AA 274A: Principles of Robot Autonomy I
Problem Set 2

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Problem 1

(i) See attached code.

(ii) **Include results of sim_astar.ipynb.**

Figure 1: Trajectory through obstacle field generated from A*

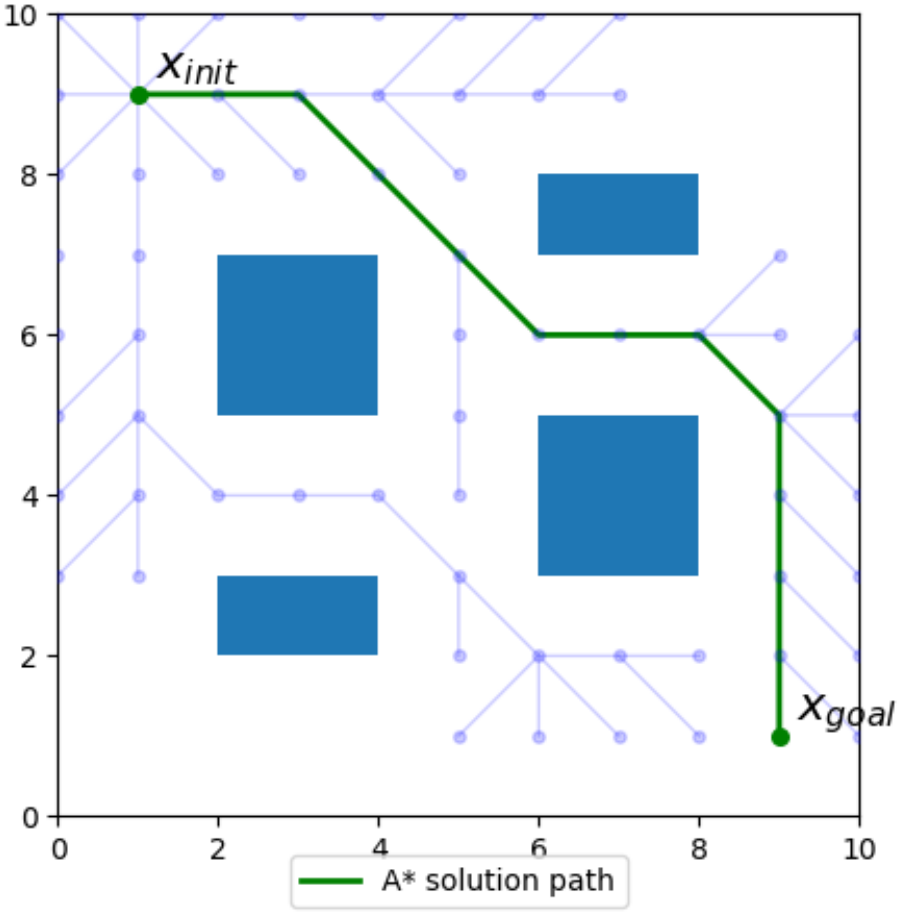
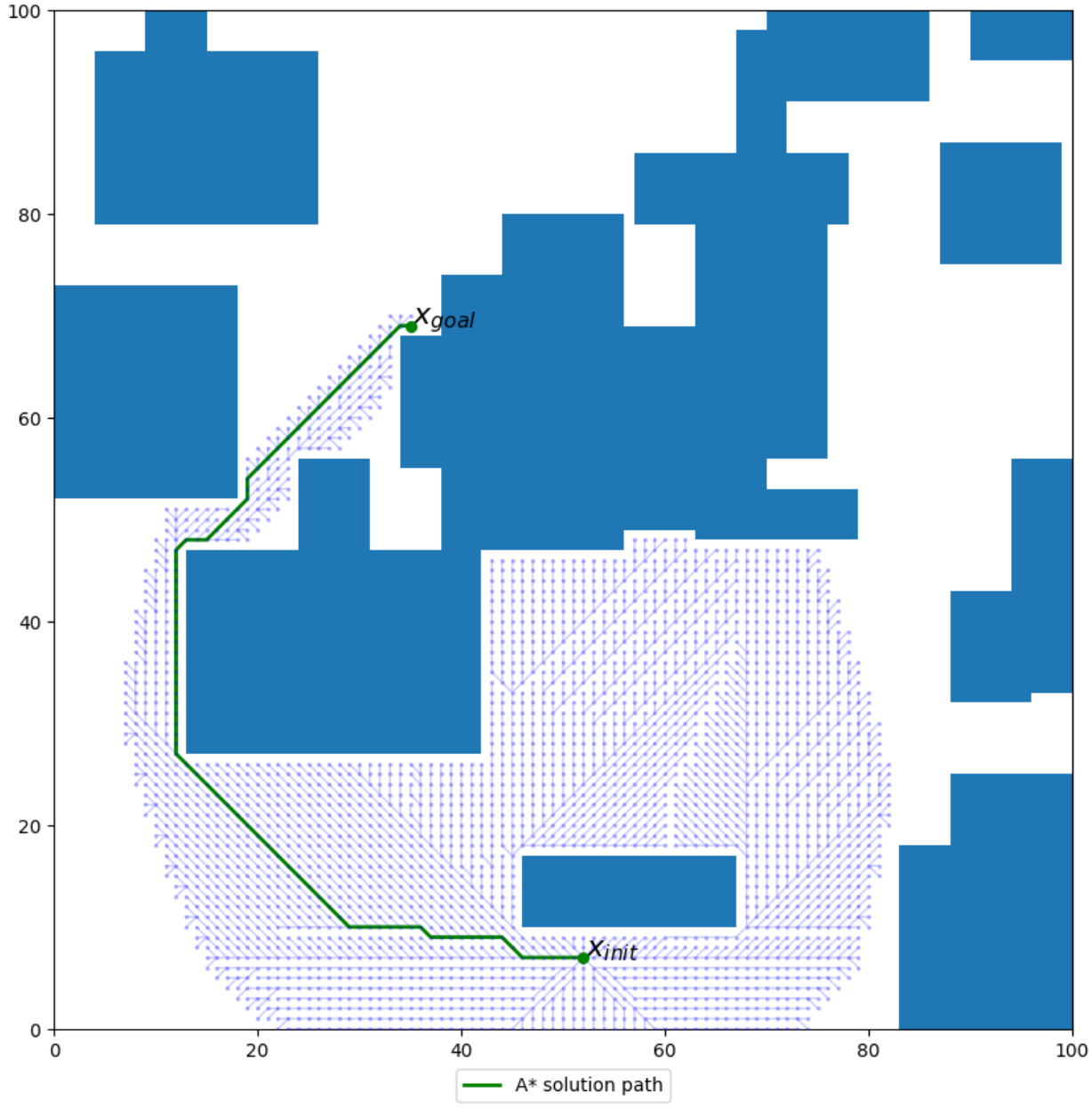


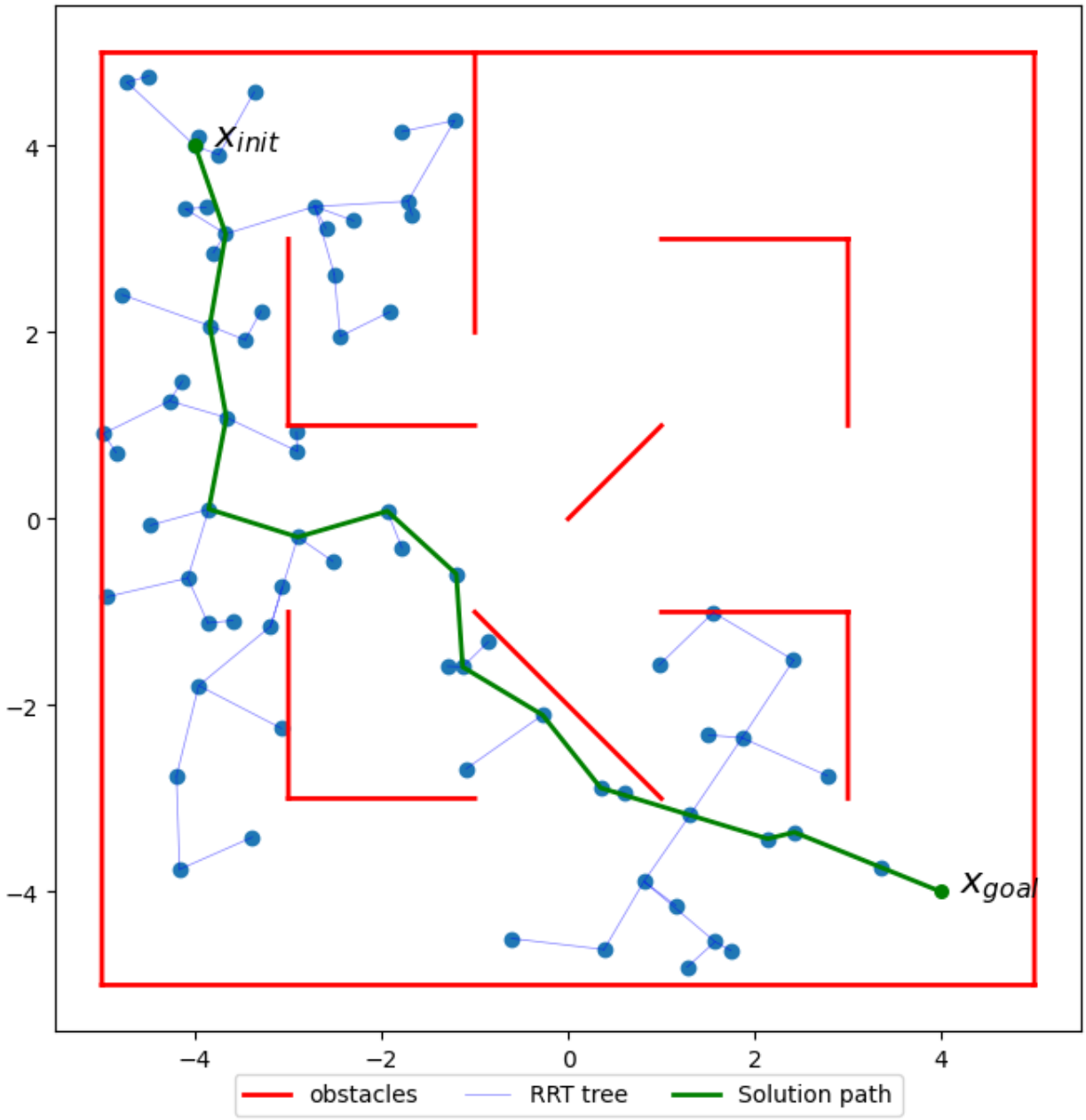
Figure 2: Trajectory through more complex obstacle field generated from A*



Problem 2

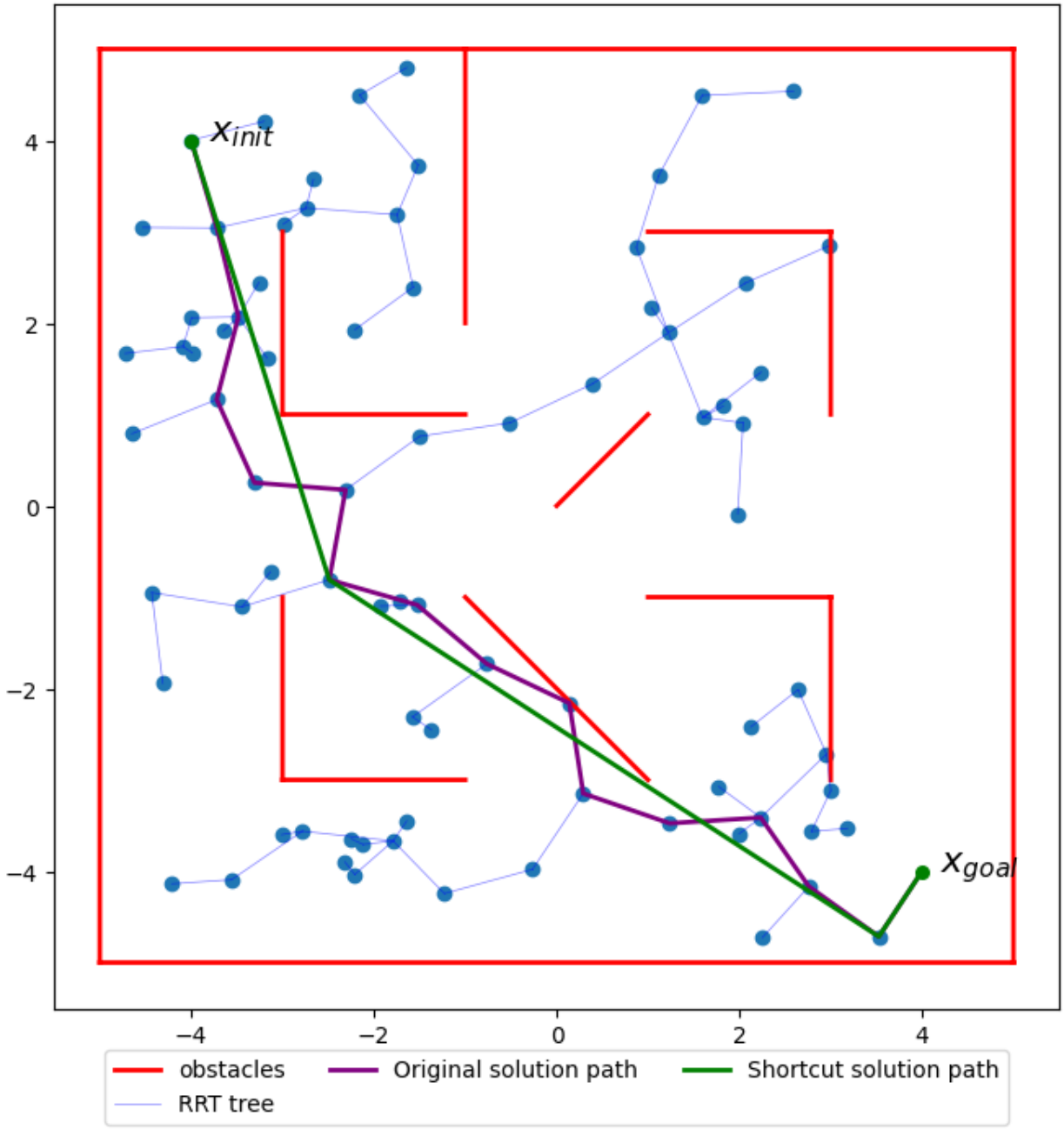
(i) **Run the simulation using sim_rrt.ipynb**

Figure 3: Trajectory through obstacle field generated from RRT with $\epsilon = 1.0$



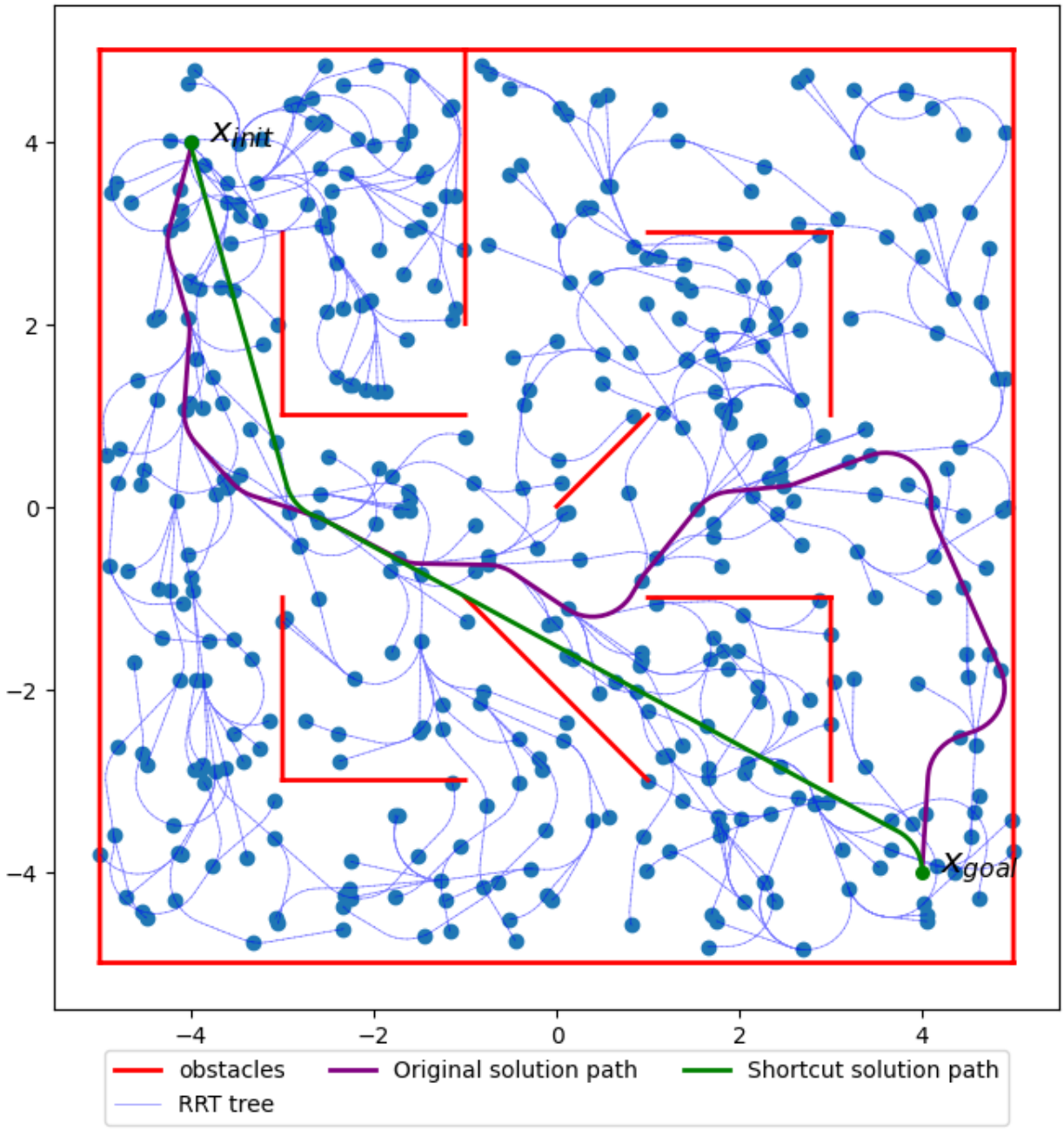
(ii) **Run the simulation using sim_rrt.ipynb and the shortcut path.**

Figure 4: Trajectory through obstacle field generated from RRT and shortcut path with $\epsilon = 1.0$



(iii) **Implement the RRT for Dubins car planning problems.**

Figure 5: Trajectory through obstacle field generated from RRT for Dubins car planning problems with $\epsilon = 1.0$

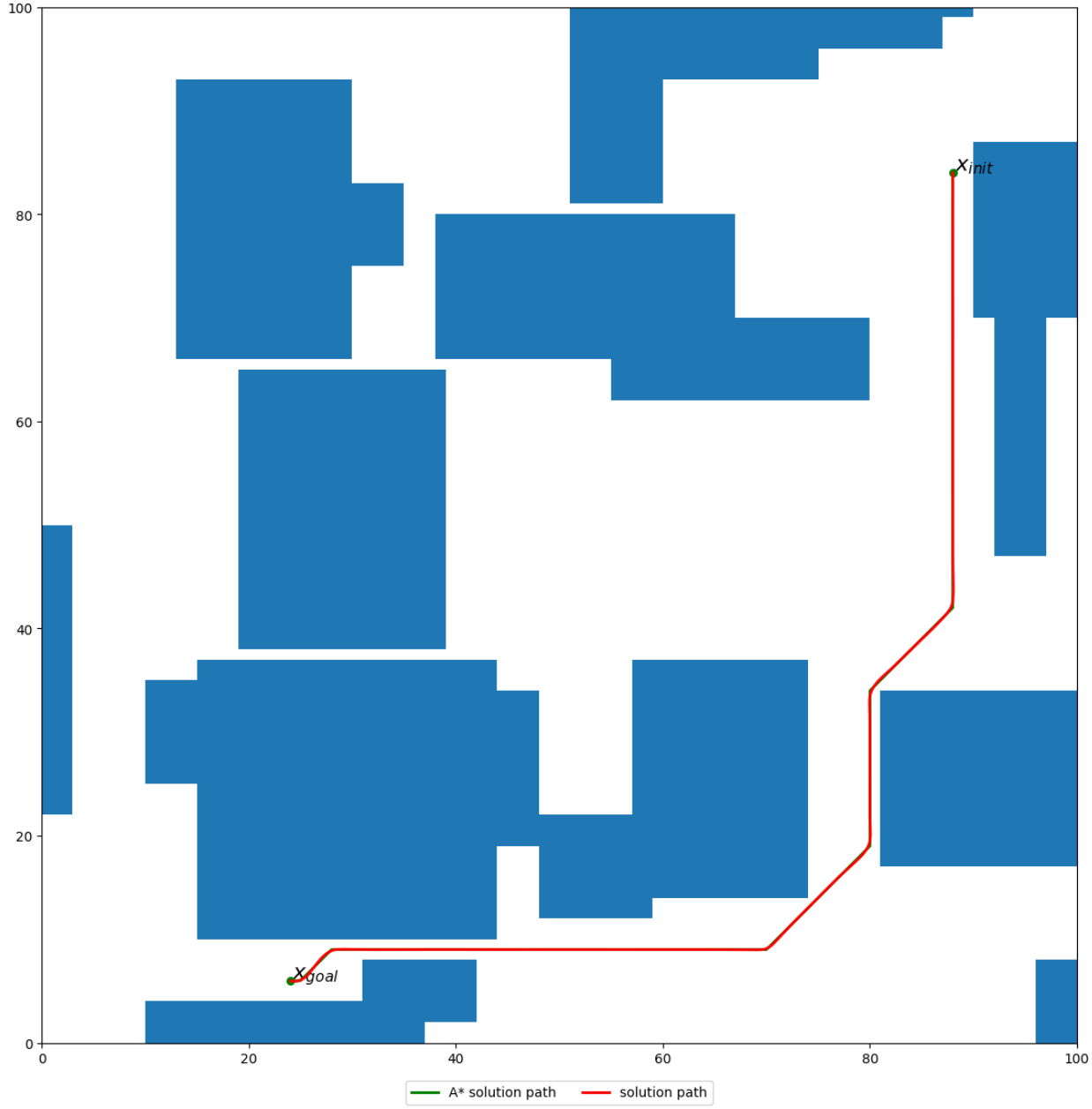


(iv) See above parts for plots.

Problem 3

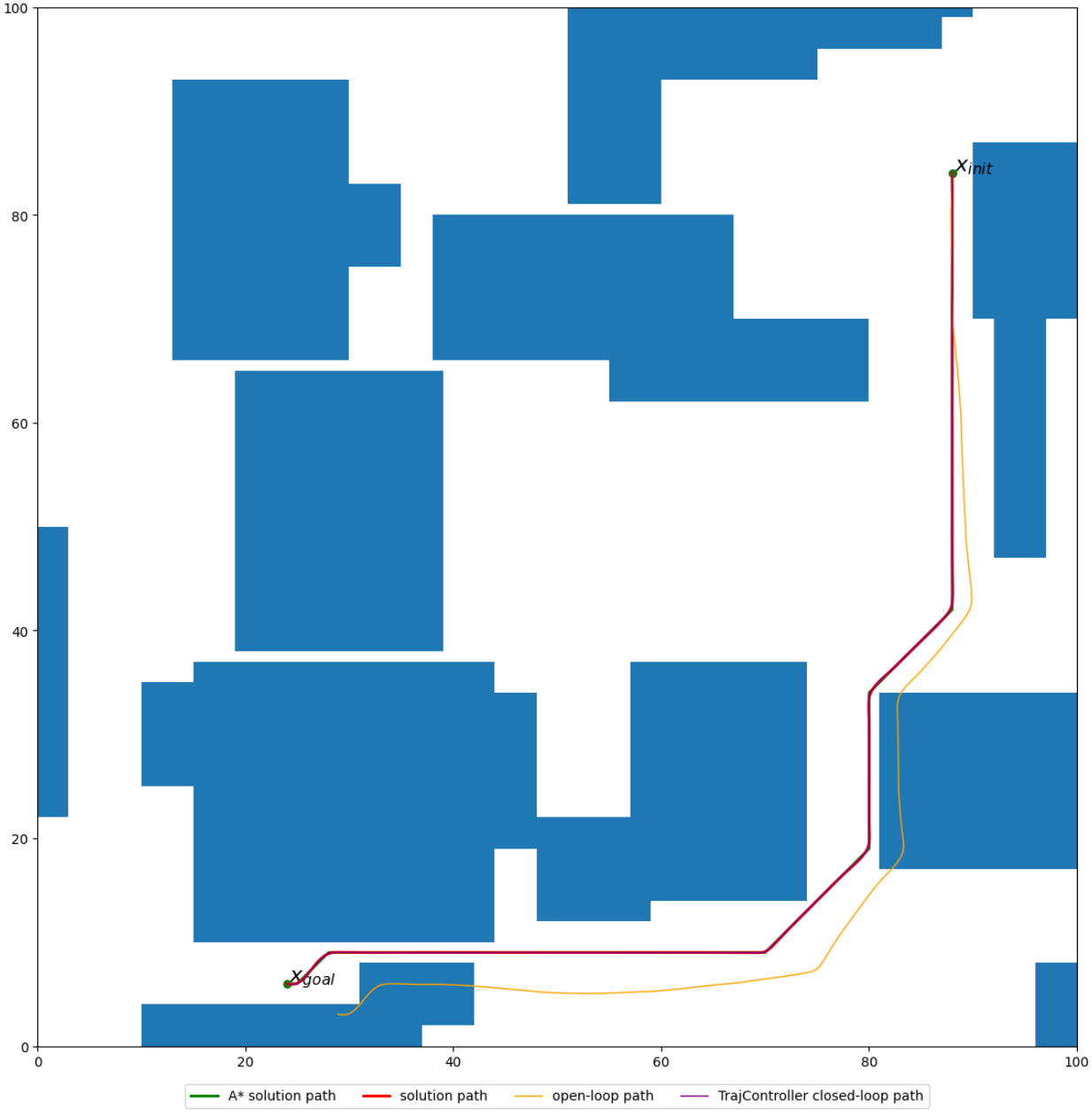
(i) **Smooth the paths from A* by fitting a cubic spline to the path nodes.**

Figure 6: Trajectory through obstacle field generated from A* and smoothed using cubic splines



(ii) **Generate control-feasible trajectories using time-scaling strategy and differential flatness from HW 1.**

Figure 7: Control-feasible trajectory through obstacle field generated from A*



(iii) **Improve the performance of the controller at the end by introducing a switching controller.**

Figure 8: Zoomed into goal from Figure 7

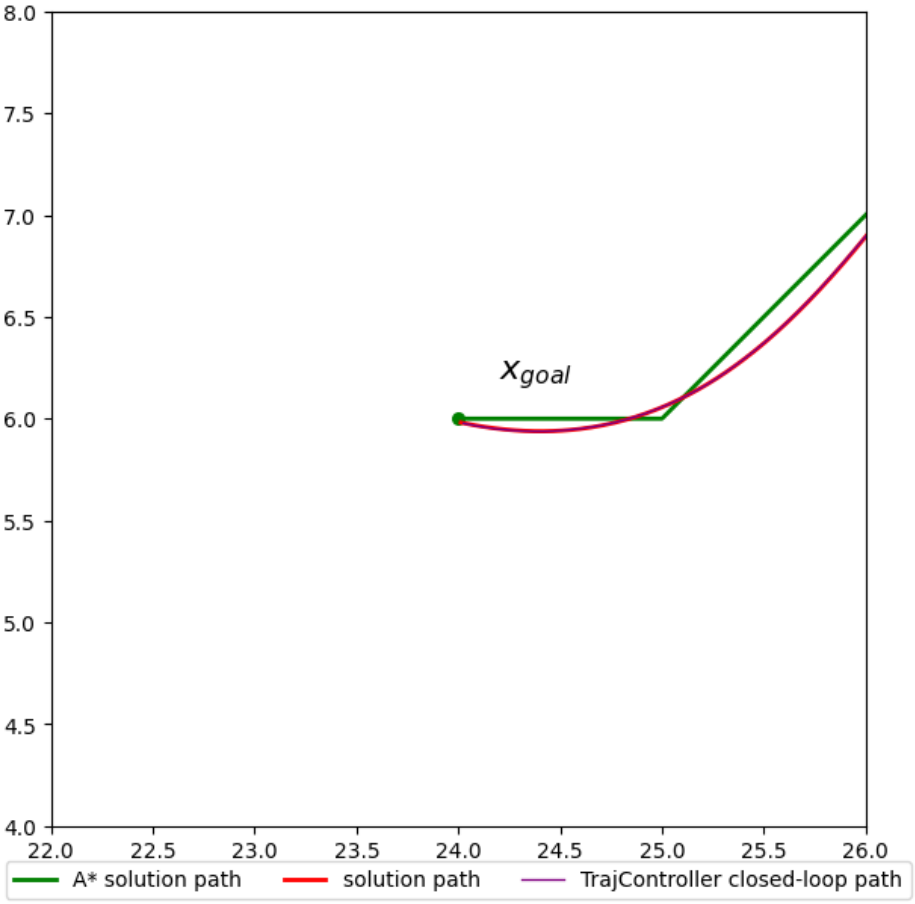


Figure 9: Control-feasible trajectory through obstacle field generated from A* with improved final state through switching controller

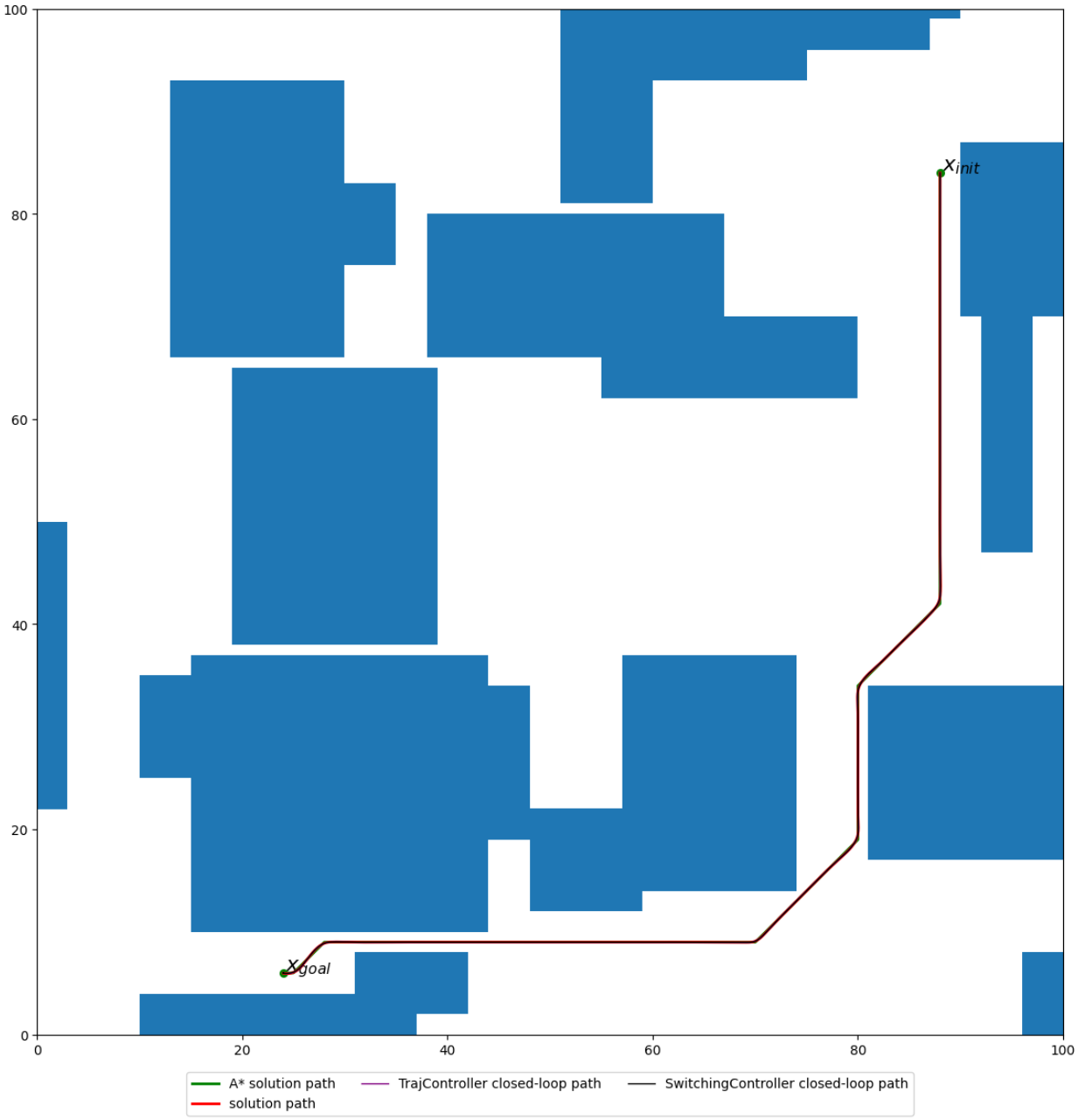


Figure 10: Zoomed into goal from Figure 9

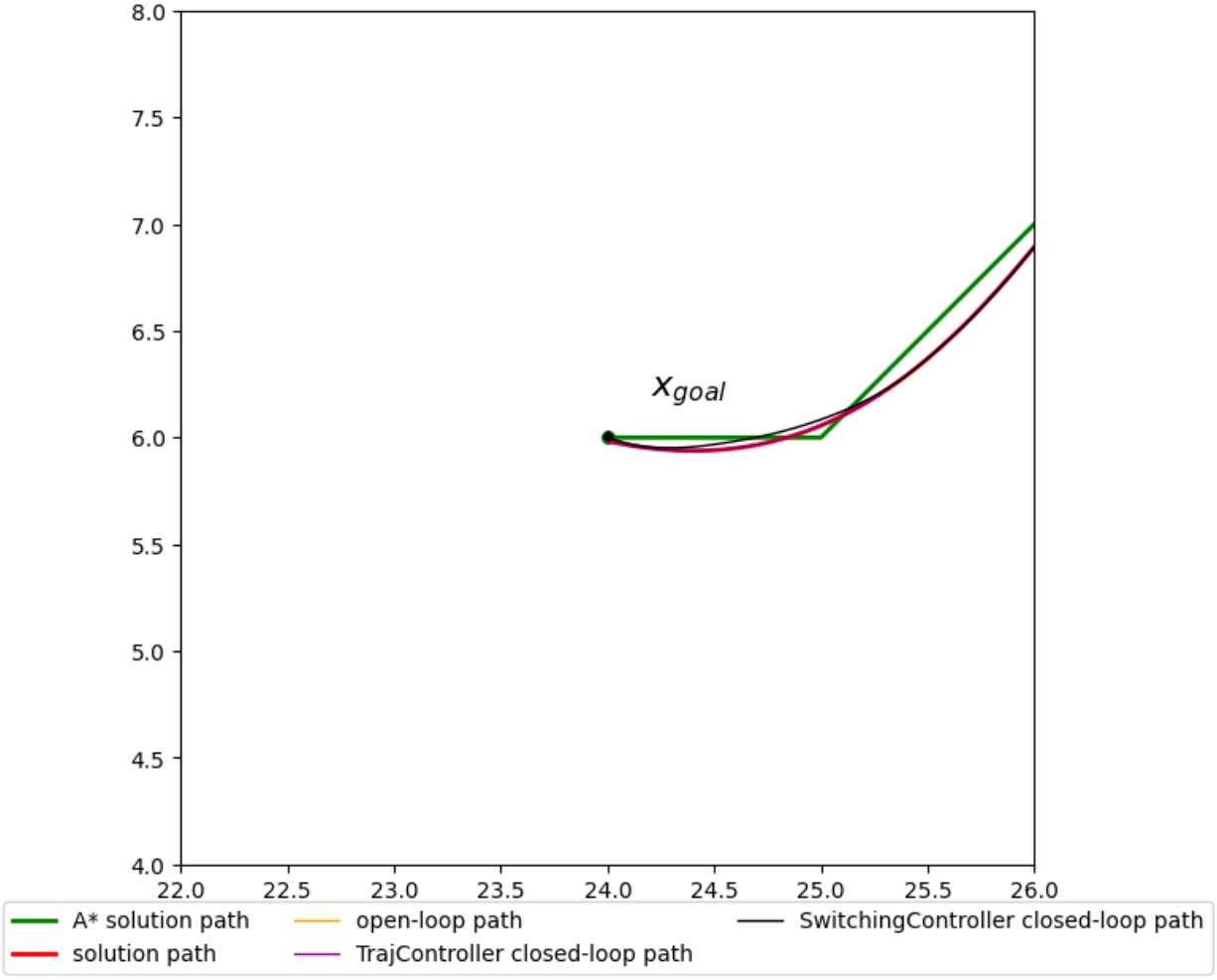
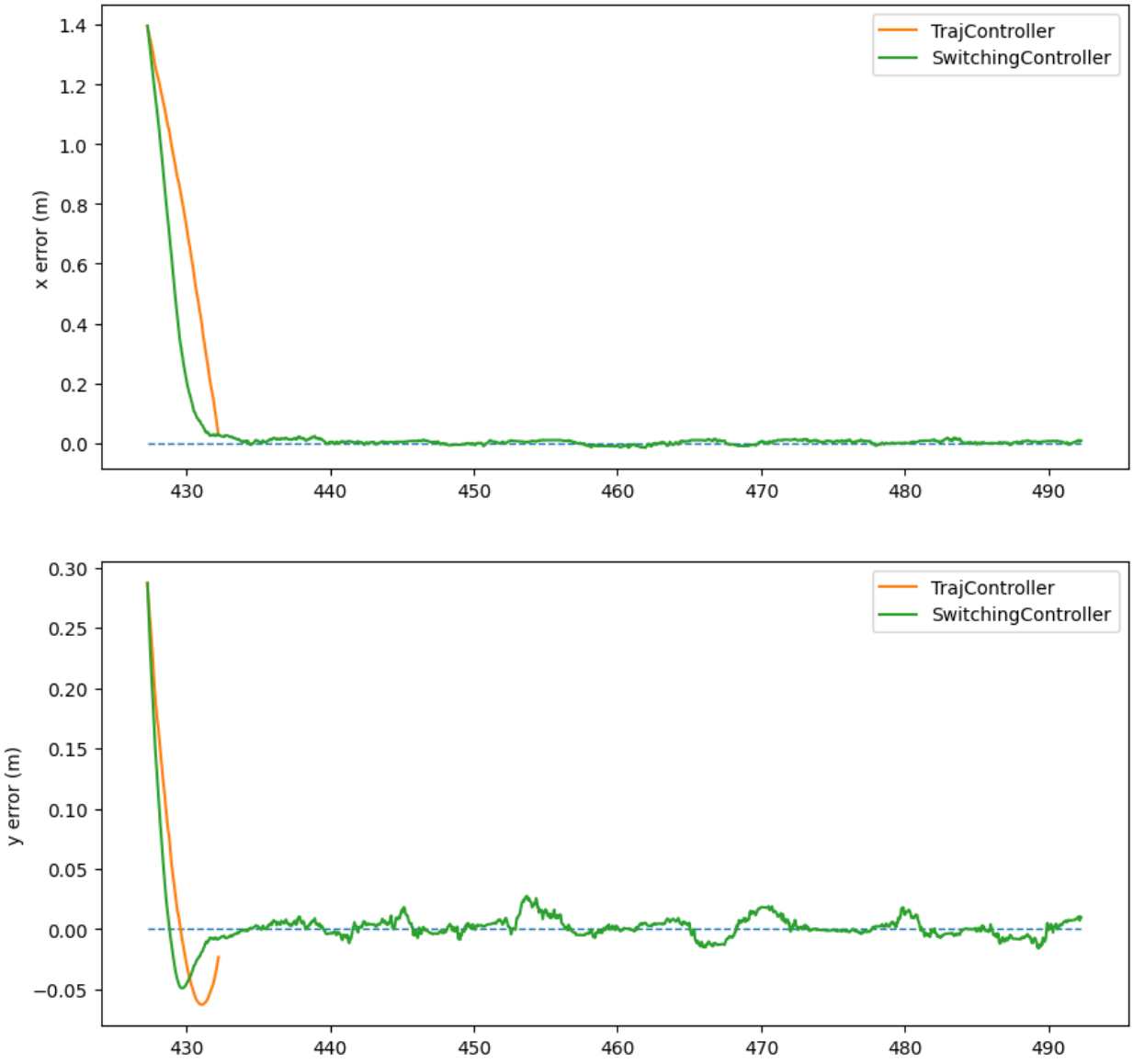


Figure 11: Plotting error at the end of the trajectory



(iv) See above parts for plots.