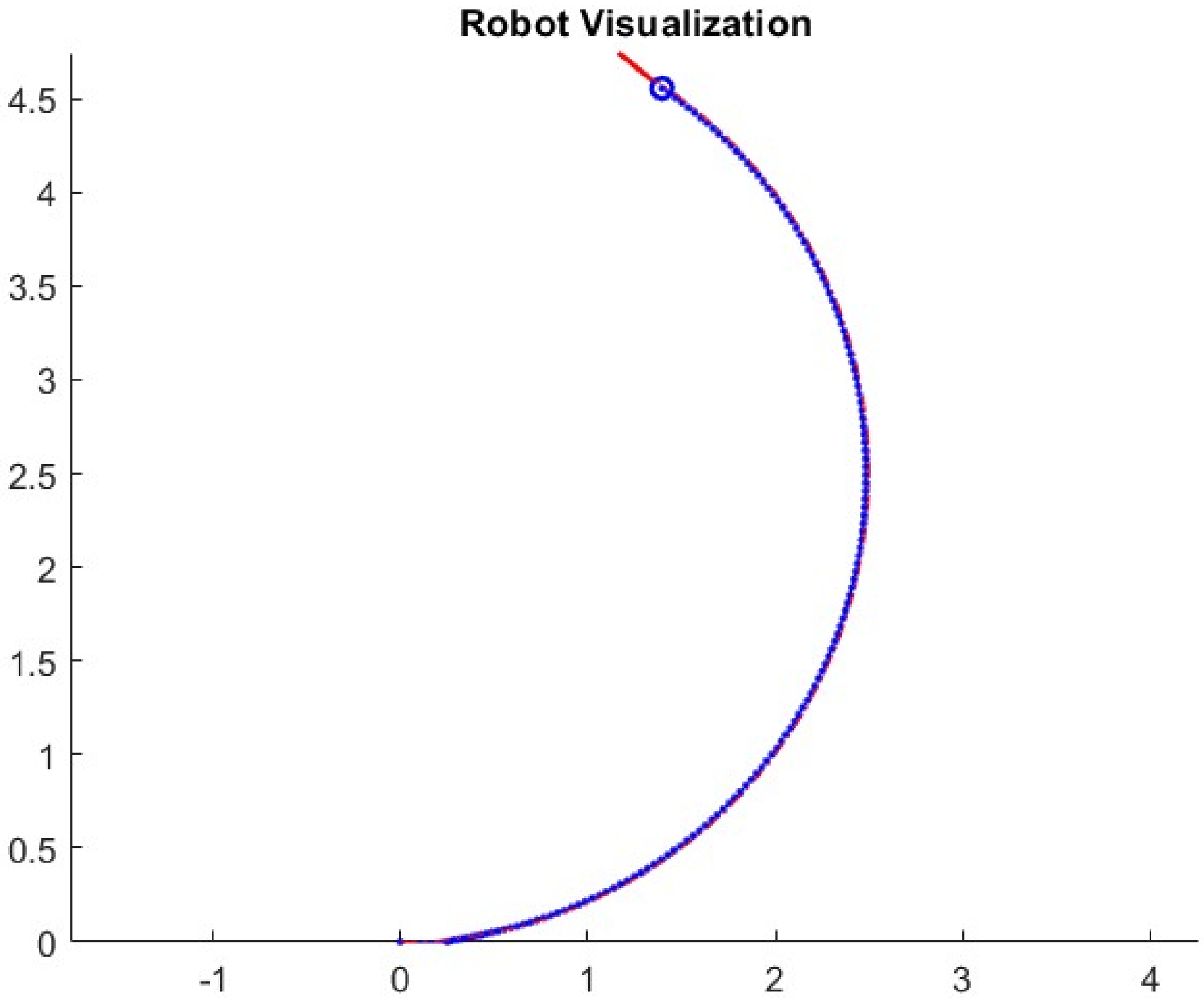
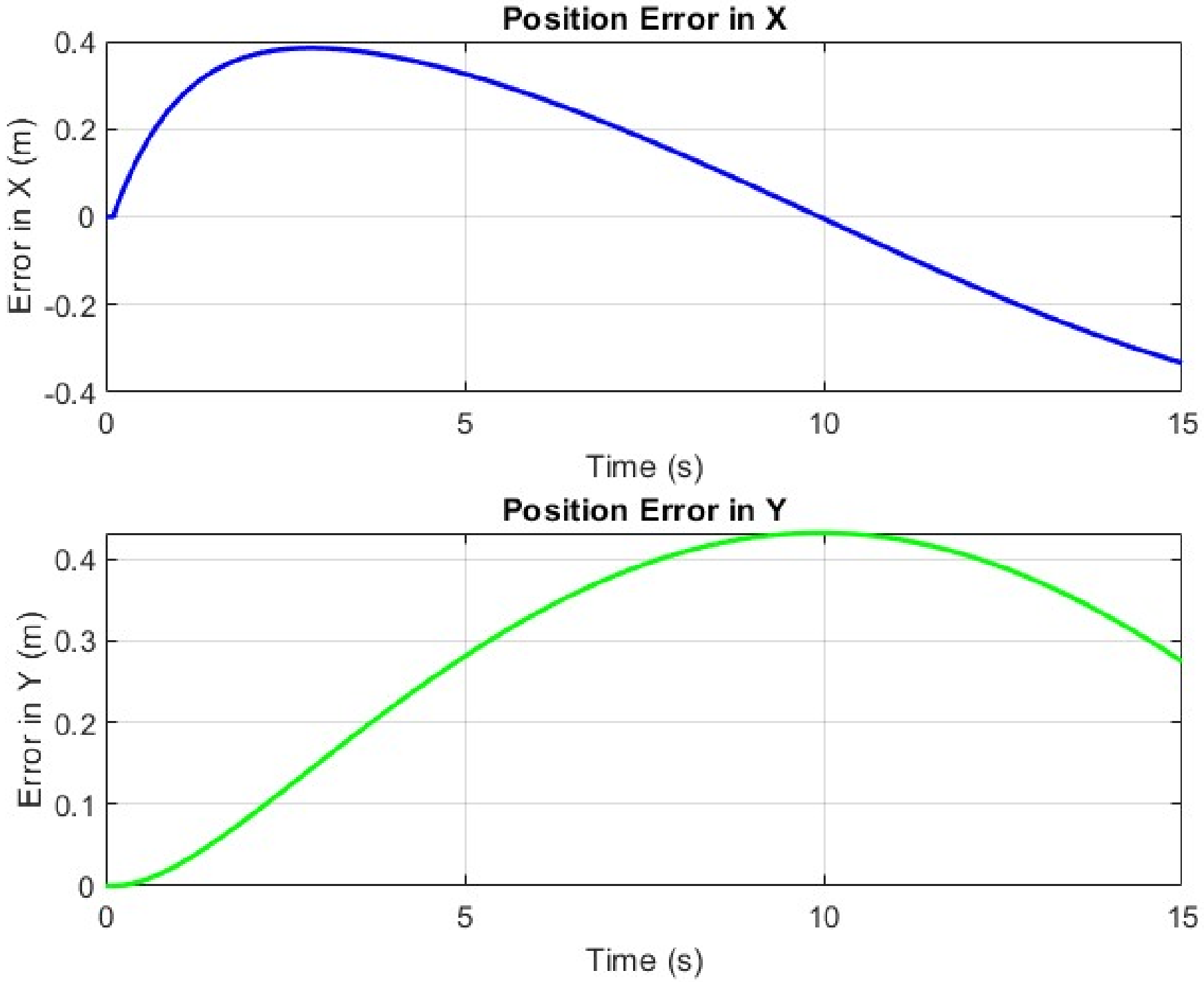
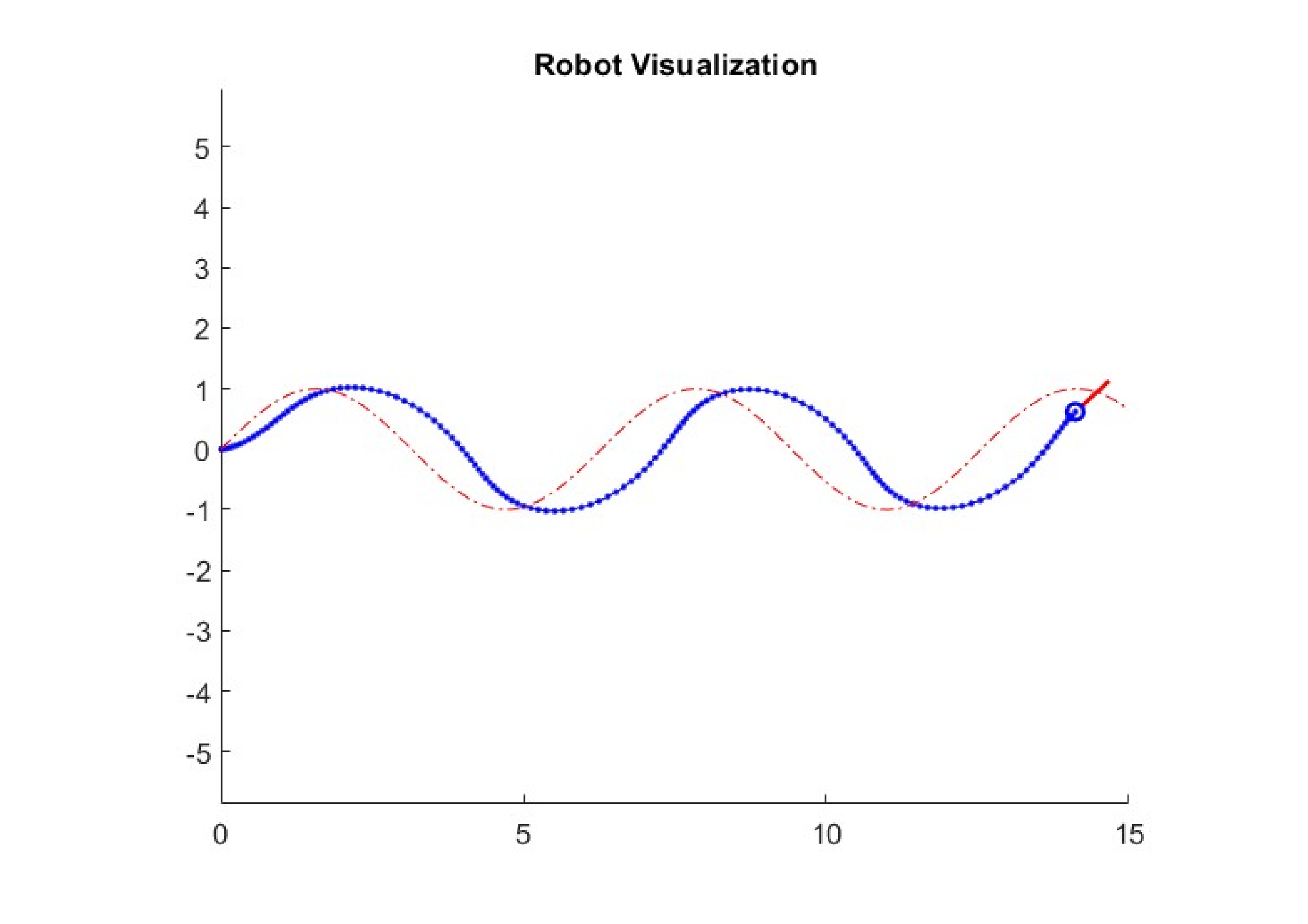
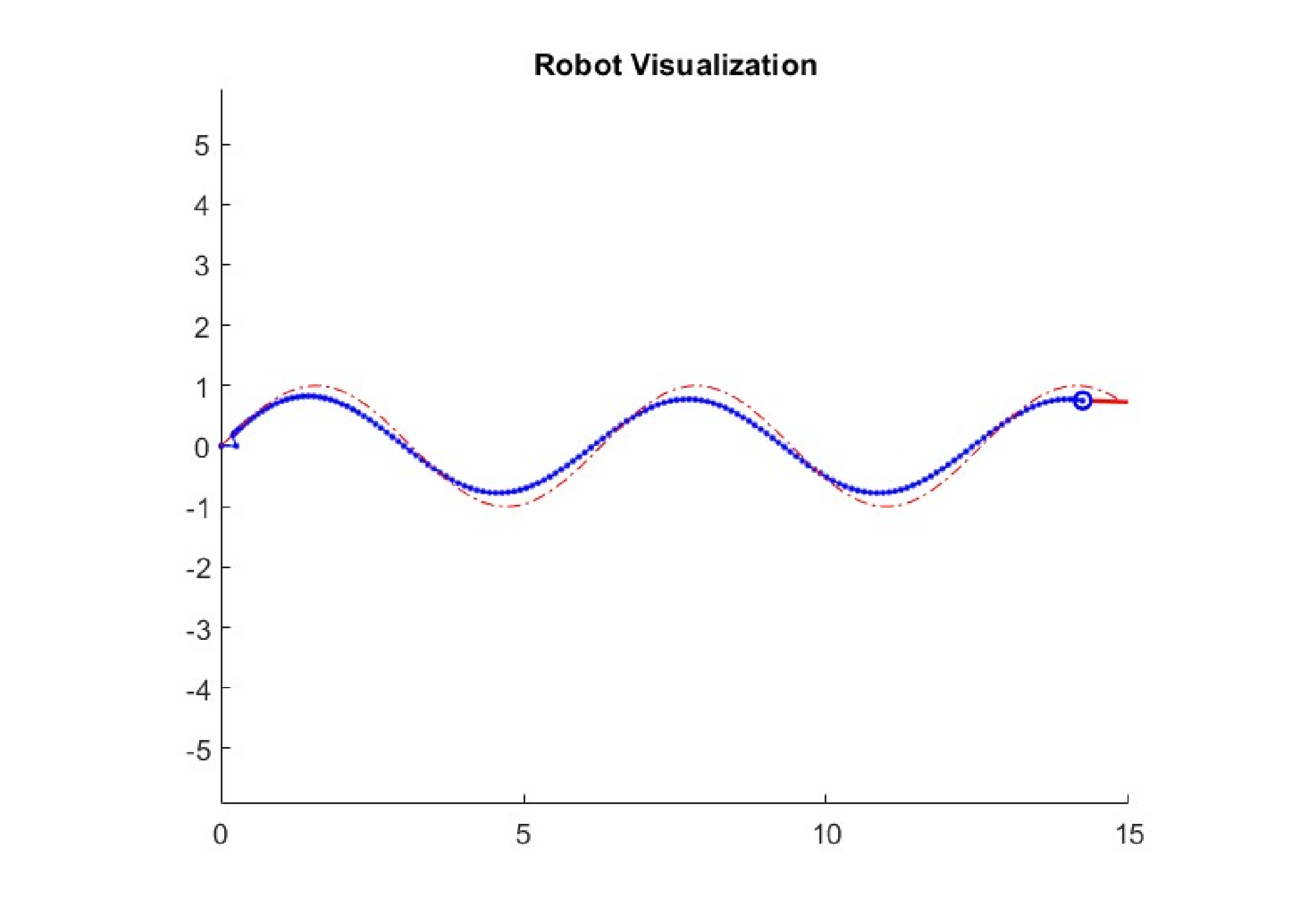
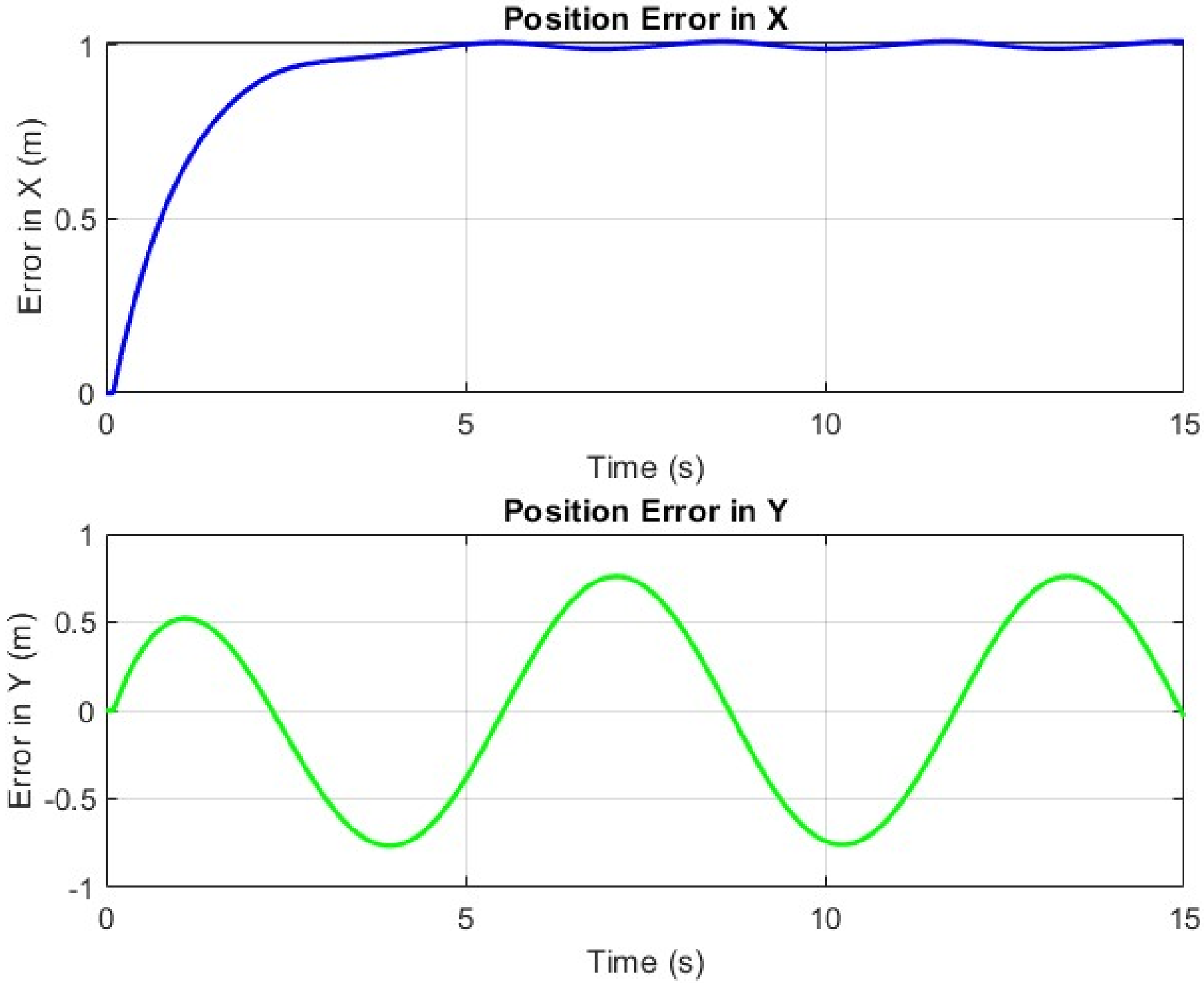

Robot Visualization
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-1
0
1
2
3
4


Robot Visualization
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-1
0
1
2
3
4


Position Error in X
Error in X (m)
0.4
0.2
0
-0.2
-0.4
0
5
10
15
Time (s)
Position Error in Y
Error in Y (m)
0.4
0.3
0.2
0.1
0
0
5
10
15
Time (s)


Robot Visualization
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5
10
15


Robot Visualization
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
5
10
15


Position Error in X
Error in X (m)
1
0.5
0
0
5
10
15
Time (s)
Position Error in Y
Error in Y (m)
1
0.5
0
-0.5
-1
0
5
10
15
Time (s)

The Approximate Linearization controller uses a “”proportional control”” approach to minimize the position and heading errors. This type of controller is easy to implement but may not provide the most precise control in more complex trajectories. As we have seen from the graphs, the approximate linearization approach as compared with the Input Output Feedback Linearization provided more or less the same trajectory followed for the circle equations, where as for the wave equations Input Output feedback outperformed the approximate linearization approach

The method of approximate linearization responds reasonably well to small errors in position and orientation and can be proved effective in simple path tracking at low speeds. However, at complex trajectories, overshooting can occur as the controller only reacts to the current pose error and does not predict future errors based on the current trajectory, which can lead to lag in following the trajectory, especially at higher speeds or when sharp turns are involved.

The Input/Output (I/O) Feedback Linearization controller linearizes allows for more precise control of the position and orientation. By compensating for the robot’s nonlinearities, this controller avoids many of the overshooting and oscillation problems that arise in proportional control. Moreover, because the controller is based on a linearized model of the system, it can respond more effectively to changes in the reference trajectory and prevent large errors from building up. One potential drawback of this method could be that it is mathematically more demanding to implement.