

Tutorial - 2

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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 shown in fig. 3 - Shown 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 (percent)
returns an action.

Static: seq, an action sequence, initially empty
state, some description of current world state
goal, a goal, initially null
problem, a problem formulation.

State \leftarrow UPDATE-STATE (state, percent)

If seq is empty then do

goal \leftarrow FORMULATE-GOAL (state)

problem \leftarrow FORMULATE-PROBLEM (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 agent, given it is in some state currently. It is a function $Actions(s)$ that returns list of all possible actions.

Model transition 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 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 a accumulated cost of performing certain sequence of actions. This can help in determining whether action sequence under Consider action is optimal.

Thus a problem can formally specified by identifying initial state, actions (operators), transition model (successor function), goal test & path cost. In term of problem solving agent solution is the path from initial state to goal state optimal solution is 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 problem. They will clearly show state space up to depth level 3 or till goal node which ever is shallowest.

1. Navigate to KGCE workshop from HOB 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, under constraint that, for both banks, if there are missionaries present on 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 N queens on a N cross N chess board where no two queens attack each other