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6.231 Final Project Proposal

For my 6.231 project, I am looking at implementing a vehicle routing problem. The problem will involve numerically finding the lowest cost (shortest) path in a 2D plane. The cost of covering a piece of ground will be determined by a contour plot covering the landscape. The plan is to discretize the state and control space into squares with any of the 9 directions allowed. I will compare VI and PI over the space of the problem in terms of time to convergence for various landscapes. Additionally, I'll attempt to determine if a hybrid strategy can find a solution faster (in terms of computing time). Additionally, I will compare the quality and runtime of the rollout algorithm, using Euclidean distance as its heuristic, instead of the exact solution.

There are some possible extensions of the problem that may be investigated if time permits. One extension involves solving the traveling salesman problem over this open 2D routing. Another extension involves searching for the optimal hybrid strategy of VI and PI iterations for each landscape (using dynamic programming over the space of DP algorithms applications on the original problem). Finally, I may also look at the complications of introducing stochastic control. For example, I could consider the possibility that some surfaces are covered in black ice that may cause the vehicle to slide downhill (with probability proportional to the steepness) or skid in some other direction (with probability proportional to the speed).