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Revenue Management

We consider the general case where the length of the buffer is n. Then the states are given by $\mathcal{X} := A \cup B$, where $A = \{0, \dots, n\}$ and $B = \{n+1, \dots, 2n+1\}$, with A denoting the states where the server is off and B denoting the states where the server is on. The number of customers in the queue is exactly the state number for states in A and the number of customers in the queue for states in B is modulo $n+1$ of the state number. As for the action, we have $\mathcal{A}(x) = \{0, 1\}$ where 0 (1) means the server is off (on).
With that, we can get evaluate the reward function by considering cases.

Action: $a = 0$ server is switched off

- $x < n$, $R(x, a, w) = \frac{1}{4}(-x) + \frac{3}{4}(-x - 1)$
- $x = n$, $R(x, a, w) = \frac{1}{4}(-n) + \frac{3}{4}(-n - 1000)$
- $n < x < 2n+1$, $R(x, a, w) = \frac{1}{4}(-(x \mod n+1)) + \frac{3}{4}(-(x \mod n+1) - 1)$
- $x = 2n+1$, $R(x, a, w) = \frac{1}{4}(-n) + \frac{3}{4}(-n - 1000)$

Action: $a = 1$ server is switched on

- $x < n$, $R(x, a, w) = \frac{1}{4}(-x) + \frac{3}{4}(-x - 1) - 10$
- $x = n$, $R(x, a, w) = \frac{1}{4}(-n) + \frac{3}{4}(-n - 1) - 10$
- $n < x < 2n+1$, $R(x, a, w) = \frac{1}{4}(-(x \mod n+1)) + \frac{3}{4}(-(x \mod n+1) - 1)$
- $x = 2n+1$, $R(x, a, w) = \frac{1}{4}(-n) + \frac{3}{4}(-n - 1)$

Value Iteration

Policy Iteration

Linear Programming