K.G.C.E.
Karjat - Raigad

Tutorial No :- 02

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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 shows in figure 3 shows agent program for ~~program~~ problem solving agent. Agent first formulates goal and problem, then determines or rather searches an action sequence.

```
Function Simple-Problem-solving-Agent return 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 ← 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 :- problem solving agent architecture

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

Action It defines all possible actions available to the agent given it is in some state a currently. It is function ACTION(s) that returns list of all possible actions

Transition Model also known as successor function which define which state/s the system tend to move 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

path cost It is accumulated cost of performing certain sequence of action. This can help in determining wether the action sequence under consideration is optimal.

Working :- Based on understanding of problem formulation students need to formulate following problems

1) Navigate to KGCE workshop FROM HOD IT cabin with minimum number OF moves, Moves can be climbing or alighting staircase

2) 8 Puzzle problem

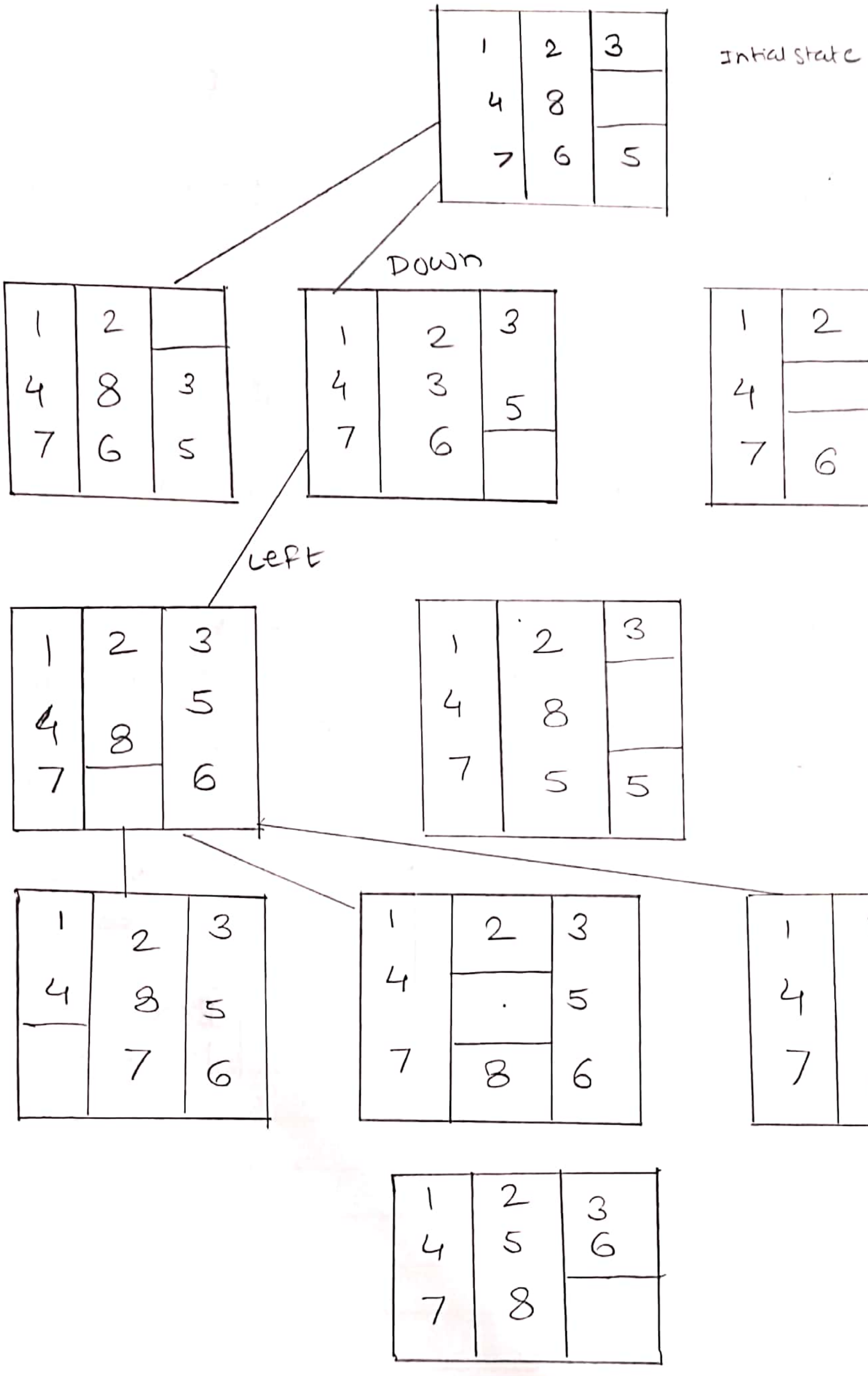
3) The Missionaries and cannibals problem. There are three Missionaries and three cannibals who must cross a river using boat which can carry at most two people, under the constraint that for both banks, The boat cannot cross the river by itself with no people on board

4) N Queen's problem. Arrange N queens on a N cross N Chess board where no two queens attack each other

5) Two room vacuum cleaner world

6) water Jug problem

8 Puzzle problem



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-- Solution

{{1,2,3}, {4,8,-}, {7,6,5}} → {{1,2,3}, {4,8,5}, {7,6,-}}

{{1,2,3}, {4,8,5}, {7,-,6}} → {{1,2,3}, {4,-5}, {7,8,6}}

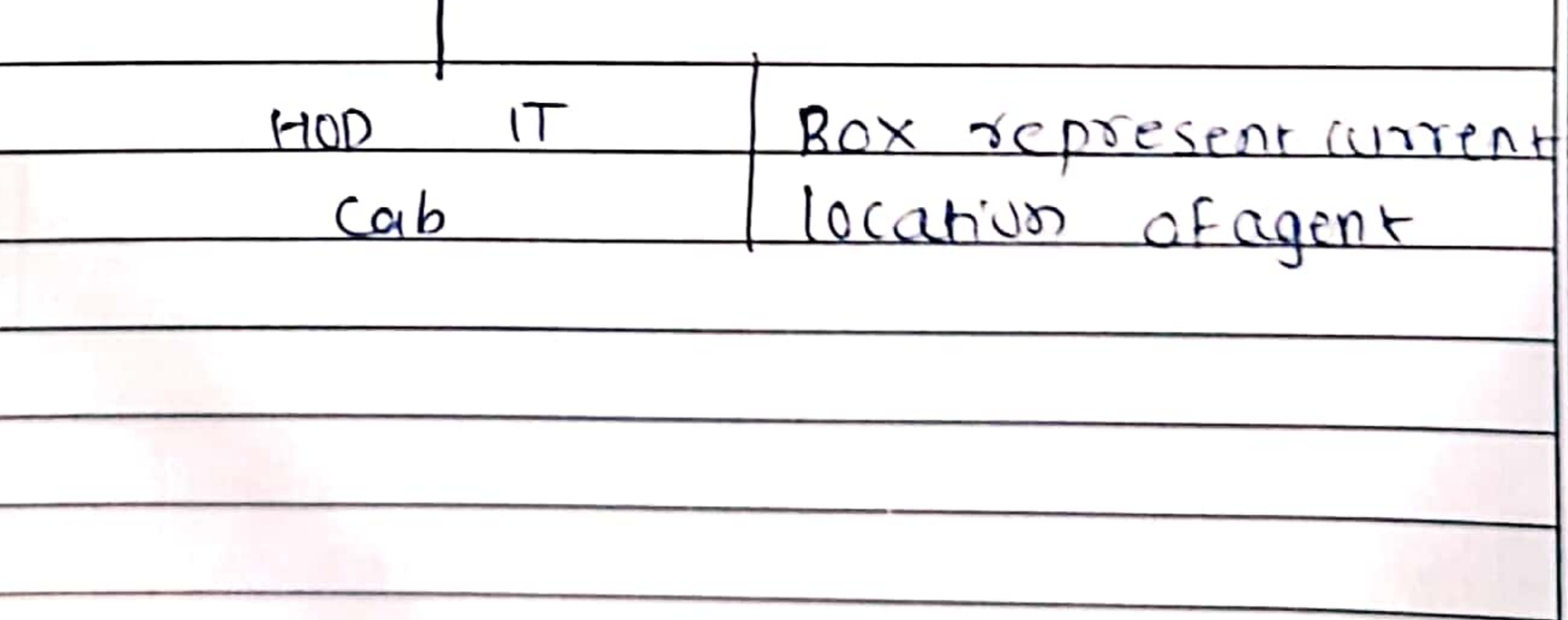
{{1,2,3}, {4,5,-}, {7,8,6}} → {{1,2,3}, {4,5,6}, {7,8,-}}

Path Cost = 5 steps

1] Navigate to KGCE Workshop from HOD IT cabin with minimum number of moves moves can be Climbing or alighting staircase turing left right making through a corrider

States: It can be represented as a top view of the agent along with arrows in direction left, right forward & backwards. We use 'climb' & alght for moving through staircases.

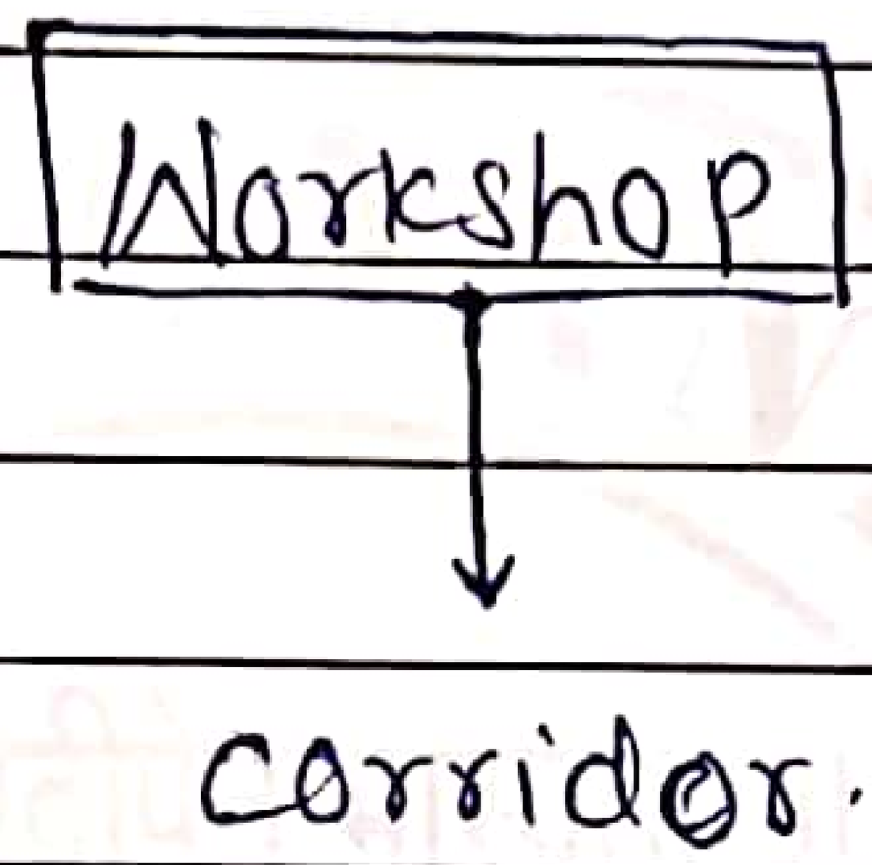
1. Initial state:



2 Action : The agent moves in left, right operation to the stairs

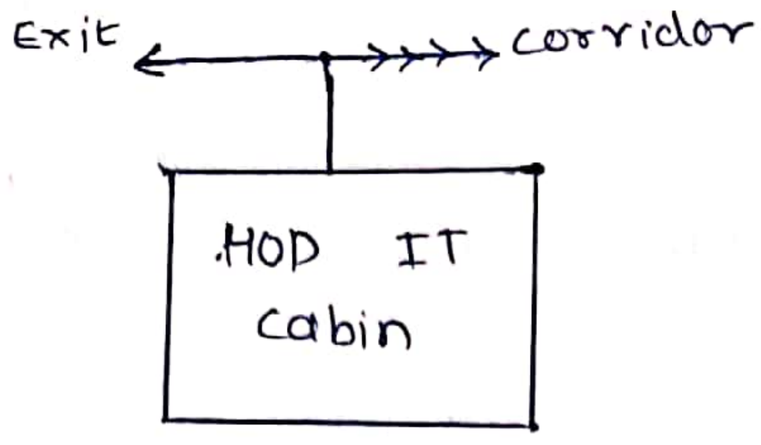
3 Successor function : If we apply right operation to the start state, the agent enters the corrider the first step towords goal state

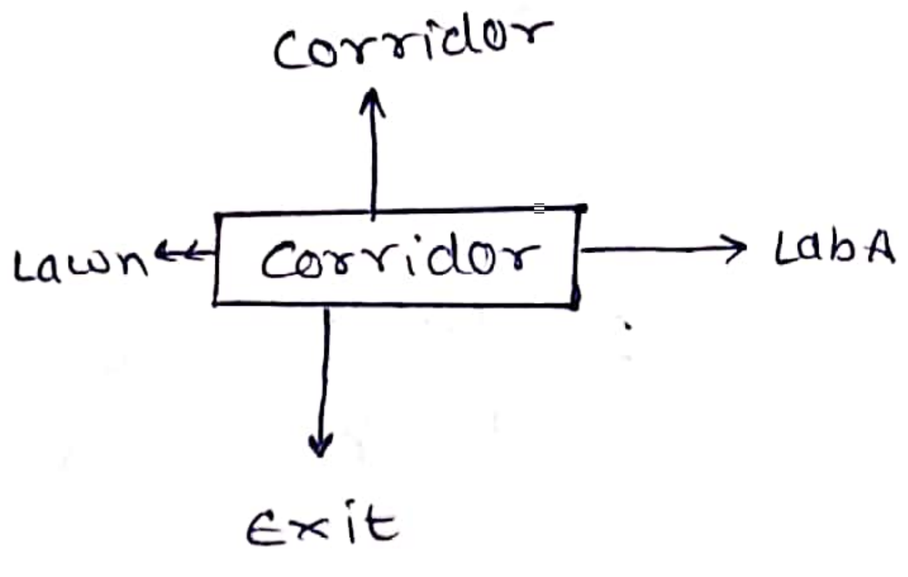
4 Goal test

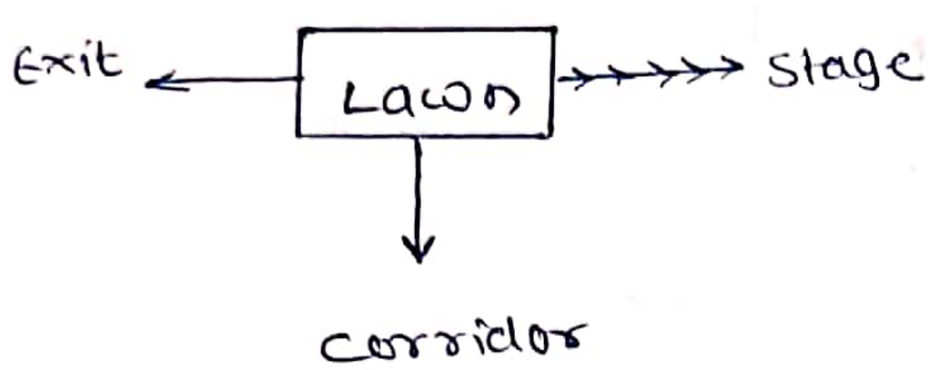


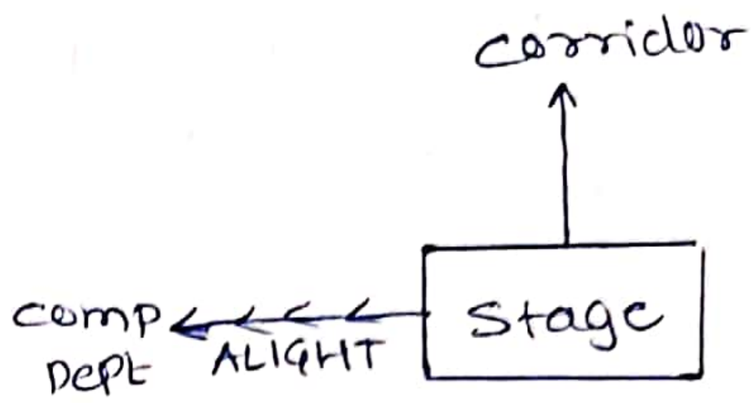
5 Path cost : NO. of actions to reach the workshop
path cost : 8 directions + 4 staircase
= 12

1. HOD IT Cabin → GCG Workshop (solution)









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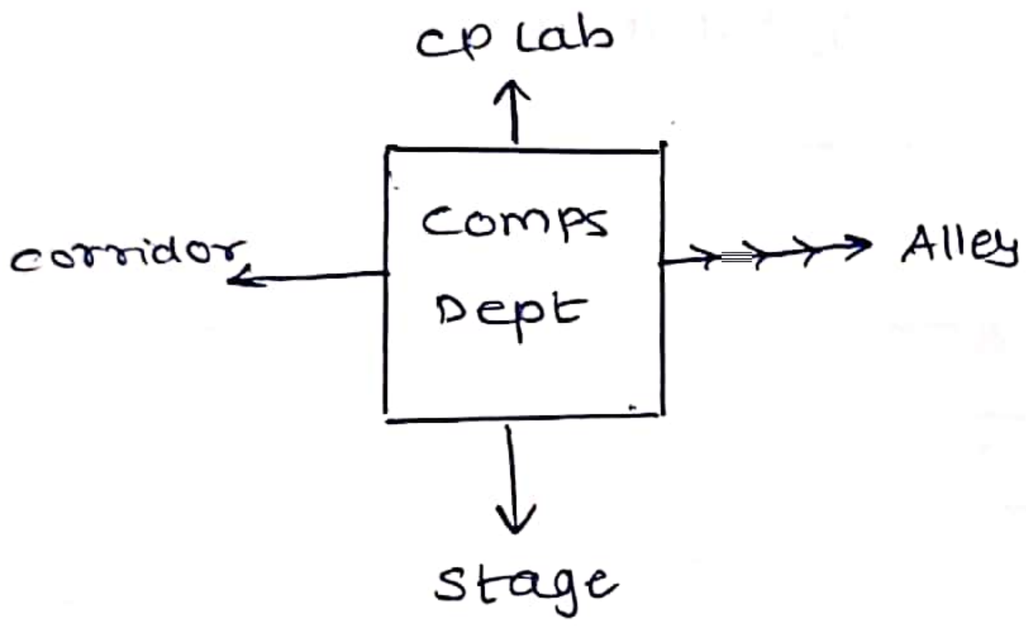

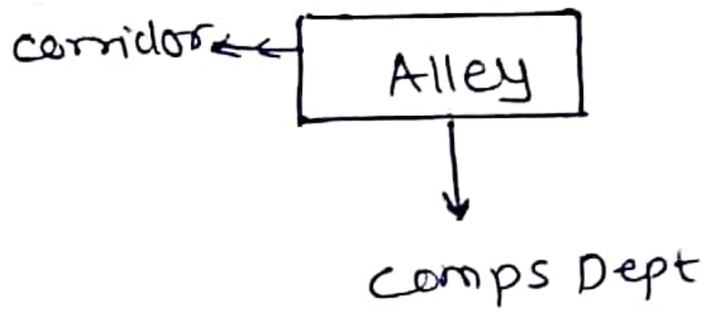

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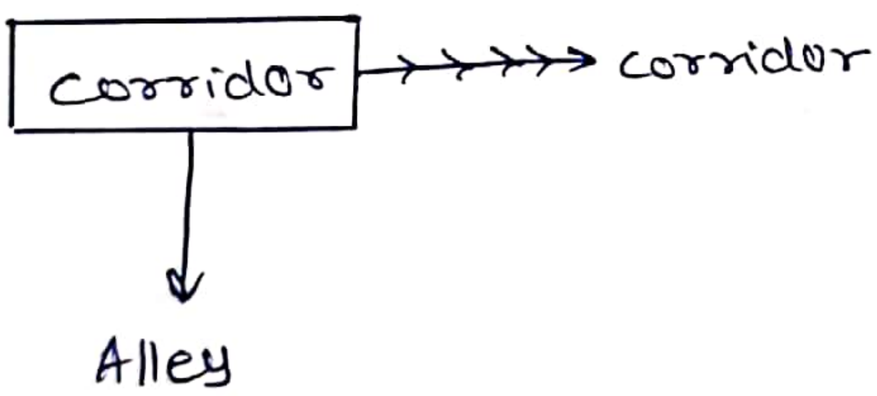
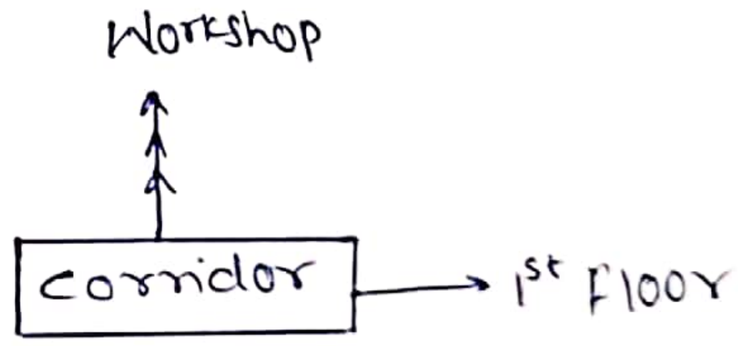
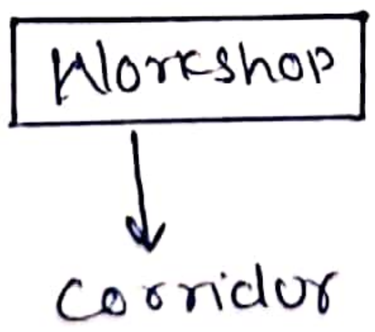
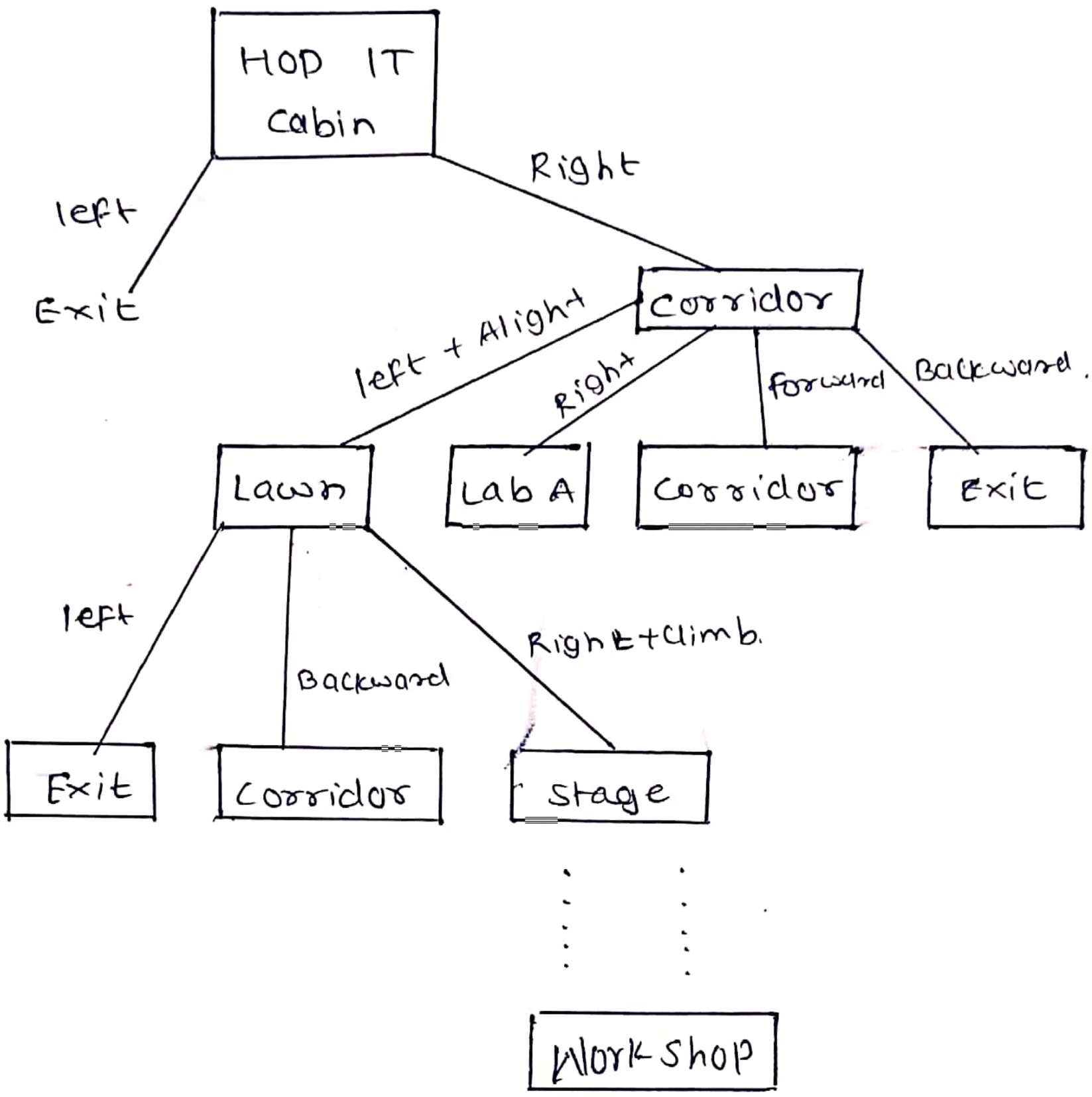






Goalstate

State space



Goalstak.