EE618—Homework # 5


2. Consider the linear search problem that given in Homework LSP where

\[ L = 25, \quad N = 51, \quad p_j = \frac{3^{-|j|}}{\sum_{m \in [-L,L]} 3^{-|m|}}. \]

(a) Obtain an optimal search trajectory and the corresponding cost by either exact DP or a Label correcting algorithm as you did in the previous homeworks. For consistency, run either of the MATLAB scripts uploaded on the web as the solutions to the previous homeworks. (Be patient that it takes a while to run these scripts. Actually, this is the whole reason why we do approximate DP.) Plot the optimal search trajectory you obtained.

(b) Write a MATLAB script that implements a rollout policy based on the heuristic:

- initially place the searcher at location \( i \) maximizing \( p_i \),
- at any other state, go right by one step if the cost-to-go of going always right is lower than the cost-to-go of going always left; otherwise go left by one step.

Plot the heuristic and the rollout search trajectories. Compare the cost of the heuristic and the rollout trajectories with the optimal cost.

(c) Repeat the previous part except that use the rollout policy you obtained in the previous part as an heuristic policy for this part.

(d) Write a MATLAB script that implements a one-step-lookahead policy based on a cost-to-go approximation which is the optimal cost-to-go of a simplified problem where the states are aggregated into the aggregate states \( (X, Y, Z) \in \{L, M, R\}^3 \) as discussed in the class. Plot the one-step-lookahead trajectory. Compare the approximate cost (the optimal cost of the simplified problem) and the cost of the one-step-lookahead trajectory with the optimal cost. (Begin by choosing some reasonable aggregation and disaggregation probabilities.)