

Tutorial-2

| | |
|----------|-----|
| PAGE No. | |
| DATE | / / |

Tutorial 2:- To understand state space problem formulation.

Name:- Bhavesh Santosh Ainkar

Roll No:- 1

Class:- BE

Sem :- VII

Sub :- IS LAB.

Tutorial 2: To understand State Space problem Formulation

Aim: - To understand state space based problem Formulation of AI problems So that problem Solving Agent can be applied.

Theory: - First we understand the problem Solving agent. Algorithm show in Fig 8 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.

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 \leftarrow Update-State(State, percept)

if seq is empty then do

goal \leftarrow Formulate-Goal(State)

problem \leftarrow Formulate-problems(State, goal)

seq \leftarrow Search(problem)

action \leftarrow First(seq)

seq \leftarrow 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 $Actions(s)$ that returns list of all possible actions.

Transition Model - also known as Successor Function which define which states 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 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 whether the action sequence under consideration is optimal.

Thus a problem can formally be specified by identifying initial state, action (operators), transition model (successor function), goal test and path cost. In terms of problem solving, a 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, students need to formulate following problems. They will clearly show state space up to depth level 3 or till goal node whichever is shallowest.

1. Navigate to KGRE Workshop from HOD IT 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 cross a river using a boat which can carry at most two people, and 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 would eat the missionaries. The boat cannot cross the river

by itself with no people on board.

4. N Queens problem, Array N Queens on N cross
N chess board

5. Two room Vacuum Cleaner world

6. Water jug problem

Resources - refer to Second Chapter from Artificial
Intelligence. A Moders Approach.