Day:_____ Date:_____

AI → Self Study:

→ 4-definations of AI → cognitive science (AI + psychology)

↳ Acting Humanly → (Turing Test (computer or human) → not possible to differenciate

↳ Thinking Humanly: it about process how humans think

↳ Thinking Rationally: (laws of thought approach) → Thinks logically

↳ Acting Rationally: (best approach) an agent act logically to achieve best outcome either it is certain or uncertain.

To Build any agent we need (rationallity)

↳ Rationality depends on:

↳ PEAS → 4 things:

* Performence measure: (what defines success?)
* Environment: (what it already knew about world.)
* Acctuators: (Actions availaible to do)
* Sensors: (Every thing it percived / seen till this moment)

*Omniscience:

↳ An agent looks at a bridge it looks safe. The agent crosseses. The bridge collapses because of an invisible flaw.

Was the agent rational?

↳ Yes!

Reason: Rationallity is based on what agent (saw) (perciève) not on seeing future invisible things

↳ so rationality measured on expected performance not on actual per..

Day: _____ Date: _____

Properties of Environments:

- Fully observable: Chess (sensors detect everything relevant)
- Partial observable: Noisy or missing data (Taxi driving can't observe everything)

- multi-agent: Dependency on Someone. Taxi driving avoiding other cars
- Deterministic: Next state defined by previous (chess)
- Stochastic: Randomness (weather prediction, ludo, Taxi driving)

- Episodic: Next step doesn't depend on previous.
- Sequential: current step affects all future decisions. (chess, Taxi driving) ludo

- Static: Env → not change while agent thinking (cross words)
- Dynamic: Env → changes while thinking (Taxi driving)
- Semi-Dynamic: Env doesn't change but score does (chess) with time

- Discrete: Fixed state actions. (Chess) E4, E5 → D5 not half moves.
- Continuous: Smooth transitions. either in decimals.
  - Steering wheel degree: 10.1, 10.2 ---- 13.1

known/s: Unknown

- Known as physics. → have to learn how world works in (new game)

4 → Agent Architectures:

Level 1: Simple Reflex Agent: → reacts based on what it saw. ~~sees car ahead actions brake~~ no memory of either behind car or not

~~Level 2: Model Based Reflex Agent~~: with memory action.

level 3: Goal Based reflex agents:
- Destinations, memory, action.

Level 4: Utility based Agent:
- find Best way to destination then provide comfort and safe ride ~~with all other features~~.

Day: Date:

lec 3: Searching: Azan Koosi

Uninformed Search: (Blind Search)
- DFS
- BFS
- Uniform-cost-search
  - → Time consuming
  - → No knowledge.

Informed Search: (To Solve quickly)
- A* → This is knowledge
- Heuristic DFS
- Best first search
  - → quick solutions.
  - → less complexity (Time & space)

Heuristic & knowledge.

The search problem consist of:

A state space:

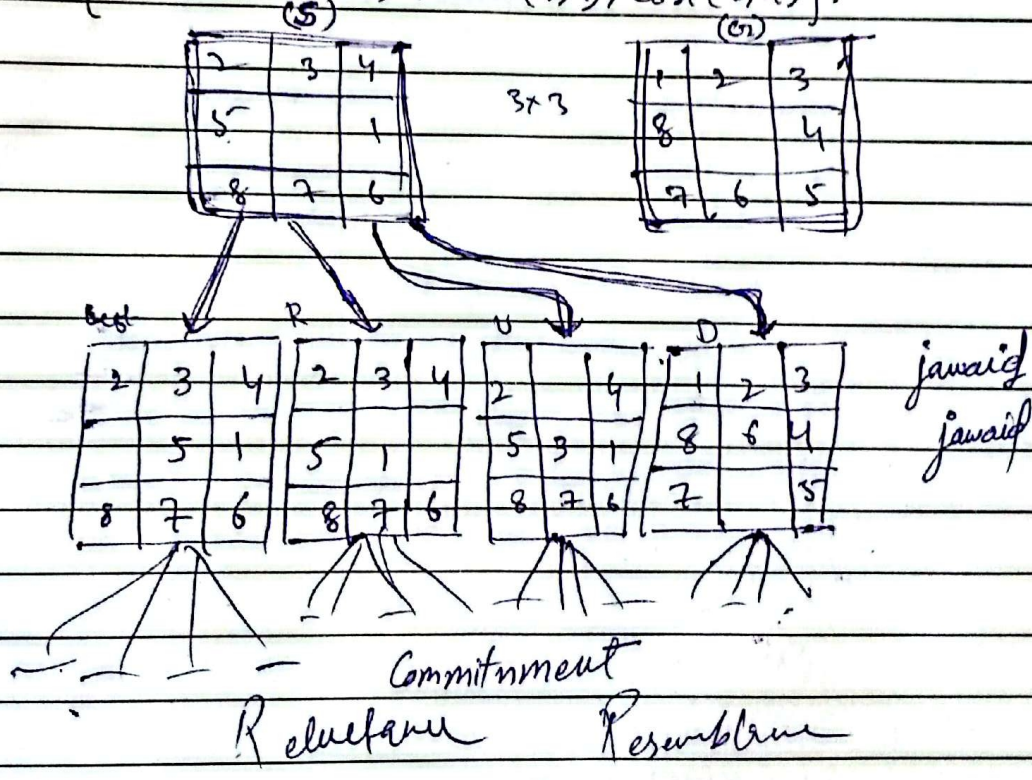
A successor function. (with actions, costs)

start state and goal state.

State space search:

Specify, Analyze.

S: { S, A, Actions(S), Result(S,a), cost(S,a) }.



Day: _____ → Breadth-First-Search (queue) Date: _____

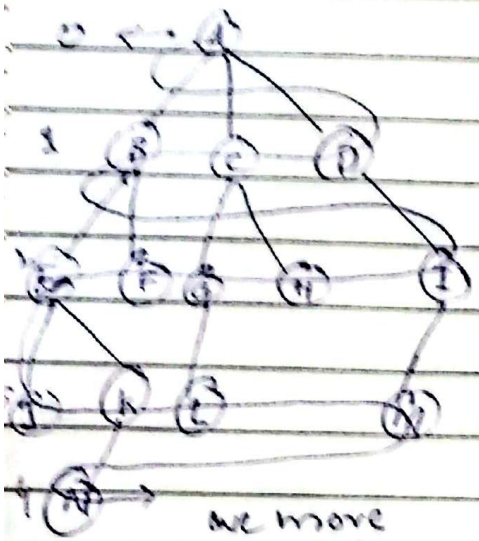
Uninformed search.

↳ BFS

↳ FIFO (Queue)

↳ Shallowest Node → move level wise.

↳ complete → visit of tree.



we move level wise

Queue

out ← [A] ← in

BCD

CDEF

DEFGH

EFGHI

FGHIJK

GHIJK

HIJKL

IJKL

JKLM JKLM

KLMN KLM

LMN KMN

MN

N

A → N → path

→ This gives us optimal solution.

Time complexity:

↳ $O(b^d)$ → depth. level.

b → branch factor (Node) (childs)

→ DFS

↳ uninformed search

↳ stack [LIFO]

↳ Deepest Node

↳ incomplete ~~visit~~

↳ time

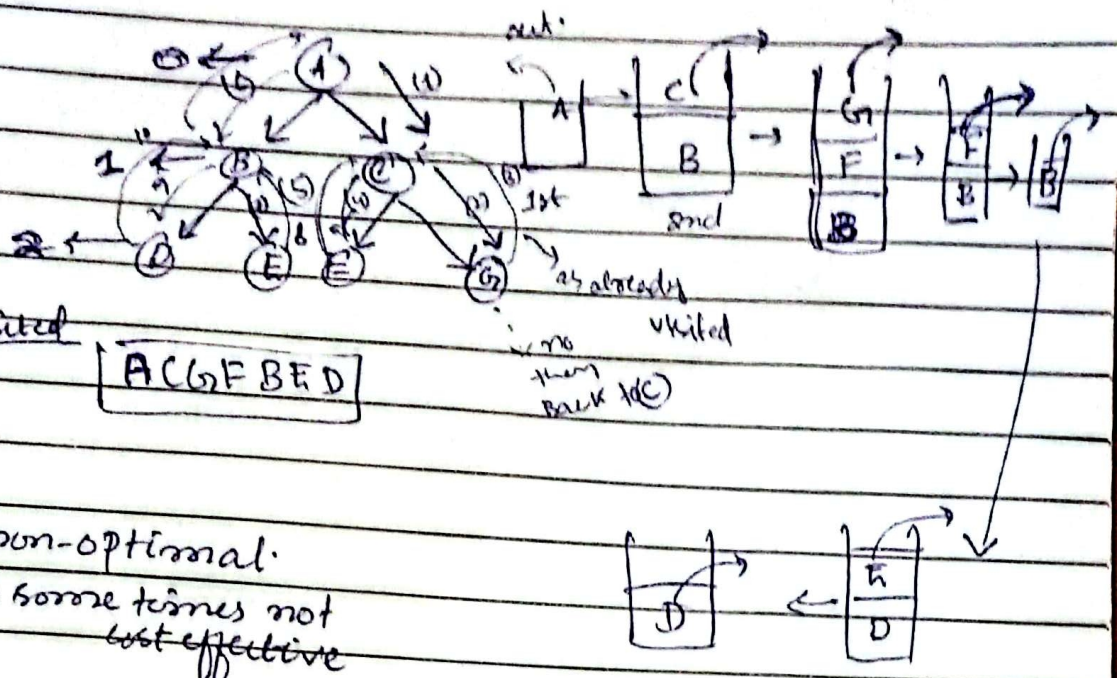
it is possible

some times doesn't

gives us solution.

Day:_____ Date:_____

DFS

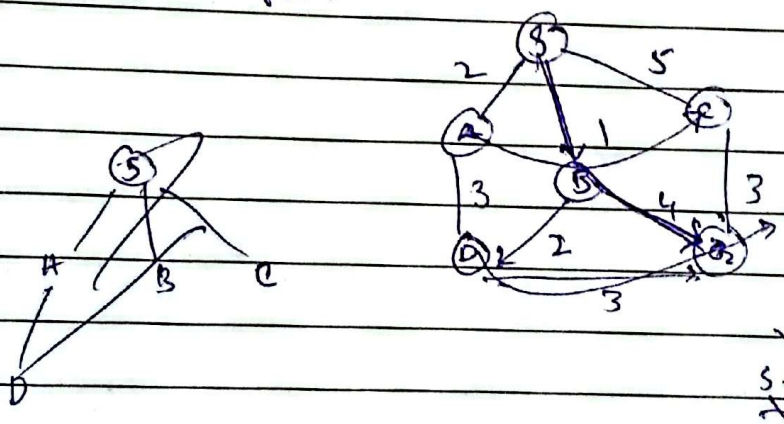


⇒ non-optimal.
↳ some times not ~~cost effective~~

time complexity
↳ $O(b^d)$

$b = 2$
$D = 2$ $= (2)^2 = (4) \rightarrow$ searches.

⇒ BFS Example:

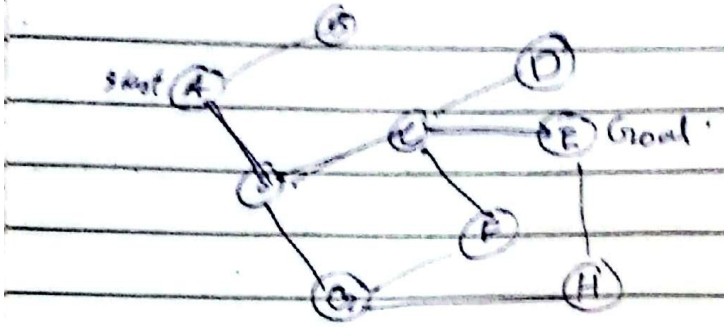


~~visited~~:
SABCDG

SBG.
path.

~~Queue~~:
~~SABCDG~~
~~BED~~

Day:_____ Date:_____



visited

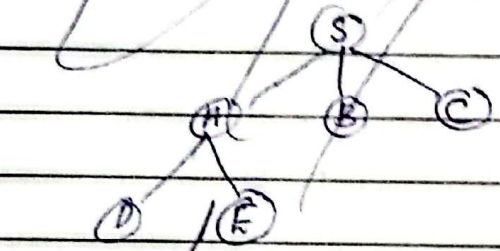
~~[ABSCGFE~~ → visited

ASCE

Queue:

~~[ASBCGFE~~ DH

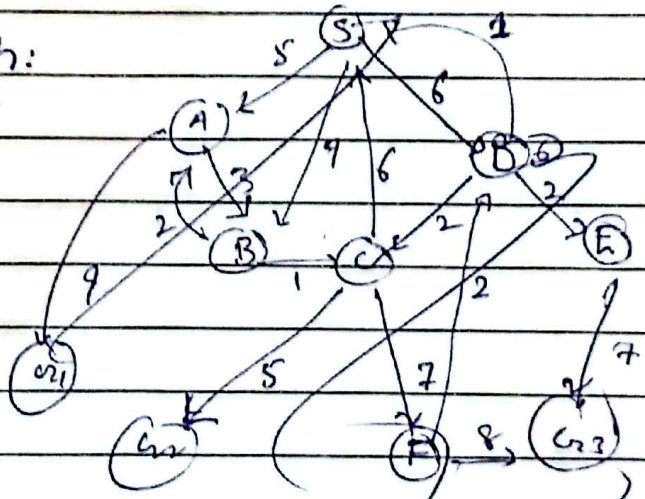
DFS → non-weighted.



Uniform - cost - search.

↳ using priority queue.

EXP:



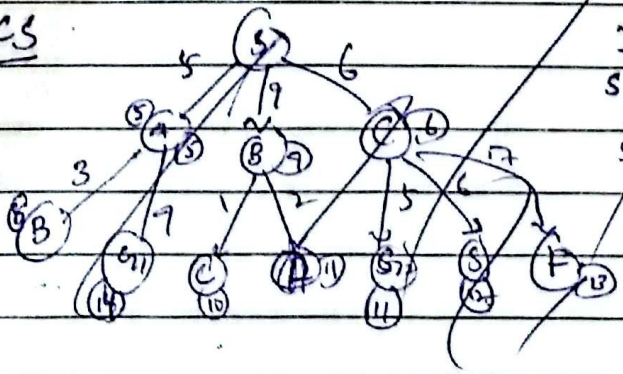
Now informed search:

↳ Greedy search.

↳ A*

↳ Best first search.

Tree: ~~U~~ CS



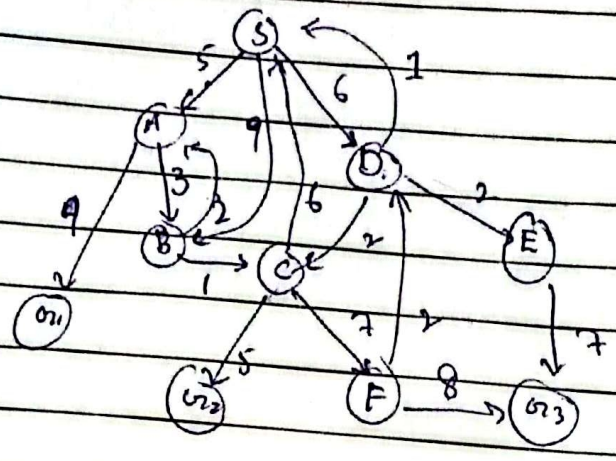
visited

S A B B C G2

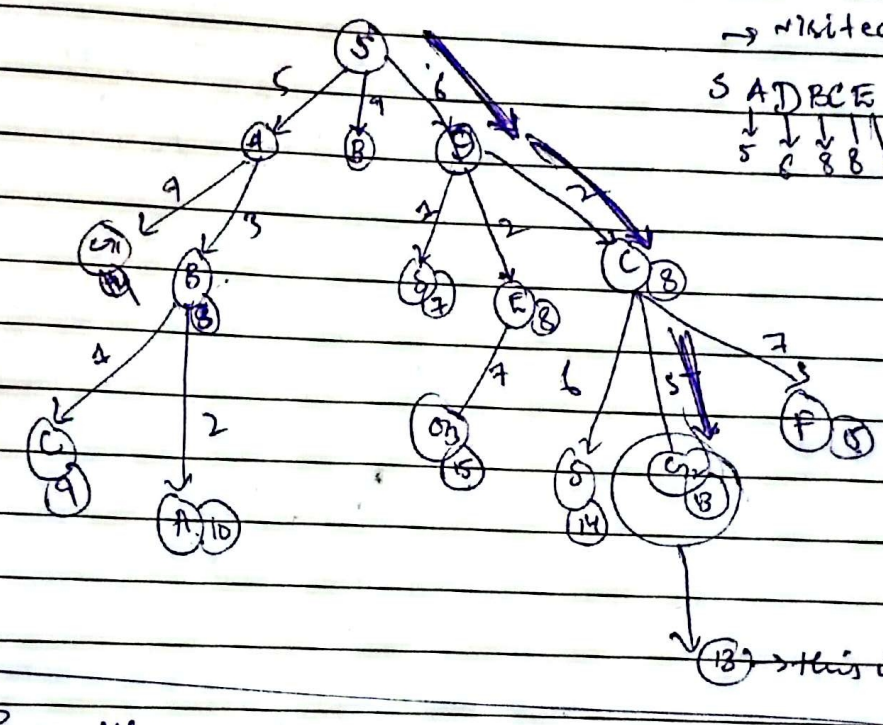
5 6 8 10 11

Day:_____ Date:_____

UCS



Tree. Priority Queue.



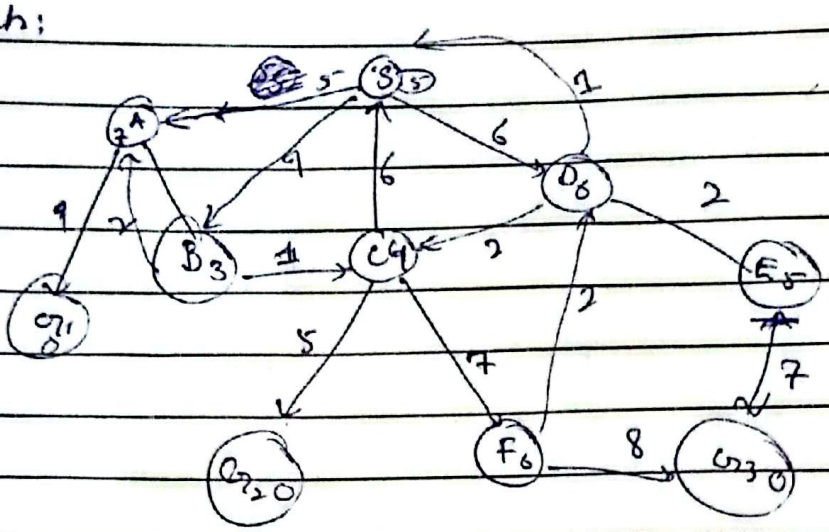
→ visited:

S A D B C E
5 6 8 8 8

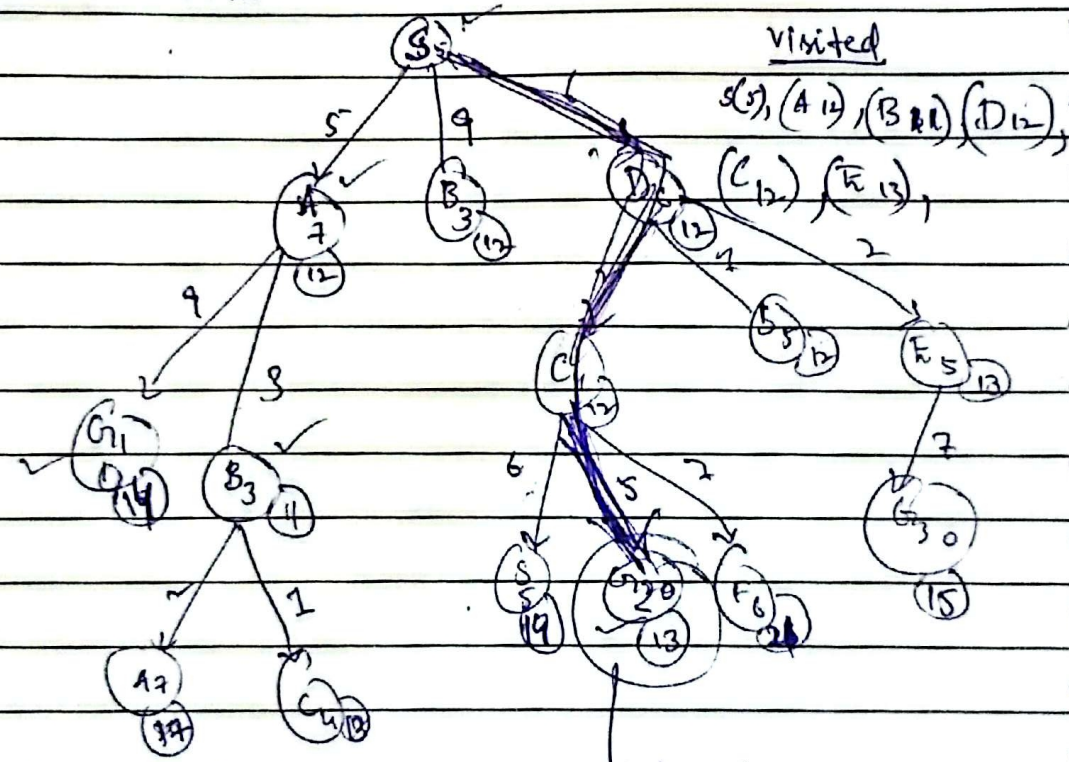
Breadth ~~First~~

Day:_____ Date:_____

A* Search:



= cost of path + heuristic



Visited

S(5), (A 12), (B 11), (D 12), (C 12), (E 13),

this is goal

huristic: approach.