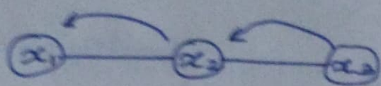
Markov model

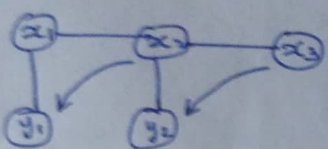
* next state depend only on present state



states - position

Hidden Markov model

* state cannot be observed directly.
* instead known by sensor values.



states - possible positions

observations - sensor data (4 towers)

Transition probability - change of state (up, down, right, left)

Emission probability - sensor values for every state

eg : State 1 T_1 T_2 T_3 T_4
State 2 T_1 T_2 T_3 T_4 } evidence

Initial probability - equal for all states.

Steps :

* update its belief at a particular position through emission matrix (sensor readings).
* predicts next state by transition matrix
* repeats over.

Forward - Backward algorithm.

used to find probability of robot in every state at each time step.

Forward

* calculate forward prob. using emission prob.

* calculated by considering sum of possibilities of all possible transitions from previous state weighted by emission.p

Backward

* calculate backward prob. from last time step by initialising state prob to 1.

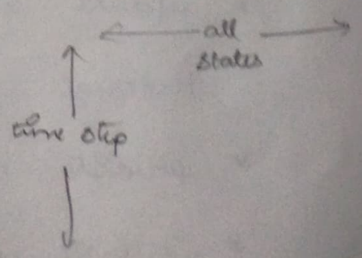
Combining both.

* To calculate posterior prob.

= (Forward prob * Backward prob) at each time step.

Thus maximum prob. state for each time step is taken as final predicted position at each time step.

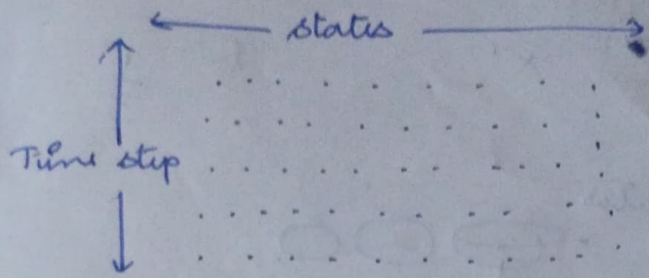
It is used for viterbi.



Viterbi algorithm.

Used to find most likely sequence.

* Initialization



* Recursion

calculate each prob for all states for each time step. Find maximum prob at each time step.

* Backtracking

After completing all time step, backtrack through sequence to find most likely path/sequence Prune all other states.

This sequence is the most likely path that robot would have travelled.