Problem 4
Robot localization using HMM

Note: Please use Jupyter notebook or Google Colab to run the notebook.

- Using transitional matrix for the calculating T(i,j)= P(Xt=j/Xt-1=i)

- Assuming all states have equal probability as the starting initial state. So starting randomly from any state.

- Probability scaling is used if the probability at any node does not sum to 1. [E.g: If a node has only 2 possible next states with probability 0.25 and 0.25, then I am considering it as 0.50 and 0.50 probability which sum to 1]
- Sensor's are predicting its position by considering only the present state on the basis of the 4 directions with respective proximity values.
- Transition matrix used for considering the transition probabilities.
- For predicted probabilities are the one which the sensor can report out of available prediction states (on comparing with the directional proximity prediction).

OUTPUT:

##NOTE::-- LOCATION REPORTED BY SENSORS ARE PREDICTED ON THE BASIS OF WALLS IN ALL DIRECTIONS WITH PROXIMITY
--PROBABILITY CALCULATED WITH RESPECT TO SUM, THUS TRANSITION PROBABILITY WHOSE SUM!=1 ARE SCALED

Iteration # 10 :Actual Location: S2 Location Reported by sensors: S3 with probability: 0.75
Actual Last Loc.: S3 Transition Prob: 0.20

Iteration # 20 :Actual Location: S4 Location Reported by sensors: S4 with probability: 0.75
Actual Last Loc.: S5 Transition Prob: 0.23

Iteration # 30 :Actual Location: S3 Location Reported by sensors: S3 with probability: 0.75
Actual Last Loc.: S4 Transition Prob: 0.20

Iteration # 40 :Actual Location: S3 Location Reported by sensors: S3 with probability: 0.75
Actual Last Loc.: S3 Transition Prob: 0.20

Iteration # 50 :Actual Location: S1 Location Reported by sensors: S4 with probability: 0.75
Actual Last Loc.: S2 Transition Prob: 0.20

Iteration # 60 :Actual Location: S2 Location Reported by sensors: S2 with probability: 0.75
Actual Last Loc.: S3 Transition Prob: 0.20

Iteration # 70 :Actual Location: S1 Location Reported by sensors(can be any): S1,S6,S5 each with probability: 0.25

Actual Last Loc.: S1 Transition Prob: 0.20

Iteration # 80 :Actual Location: S2 Location Reported by sensors(can be any): S1,S6,S5 each with probability: 0.25

Actual Last Loc.: S2 Transition Prob: 0.20

Iteration # 90 :Actual Location: S4 Location Reported by sensors: S4 with probability: 0.75

Actual Last Loc.: S4 Transition Prob: 0.23

Iteration # 100 :Actual Location: S3 Location Reported by sensors: S3 with probability: 0.75

Actual Last Loc.: S3 Transition Prob: 0.20