

ASSIGNMENT 2

- A program that detects the location of the robot given the sequence of sensor readings.
- A program that returns the most likelihood traversal of robot given the sequence of observations of sensor reading

Dependencies : Python 3.X

Built on : Spyder

1) Case formulation:

- ENVIRONMENT
-> 4*16 Grid
Out of those some are hurdles , and hence 42 possible locations.
- SENSOR
The sensor senses if there is any obstacles in North , South , East and West respectively
- HMM

2) Solution

$$F_{1:t} = \alpha * O_t * T * F_{1:t-1}$$

Where

O_t : Observation Matrix

T : Transition Matrix

Alpha : Normalization constant

$F_{1:t}$: current probability vector in time t

$F_{1:t-1}$: current probability vector in time t-1

VITERBI ALGORITHM

- Suppose, there are 5 observation given, then to get most likely sequence at time unit 5, we should know best likely sequence from time unit 1 to 4 which can be used to know the best likely sequence at time unit 5
- Now, we can apply above step for each time unit
- So, we calculate the best sequence according to below formula:
 - $M_{1:t} = \alpha * (\text{current time observation}) * (\text{best sequence until previous state})$

Localisation Error vs NUMBER OF OBSERVATIONS

And

Path Accuracy vs NUMBER OF OBSERVATIONS

Localisation error (which uses Manhattan distance) and Path accuracy (defined as the fraction of correct states on the Viterbi path) decreases and increases respectively by increasing the number of observations (just upto 20 - 25) even when there is a high error rate of 20 percent because of the algorithm's ability to integrate evidence over time and to

take into account the probabilistic constraints imposed on the location sequence by the transition model.

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