K.G.C.E.
Karjat - Raigad

AI Tutorial 2)

Page No. :
Date :

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Aim – To understand State Space based problem formulation of AI problems so that Problem Solving Agent can be applied.

Theory – First we under understand the problem solving Agent. Algo. shown in figure below shows agent program for problem solving agent. Agent first formulates goal & problem, then determines or rather searches an action sequence after which it returns the next action to be executed in a sequential manner.

```
Function : SIMPLE-PROBLEM-SOLVING-AGENT (percept) returns an action
  static: seq, an action sequence, initially empty
          state, some description of the current world state
          goal, a goal, initially null
          problem, a problem formulation.
  state ← UPDATE-STATE (state, percept)
  if seq is empty then do
     goal ← FORMULATE-GOAL (state)
     problem ← FORMULATE-PROBLEM (state, goal).
     seq ← SEARCH (problem)
  action ← FIRST (seq)
  seq ← REST (seq)
  return action
```

Defining the Problem is referred to as problem formulation. It involves defining following five things:

Initial State – It is the starting state that the problem is in.

Actions – It defines all possible actions available to the agent, given it is in some state s currently.

Transition Model – also known as Sucessor function which

which define which state is the system tend to move to when a particular action is executed by the agent.
Goal Test - This act as a stopping condition when the state passed to this function is goal state it will return true & searching would stop.
Path cost - It is accumulated cost of performing certain sequence of actions.

Thus a problem can formally specified by identifying initial state, actions, transition model, goal test & path cost. In term of problem solving agent solution is the path from initial state to a goal state, optimal solution is the lowest path cost of all solutions.

Working - Based on understanding of problem formulation students need to formulate following problems. They will clearly show state space up to depth level 3 or till goal node which ever is shallowest.

a) Navigate to KGCE Workshop from HOD IT Cabin with minimum number of moves.
b) 8 Puzzle problem.
c) The missionaries and cannibals problem.
d) N Queen's problem, Arrange N queens on a N cross N chess board where no two queens attack each other.
e) Two room vaccum cleaner world.
f) Water Jug Problem.