ECE59500RL HW2

Robert (Cars) Chandler — chandl71@purdue.edu

Problem 1

Problem 2

Problem 3

Problem 4

First, we need to assign labels to the states, which are the different spaces on the board. We will use a zero-indexed x-y coordinate system to refer to the different states $s_{xy} \in \mathcal{S}$, with the origin at the bottom left square, $s_{0,0}$. Moving horizontally will increase the x-component and vertically the y-component, so that our state space is

$$\mathcal{S} = \{s_{ij} : i, j \in \mathbb{N}_0, \quad i, j \leq 5\}$$

Note that although we are using two "dimensions" to identify each state, we still treat it as a one-dimensional vector, so that we have one row for each $s \in \mathcal{S}$ in $\vec{v}$, P^π, and so forth. ### 4.1.a The policy can be evaluated analytically using the following equation:

$$\vec{v}^\pi = (I - \gamma P^\pi)^{-1} \vec{R}^\pi$$

We have $\gamma = 0.95$ from the problem statement. P^π and $\vec{R}^\pi$ each need to be evaluated by going over each state in $\mathcal{S}$ and using the information given to us to evaluate them. Beginning with $\vec{R}^\pi$:

$$\vec{R}^\pi = \begin{bmatrix} R(s_{1,1}, \pi(s_{1,1}) \\ R(s_{1,2}, \pi(s_{1,2}) \\ \dots \\ R(s_{4,4}, \pi(s_{4,4})) \end{bmatrix}_{|\mathcal{S}| \times 1}$$