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Tutorial 2: To understand State Space problem

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

Theory: First we understand the problem solving agent.

Algorithm shown in Figure 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 sequencial manner.

function SIMPLE-PROBLEM-SOLVING-AGIENT (percept) returns an action

Static: Seq. an action sequence, initially empty.

State, some description of the current world State

goal, a goal, initially nyll

problem, a problem formulation.

State
UPDATE-STATE (State, percept)

if seq is empty then do

goal
FORMULATE - GOAL (State)

problem
FORMULATE - PROBLEM (State, point)

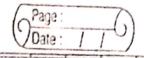
problem - FORMULATE - PROBLEM (State, goal) Seq - SFARCH (problem)

action + First (seg)

Seq + REST (Seq)

return action

Figure 3: Problem Solving Agent Architecture



Defining the problem is referred to as problem formulation. It involves defining foll five things: Initial State: It is the starting state that the problem is in.

Actions: It defines all possible actions quallable to
the agent I 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 statels the system tend —

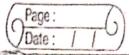
to move to when a particular action is executed by the agent. Successive application of transition model gives rise to what is known as State

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 persforming certain sequence of actions. This can hap 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 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. Process of finding a solution is called search.



Working! Based on understanding of problem formulation students need to formulate foll problems. They will clearly show state space up to depth level 3 or till good node which ever is shallowest. 1. Navigate to KGCE Workshop from HODIT Gbin with minimum nymber of moves, moves can be dimbing or a lighting staircase, turning left, right, walking through a corridor. 2. 8 Puzzle problem 3. The missionaries and cannibals problem. There are three missionanies and three cannibals who must cross a river using a boot which can carry at most two people, under the constraint that, for both banks, if there are missionanies 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 Queen's problem. Arrange Haucens on a N cross N chess board where no two queens attack each other. 5. Two room vacuum cleaner world. 6. Water Jug Problem.