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Tutorial – 2

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Tutorial 2 : To understand State Space problem
— formulation

Aim : To understand State Space based problem formulat⁰
of AI problems so that Problem Solving Agent can be applied.

Theory : First we understand the problem solving agent.
Algorithm shown in Fig 3 shows agent programs 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 (percept) returns an
  static : seq, an action seq, initially empty
          state, some descript⁰ of 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

Fig. 3 : Problem Solving Agent Architecture

Defining the problem is referred to as problem formulat⁰. It
involves defining foll. five things:

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Initial state : it is the starting state that the problem is in.
Actions : defines all possible actions available to agent, given in some state currently. It is function actions that return list of all possible actions.
Transition Model : also known as successor fndⁿ which define which state the system tend to more to when a particular action is executed by the agent.
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.

Thus a problem can formally specified by identifying initial state, actions, transition model, goal test & path cost. In term of problem solving agent sol. is the path from initial state, optimal sol. is the lowest path cost of all sol. Process of finding a sol. is called search.

Working : Based on understanding of problem formulatⁿ students need to formulate foll. problems. They will clearly show state space up to depth level 3/till goal node which ever is shallowest.

1. Navigate to KGCE Workshop from HOD IT Cabin with min. no. of moves, moves can be climbing/alighting staircase turning left/right walking through a corridor.

2. 8 Puzzle problem

3. The missionaries & cannibals problem. There are 3 missionaries & 3 cannibals who cross a river using a boat which can carry at most two people under the constraint that for both banks, if there are missionaries present on bank, they cannot be outno. by cannibals .

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 chp. from AI : A modern Approach.