Assignment 2

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Part 1:

a.) State Set:

$\{S_1, S_2, S_3, S_4, S_5, S_6, S_7, S_8, S_9, S_{10}, S_{11}, S_{12}\}$

S_1 is the starting state and S_{12} is the terminal state.

b.) State Info:

Each state represents an island with two attributes (N, t):

N: The name of the island (a string)
t: "treasure" if there is treasure, or "none" if there isn't

$S_1 = (\text{"Port"}, \text{"none"})$ $S_2 = (\text{"Happy"}, \text{"none"})$

$S_3 = (\text{"Shadow"}, \text{"none"})$ $S_4 = (\text{"Sandy"}, \text{"none"})$

$S_5 = (\text{"Barren"}, \text{"treasure"})$ $S_6 = (\text{"Cozy"}, \text{"none"})$

$S_7 = (\text{"Starry"}, \text{"treasure"})$ $S_8 = (\text{"Rocky"}, \text{"none"})$

$S_9 = (\text{"Scorched"}, \text{"none"})$ $S_{10} = (\text{"Sacred"}, \text{"treasure"})$

$S_{11} = (\text{"Kraken"}, \text{"none"})$ $S_{12} = (\text{"Destination"}, \text{"none"})$

c.) Set of Actions

Let all possible actions be defined by the set:

$$A = \{\text{"dig"}, \text{"move"}\}$$

d.) Gamma

$$\gamma = 0.95$$

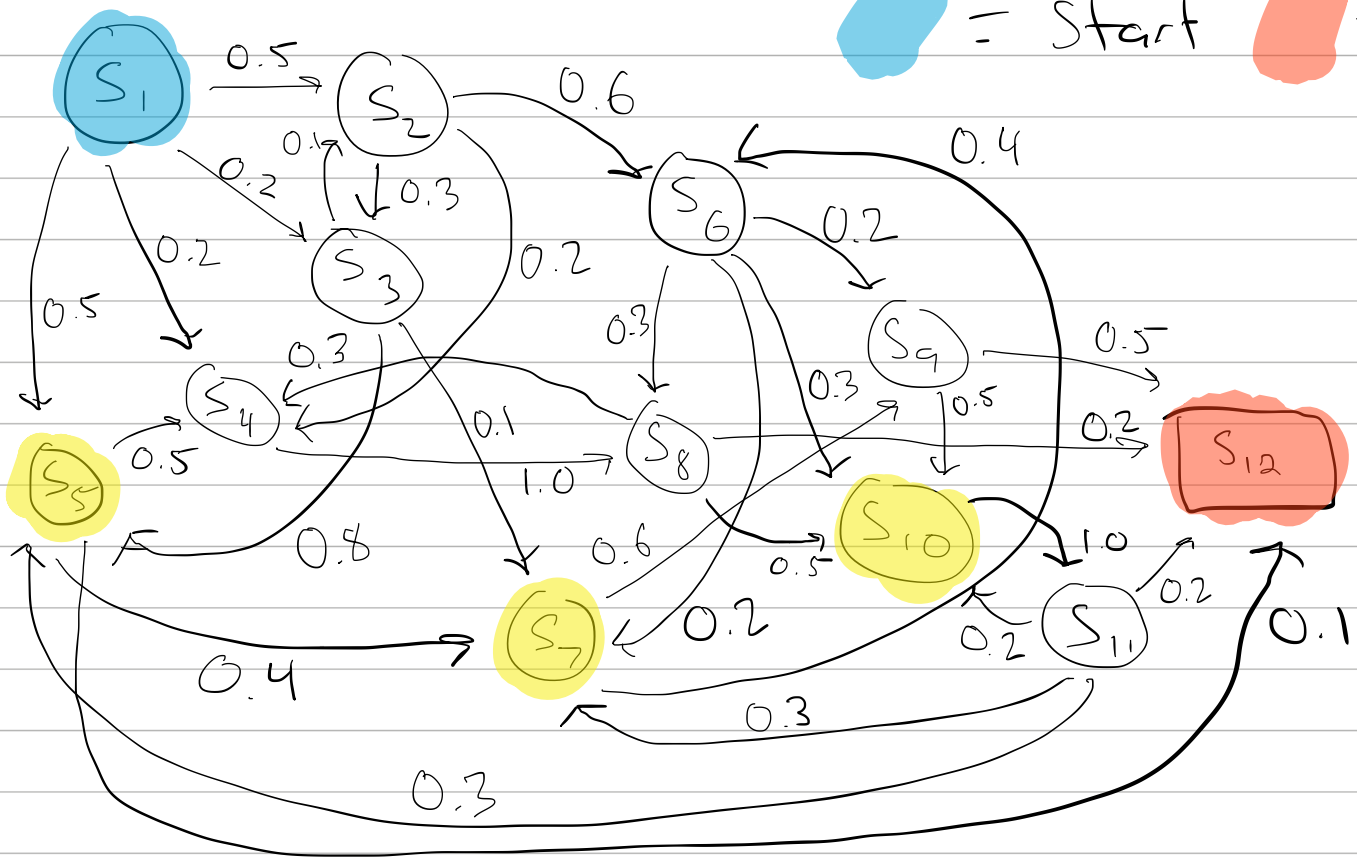
e.) State Transition Probability Matrix

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}
S_1	0	0.5	0.2	0.2	0.1	0	0	0	0	0	0	0
S_2	0	0	0.2	0.2	0	0.6	0	0	0	0	0	0
S_3	0	0.1	0	0	0.8	0	0.1	0	0	0	0	0
S_4	0	0	0	0	0	0	0	1.0	0	0	0	0
S_5	0	0	0	0.5	0	0	0.4	0	0	0	0	0.1
S_6	0	0	0	0	0	0	0.2	0.3	0.2	0.3	0	0
S_7	0	0	0	0	0	0.4	0	0	0.6	0	0	0
S_8	0	0	0	0.3	0	0	0	0	0	0.5	0	0.2
S_9	0	0	0	0	0	0	0	0	0	0.5	0	0.5
S_{10}	0	0	0	0	0	0	0	0	0	0	1.0	0
S_{11}	0	0	0	0	0.3	0	0.3	0	0.2	0	0	0.2
S_{12}	0	0	0	0	0	0	0	0	0	0	0	1.0

Markov Chain:

= treasure

= start = end



f.) Reward Function

reward at start = 0

t = time step

$\gamma = 0.95$

a.) action "move": reward -= $1\gamma^t$

b.) action "dig" and finding treasure: reward += $2\gamma^t$

c.) action "move" to S_{12}: reward += $5\gamma^t$

d.) action "move" to S_{12} with all treasure: reward += $15\gamma^t$

PART 2

1.) Agent is a traveler that starts on s_1

2.) Policy:

i.) At each timestep, perform an action:

a.) 90% chance to travel to a connected island using the probability matrix

or

b.) 10% chance to dig for treasure at the current island. If treasure is found, it can no longer be found at that island.

ii.) increment timestep and repeat until s_{12} is reached or the timestep reaches 25.