



JSPM's



**Bhivarabai Sawant Institute of Technology and
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Department of Computer Engineering

WORKBOOK

BE COMPUTER SEM I

A.Y. 2019-2020

**SUBJECT: ARTIFICIAL INTELLIGENCE AND
ROBOTICS(AIR)**

UNIT NO: 1

INTRODUCTION

Completed By:

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Syllabus Covered

Unit I	INTRODUCTION
Artificial Intelligence : Definition, Introduction, Typical Applications. State Space Search : Depth Bounded DFS, Depth First Iterative Deepening. Heuristic Search : Heuristic Functions, Best First Search, Hill Climbing, Variable Neighborhood Descent, Beam Search, Tabu Search. Optimal Search : A* algorithm, Iterative Deepening A* , Recursive Best First Search, Pruning the CLOSED and OPEN Lists.	

1) Define the following :

Artificial Intelligence:

Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.

AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

State Space Search:

State space search is a process used in the field of computer science, including artificial intelligence (AI), in which successive configurations or states of an instance are considered, with the intention of finding a goal state with a desired property.

Problems are often modelled as a state space, a set of states that a problem can be in. The set of states forms a graph where two states are connected if there is an operation that can be performed to transform the first state into the second.

2) Differentiate between the following:

INFORMED SEARCH	UNINFORMED SEARCH
It uses knowledge for the searching process.	It doesn't use knowledge for searching process.
It finds solution more quickly.	It finds solution slow as compared to informed search.
It is highly efficient.	It is mandatory efficient.
Cost is low.	Cost is high.
It consumes less time.	It consumes moderate time.
It provides the direction regarding the solution.	No suggestion is given regarding the solution in it.
It is less lengthy while implementation.	It is lengthier while implementation.
Greedy Search, A* Search, Graph Search	Depth First Search, Breadth First Search

3) Choose and write the correct alternative :

1. A* algorithm is based on

- (a) Breadth-First-Search
- (b) Depth-First-Search
- (c) Best-First-Search
- (d) Hill climbing.
- (e) Bulkworld Problem.

Answer: (c) Best-First Search

2. A heuristic is a way of trying

- (a) To discover something or an idea embedded in a program
- (b) To search and measure how far a node in a search tree seems to be from a goal
- (c) To compare two nodes in a search tree to see if one is better than the other
- (d) Only (a) and (b)
- (e) Only (a), (b) and (c).

Answer: (e) Only (a), (b) and (c).

3. Which search method takes less memory?

- (a) Depth-First Search
- (b) Breadth-First search
- (c) Both (a) and (b)
- (d) Linear Search.
- (e) Optimal search.

Answer: Depth-First Search takes less memory since only the nodes on the current path are stored, but in Breadth First Search, all of the tree that has generated must be stored.

4. What is state space?

- (a) The whole problem
- (b) Your Definition to a problem
- (c) Problem you design
- (d) Representing your problem with variable and parameter
- (e) A space where You know the solution

Answer: (d) Because state space is mostly concerned with a problem, when you try to solve a problem, we have to design a mathematical structure to the problem, which can only be through variables and parameters.

5. In which of the following situations might a blind search be acceptable?

- a) real-life situation
- b) complex game
- c) small search space
- d) all of the mentioned

Answer: (c) Small Search Space

6. What is Artificial intelligence?

- a) Putting your intelligence into Computer
- b) Programming with your own intelligence
- c) Making a Machine intelligent
- d) Playing a Game

Answer: (c) Making a Machine Intelligence

4) Following are some of the application areas of Artificial Intelligence. Give atleast two examples of typical AI applications under these areas/domains.

Area	Application 1	Application 2
Fuzzy Logic Systems	Consumer electronics: Washing machine, oven	Automobiles
Natural Language processing	Predictive Text	Smart Virtual Assistant
Expert Systems.	MYCIN - based on backward chaining	DENDRAL - predict it's molecular structure.
Speech/Voice Recognition	Siri	Alexa
Robotics	Process Automation of workflow	Test Cases testing
Neural Networks.	Text recognition	Auto-pilot

5) With the help of the following diagram explain hill climbing search. State the problems that may occur during hill climbing search along with the solutions

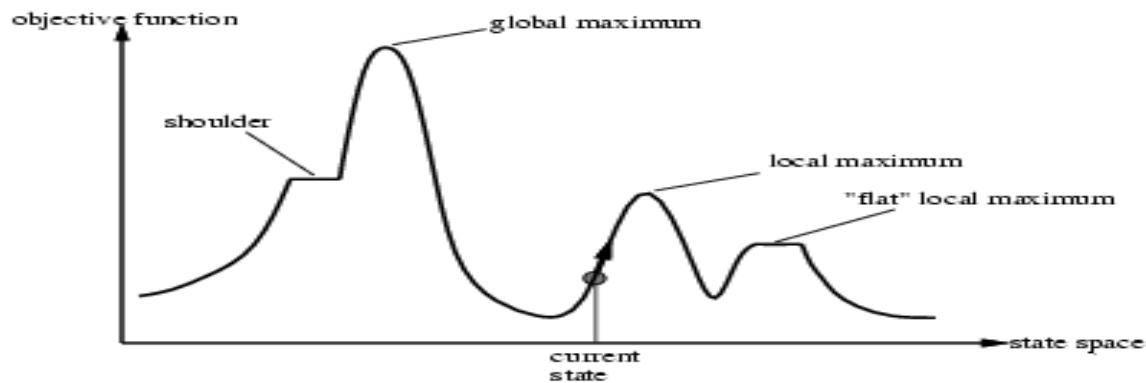


Fig. Hill Climbing

This algorithm generally moves up in the direction of increasing value - that is, up-hill. The basic idea is to always select a state that is better than the current state. i.e. it always moves to a neighbor which has better score. It terminates when it reaches a “peak” where no neighbor has a higher value/score. This algorithm only looks out for immediate neighbors of current state. It is like greedy local search which means it only considers immediate neighbors of the current state.

It does not maintain a search tree rather stores only the current node data structure i.e stores the state and its objective function. Since it keeps no history, it cannot recover from failures of its strategy. This method works in small settings of specific environment. This strategy works very well but sometimes it may not be appropriate to be used in real life scenarios due to shape of entire space. Basically, heuristic helps in deciding the direction of search.

Problems with Hill Climbing

1) Local Maxima – Can’t see higher peak.

This is a state better than the local region or neighboring states but not global maximum.

This occurs since a better solution exists but is not present in vicinity(near) the current state.

Solution – Backtrack to some earlier node and try to move in some other direction.

2) Plateau – It is a flat area of search space where all neighboring states has same value.

Algorithm fails to determine best direction to move on.

Solution - Big jump has to be taken in some direction.

-----EVALUATION SHEET -----

Ques.no	Max.Marks	Marks Obtained	Remark
1	2		
2	2		
3	6		
4	5		
5	5		
TOTAL	20		

SUBJECT INCHARGE

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