Tutorial 2

Tutorial 2: To understand state space based problem formulation of AI problem so that Problem solving Agent can be applied.

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Tutorial 2: To understan.

<u>Tutorial 2</u>: To understand state space problem formulation.

<u>Aim</u>: To understand state space based problem formulation of AI problems so that Problem solving Agent can be applied.

<u>Theory</u>: First we understand the problem solving agent. Algorithm shown in Fig 2 shows agent program for problem solving agent. Agent first formulates goal and problem, then determine 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. It is a function Action(s) that returns list of all possible actions.

Transition Model also known as successor function which define which state / 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 it will return turn 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
function), goal test and path cost.
In terms 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. Process of finding a
solution is called search.

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

1. Navigate to rmcs Workshop from HOD IS
   Cabin with minimum number of moves
   moves can be climbing or alighting
   staircase, turning 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 across a river using
   a boat which can carry at most two
   people, under the constraint that, for
   both bank, if there are missionaries.
   present on the bank, they cannot be
   outnumbered by cannibals, if they were,
   the boat cannot across 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 vacuum cleaner world.
6. Water Jug Problem.

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