K.G.C.E.
Karjat - Raigad

Tutorial No: 02

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Aim:- To understand State space based problem formulation of AI problems so that problem solving Agent can be applied.

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Tutorial 2: To understand state space problem formulation.

Aim:- To understand state space based problem formulation of AI problem so that problem solving Agent can be applied.

Theory:- First we understand the problem solving agent Algorithm shown in fig 3 shows agent program for problem solving agent. Agent first formulates goal and problem, then determines or rather searches an action sequence, after which it returns the next action to be executed in a sequential manner.

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function SIMPLE-PROBLEM-SOLVING-AGENT (Percepts) 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 refessed 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. It is a function Action(s) that returns list of all possble actions.
* Transition Model also known as successor function which define which state is the system tend to move to when a particular action is executed by the agent. Successive application of transition model gives rise to what is known as State Space.
* Goal Test: This act as a stopping condition when the state passed to this function is goal state it will return true and searching would stop.
* Path cost: It is accumulated cost of performing certain sequence of actions. This can help in determining weather the action sequence under consideration is optimal.

Thus a problem can formally specified by identifying initial state, actions (operators), transition model (successor functn), goal test and path cost. In term of problem solving agent soluth is the lowest path cost of all solutions. Process of finding a solution is called search.

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 good node which ever is shallowed.

1. Navigate to KGCE workshop from HOD IT cabin with minimum number of moves, moves can be climbing or a lighting staircase, turing left, right walking through a corridor.
2. 8 puzzle problem
3. The missionaries and cannibals problem. There are three missionaries and three cannibals who must cross a river using a boat which can carryout most two people, under the constraint that, for both banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals if they were, the cannibals coould eat the missionaries. The boat cannot cross the river by itself with no people on board.
4. N Queen's problem, Arrange N queens on a N cross N Chess board where no two queens attack each other.
5. Two room vaccum cleaner world.
6. Water Jug Problem

Resources: Refer to second chapter from Artifical Intelligence: A modern Approach.