CS 344
Artificial Intelligence

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Search building blocks

- State Space : Graph of states (Express constraints and parameters of the problem)
- Operators : Transformations applied to the states.
- Start state : S_0 (Search starts from here)
- Goal state : $\{G\}$ - Search terminates here.
- Cost : Effort involved in using an operator.
- Optimal path : Least cost path

Examples

Problem 1 : 8 – puzzle

4	3	6
2	1	8
7		5

S_0

1	2	3
4	5	6
7	8	

G

Tile movement represented as the movement of the blank space.

Operators:

L : Blank moves left

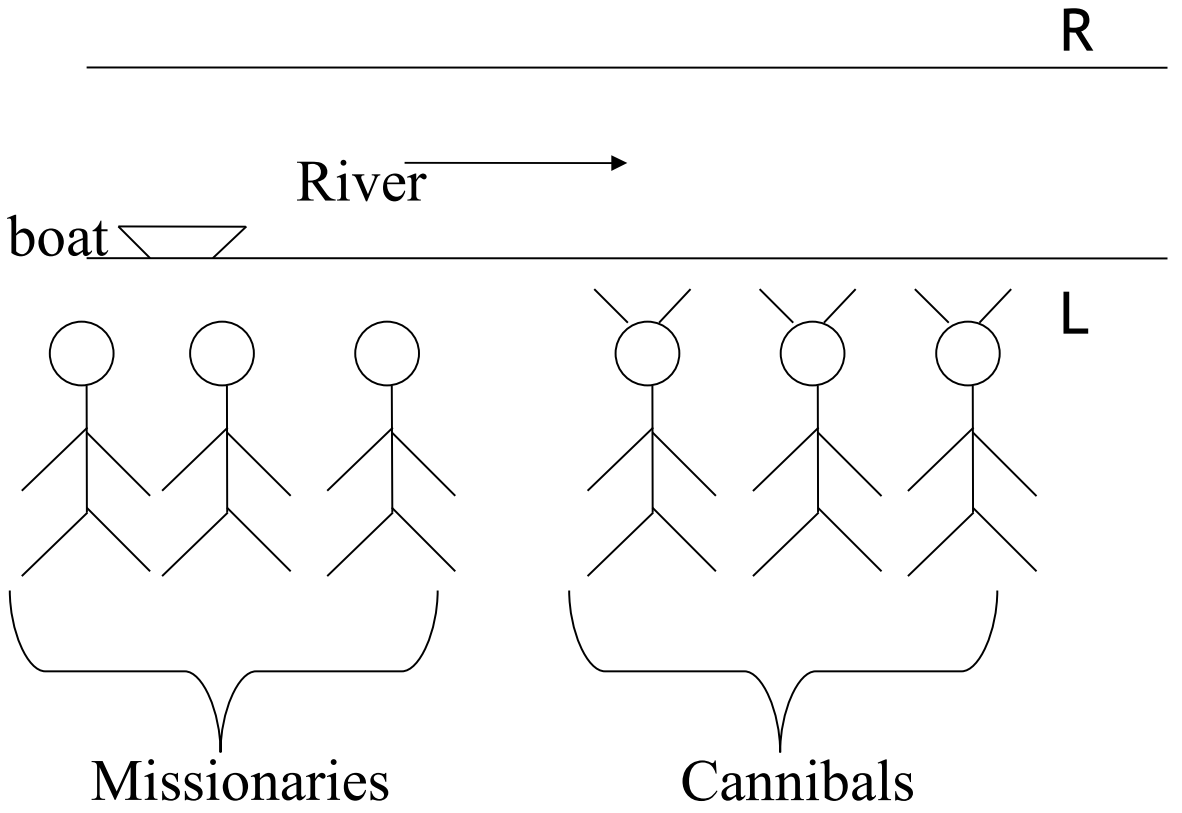
R : Blank moves right

U : Blank moves up

D : Blank moves down

$$C(L) = C(R) = C(U) = C(D) = 1$$

Problem 2: Missionaries and Cannibals



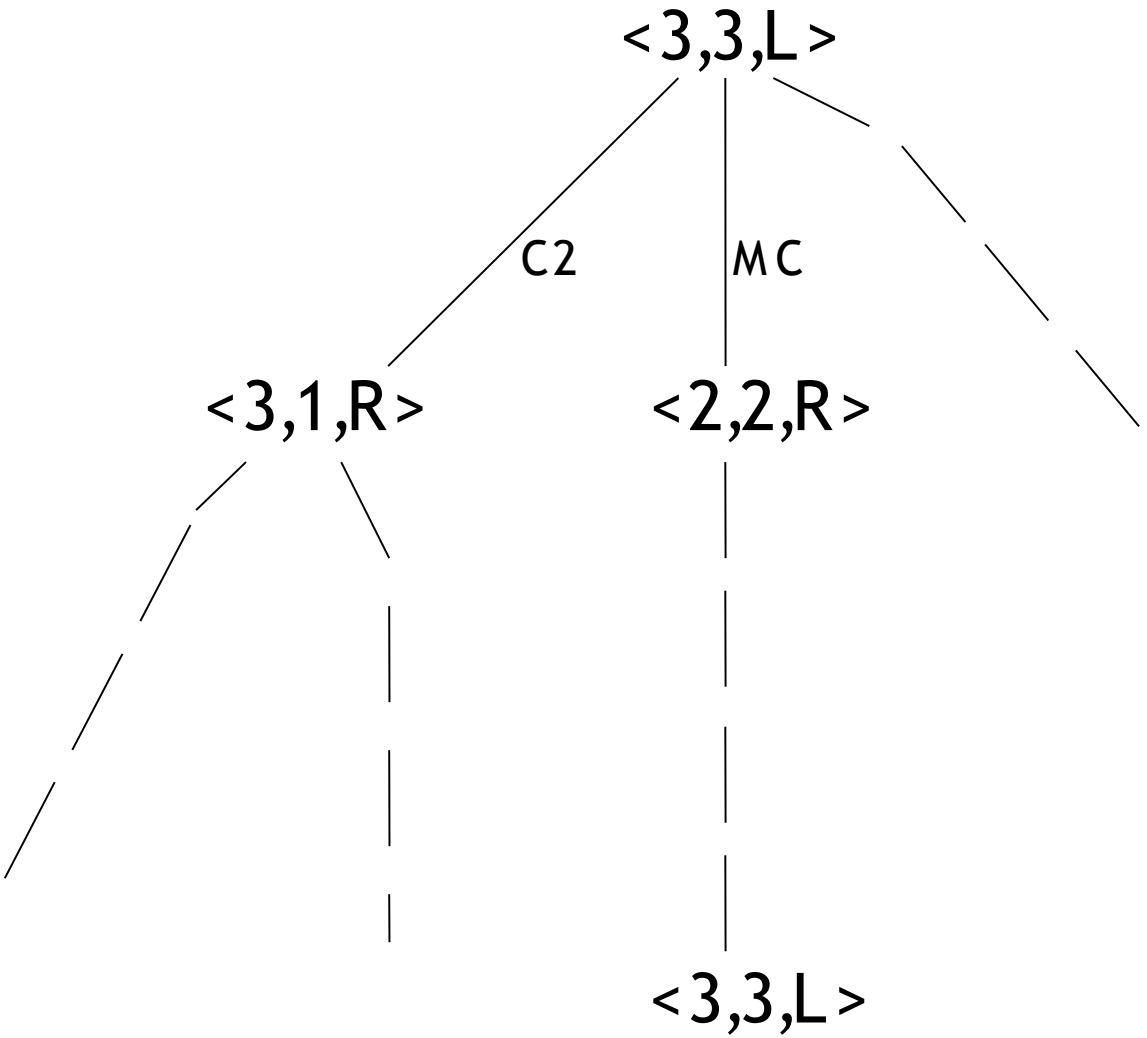
Constraints

- The boat can carry at most 2 people
- On no bank should the cannibals outnumber the missionaries

State : <*#M, #C, P*>
#M = Number of missionaries on bank *L*
#C = Number of cannibals on bank *L*
P = Position of the boat

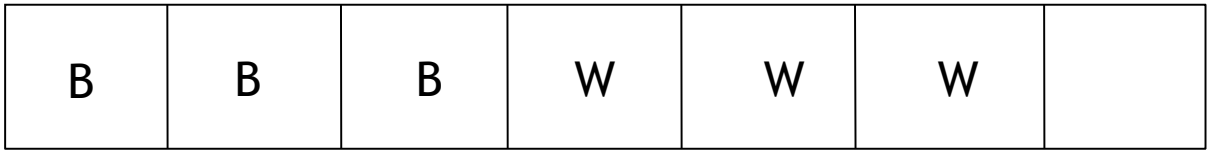
S0 = <*3, 3, L*>
G = < *0, 0, R* >

Operations
M2 = Two missionaries take boat
M1 = One missionary takes boat
C2 = Two cannibals take boat
C1 = One cannibal takes boat
MC = One missionary and one cannibal takes boat



Partial search tree

Problem 3



G: States where no **B** is to the left of any **W**

Operators:

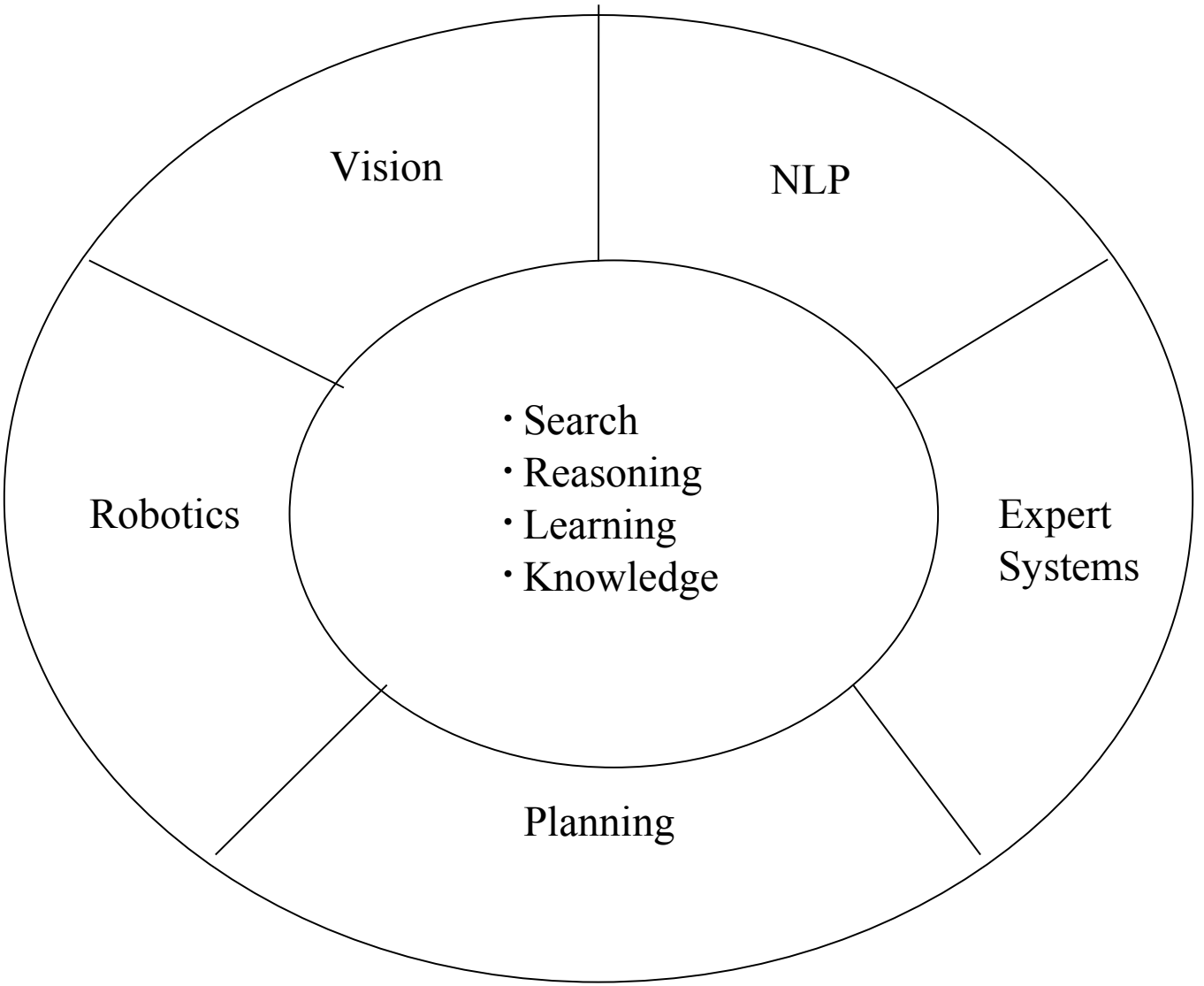
1) A tile jumps over another tile into a blank tile with cost 2

2) A tile translates into a blank space with cost 1

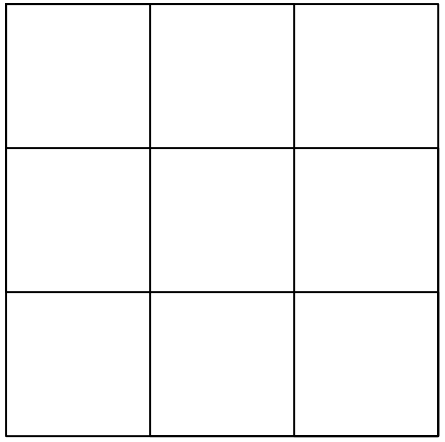
All the three problems mentioned above are to be solved using A*

Where is AI coming into picture in all these!!

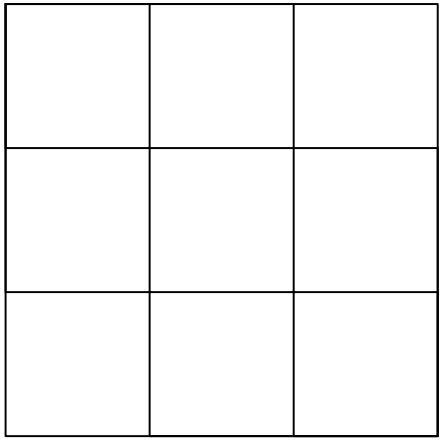
AI involves search of state space



Computer Vision



Left retina

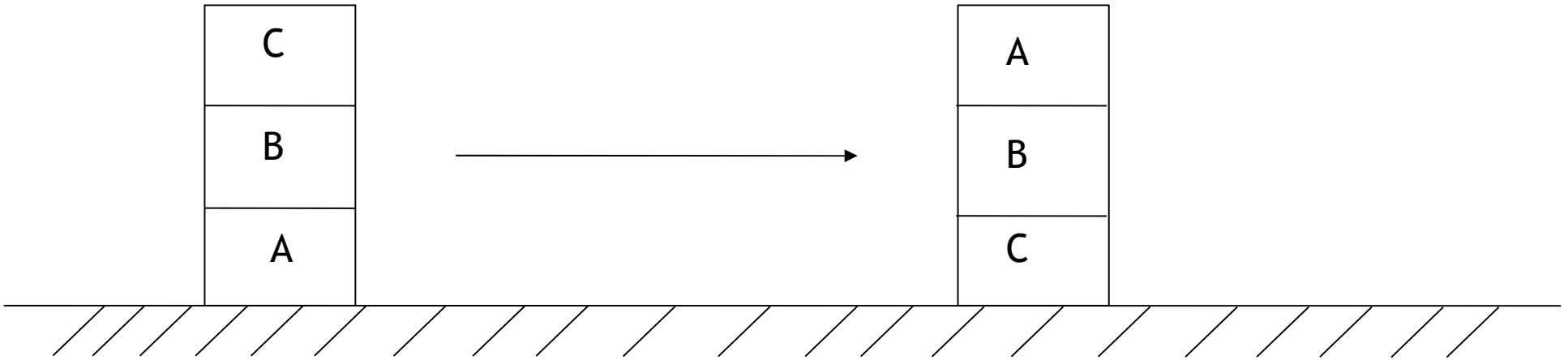


Right retina

Problem: Find the corresponding cells in the two retinae; this is a search problem.

This information is used for identifying the depth of objects and forming the 3D picture of objects

Robotic Planning



Problem: What sequence of arm moves should be followed to reach a particular configuration; again a search problem.

NLP

Search needed amongst possibilities to arrive at the right meaning.

e.g: *"The camera man shot the batsman when he was near the chairman of the selection committee"*

Different meanings for this sentence. These are to be inferred

1) Who is near chairman
2) Meaning of shot
3) .....
4) .....

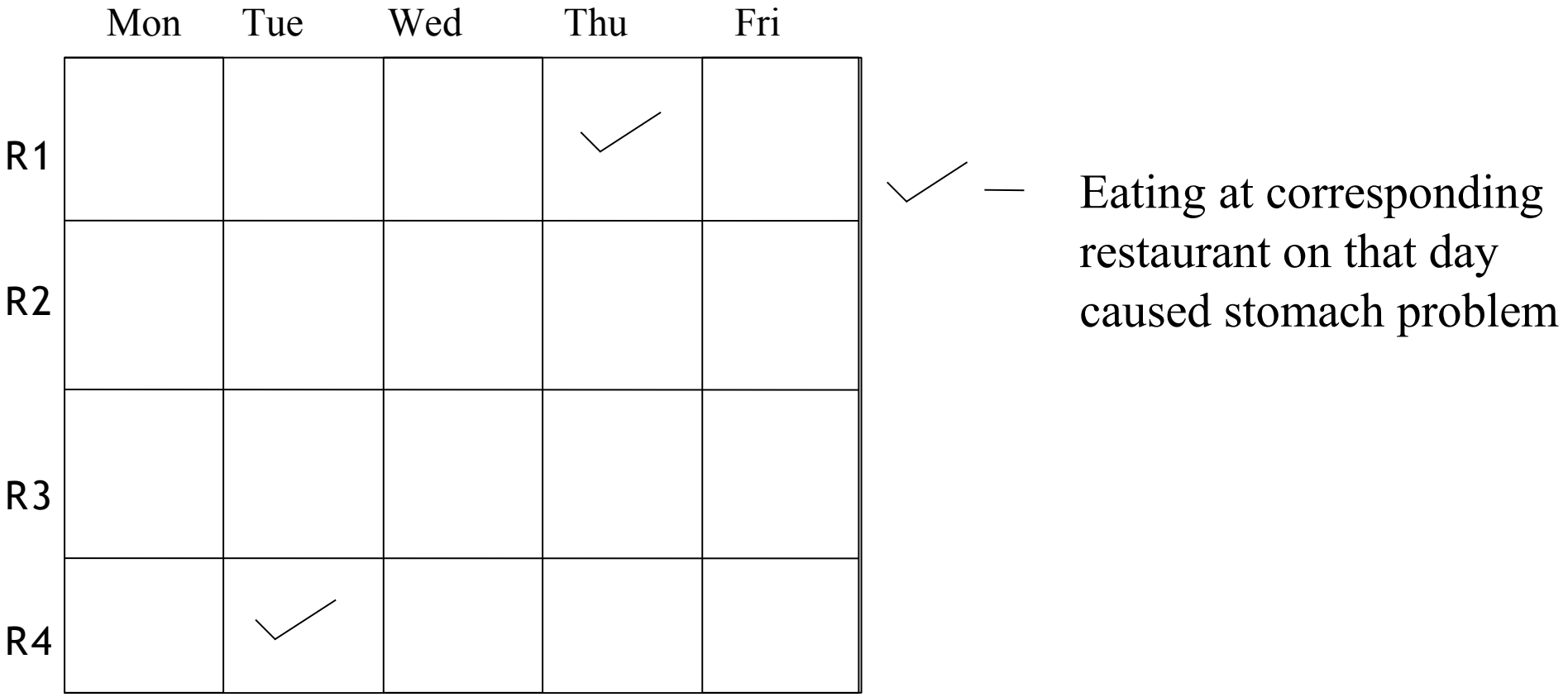
.....

There can be 14 different meanings for the sentence above.

Which one to choose as the actual meaning?

Another example: *"Time flies like an arrow"*

Machine Learning



Problem: Infer a hypothesis which generalizes the properties of restaurants on different days, in terms of causing stomach problems