Date ___/___/_____

Saathi

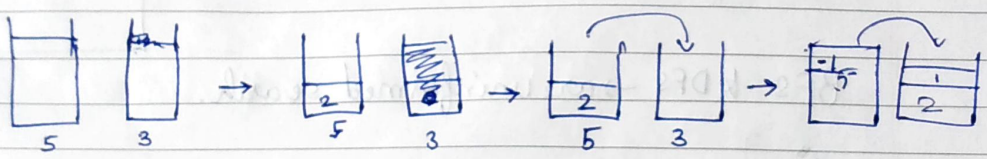
Artificial Intelligence

Agent is capable of taking some information and processing it.

Water Jug Problem

You have - 2 jugs of different operation
We need to measure the required quantity using the 4 litres.

Constraint: ① More than 8 litres cannot be filled.
② There is no extra jug.



Problem → set of goals
→ set of object
→ set of operation

Problem space: → space may contain one or more solutions

Search → a search refers to a sol. of problem if within the problem space → find strategy → to solve the problem
→ control strategies for searching → BFS & DFS.

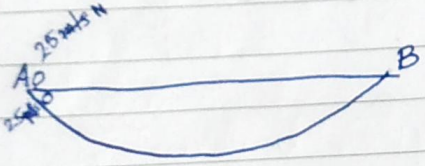
1) fundamental for the problem solving
2) mechanism is used → no direct method known
3) framework for directly problem solving used.
4) AI problems are formulated as search problem.

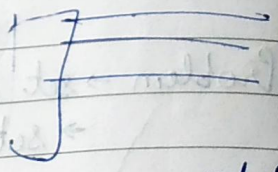
* State Space Search → consisted with some problem with some state change.
(Strategy taking minimum time to solve)

(Problem Rules for water Jug

① Initial condition	Goal comment	New Problem
		4, 3 measure 2

BFS & DFS → are uninformed search.





17/08/2022

Procedure A*
Begin
i) Put a new node n to the set ~~of~~ to open nodes.

Simulated Annealing
Current ← ~~Node~~ Make-node (Initial State Problem)

For t → 1 to ~~∞~~ α
do
T = schedule [t] // T goes downward

Saathi
26/08/2022

Simulated Annealing

if T=0, then return Current
next ← Random Successor (Current)

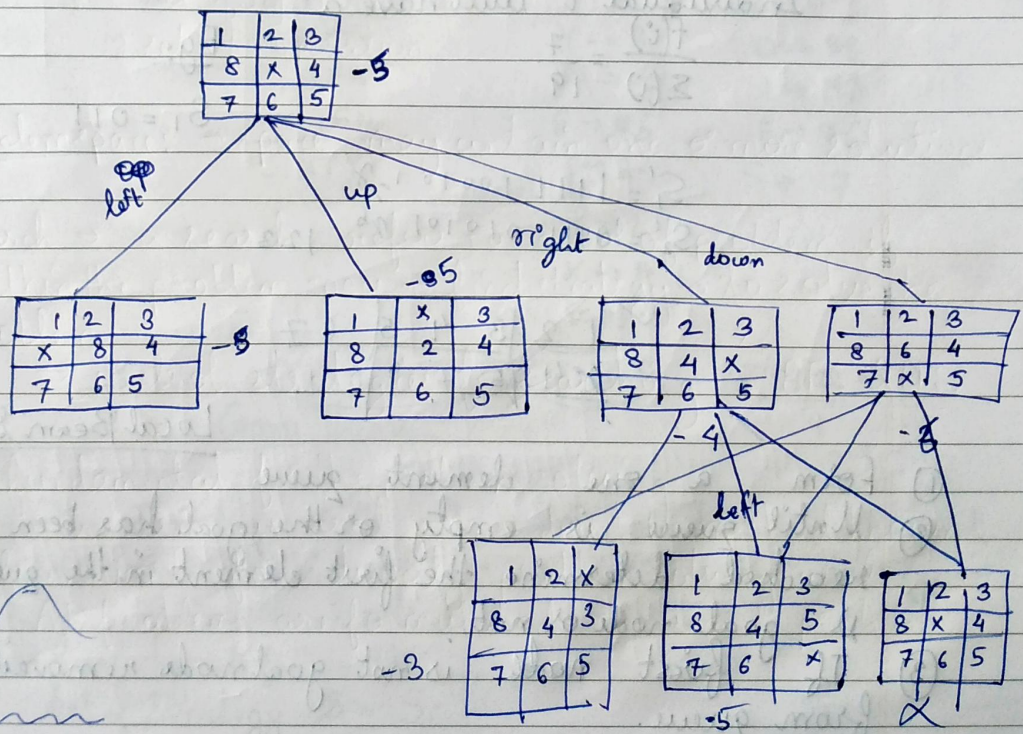
ΔE ← f-value [next] - (f value [current])
if ΔE > 0
then current ← next
else
current ← with ΔE/T
probability
END

Initial

1	2	3
8	x	4
7	6	5

Goal

2	8	1
x	4	3
7	6	5



Date

31/08/2022

Saathi

Problem

Problem: We want to maximise the number of 1's in a string of l binary digits.

Ans:- Start with a population of Random String $l = 10$, $n = 6$.

By tossing a coin 60 times we get an initial population

$S_1 = 1111010101$	$f(S_1) = 7$
$S_2 = 0111100001$	$f(S_2) = 5$
$S_3 = 1110110101$	$f(S_3) = 7$
$S_4 = \ldots$	$\vdots$
$S_5 = \ldots$	
$S_6 = \ldots$	

(f = for a candidate solution is the number of one's in genetic code)

Solution:

Individual i will have a

$$\frac{f(i)}{\Sigma(i)} = \frac{7}{19}$$

9
10
10

Eg.

$S_1 = 011$

$S_1' = 1111\ 10010\ 1$; 7

$S_2' = 0111\ 010101$ %6

123

✓ 1	2	3	4	5	6	7
✓ 2	4	5	7	9	8	1

Local Beam Search

1. Form a one element queue
2. Until queue is empty or the goal has been reached determine the first element in the queue is goal node or not.
3. If first node is not goal node remove its from queue.

Page No.

Date ___/___/_____ Saathi

4) Find its children
5) Sort the children based on w.
6) Add best w children back to queue.
   ↳ total cost = $h(n) + g(n)$
7) Sort all pair.

(a) Diff between informed & uninformed search?
(b)

Eg: Plot integers from 0-9 for the alphabet specified in the crypt Arithmetic problem with following constraints.

1. No two alphabet have the same integer value
2. Having alloted the different values for different alphabet we have to perform arithmetic operations.

```
  FORTY
+ TEN
+ TEN
-------
  SIXTY
```

Y → 3
N → 5
E → 5
T → 4
R → 2
X → 1

O → 8
I → 9
F → 6
S → 7

5/09/22

Game Theory

If neither testifies, both released. If one testify, other not, then release and collect the reward. If both testify then go to prison and collect the reward.

no. of agents $(n) = 1$ to n.
Set of Strategy $S_i \in S_i$

R S
S R

Saathi

Date

A strategy is a complete plan of action a player will take given the set of circumstances that might arise within the game

Payoff function $u_i = S_1 \times S_2 \dots S_r \in R$ which defines agent's utility / joint strategy

	C	D
C	1, 1	-1, 2
D	2, -1	0, 0

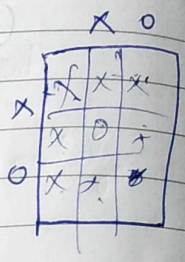
Def. Strategy profile s^* is a dominant strategy equilibrium of a game if ;

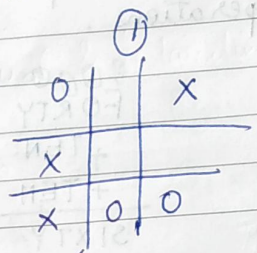
for all i,

$$u_i(s_i^*, s_{-i}^*) \geq u_i(s_i, s_{-i}^*)$$

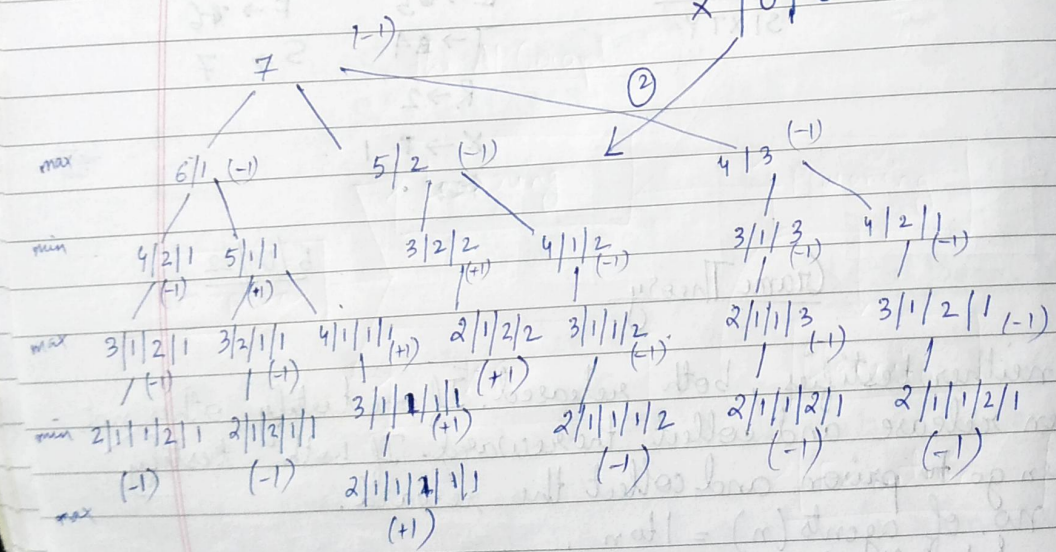
$$\forall s_i \in S_i,$$

$$s_{-i} = (s_1, \dots, s_{i-1}, s_{i+1}, \dots s_2)$$

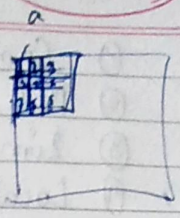


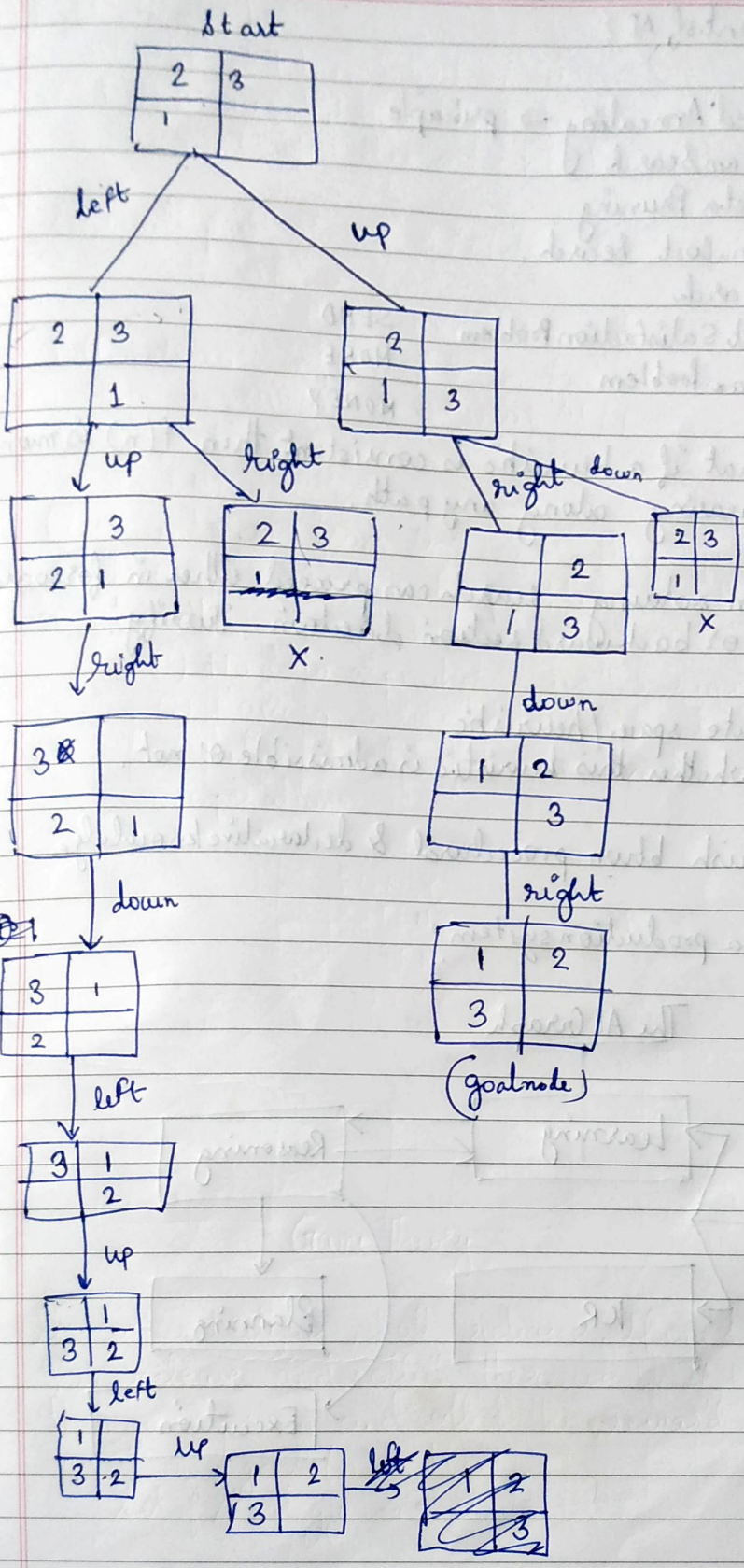


Players 1 - wins +1
Players 2 - win -1



Page No.




Start
left
up
up
right
right
down
right
down
down
right
left
up
left
up
left
(goalnode)
X
X

1. Component of AI?
2. DLS.
3. Simulated Annealing → principle
4. Local beam Search
5. Alpha-Beta Pruning
6. Uniform-cost Search.
7. Blind Search
8. Constraint Satisfaction Problem
9. Mini-max Problem

	SEND
	MORE
	MONEY

7. Show that if a heuristic is consistent then f(n) is monotonically non-decreasing along any path.

8. A problem solving search can proceed either in forward direction or backward ~~section~~ direction. Justify.

9. Define State space / heuristic
Define whether this heuristic is admissible or not.

10. Distinguish btwn procedural & declarative knowledge

11. What is a production system?

The AI Graph