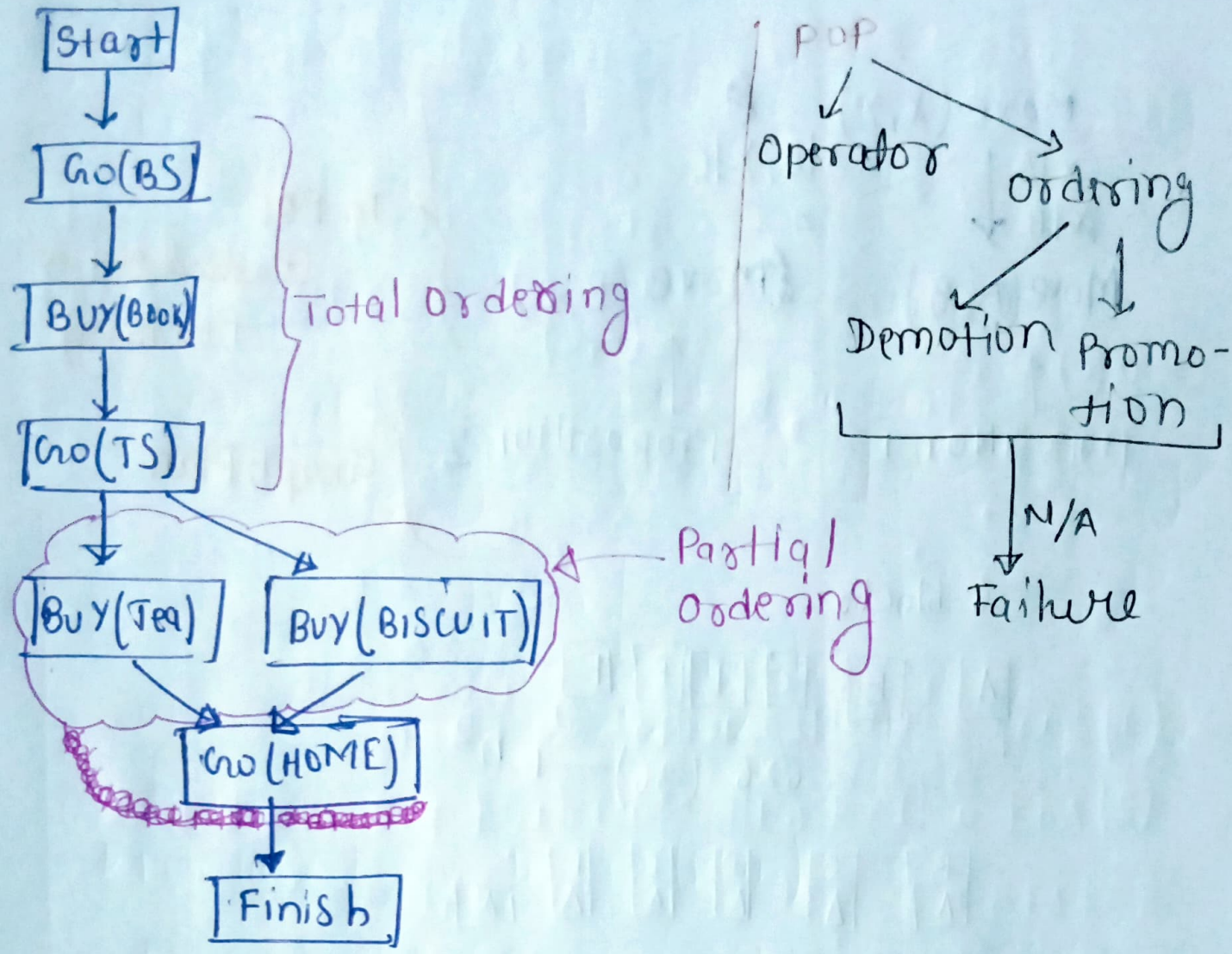


Lecture-14

POP
Graph-Plan } → Simplified Planning model
SAT Plan } → Efficient algo

→ Propositional planner
(No variable → No unifying / Matching)

Move (X, Y)

X|A
X|B

X|B, Y|C

Move (A, B)

Move (B, C)

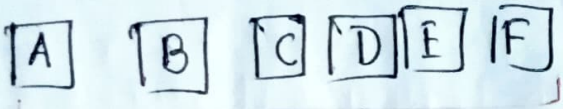
proposition 1

Proposition 2

In POP (Partial Order Planning)

Graph Plan

6 blocks



6 × 6 (36) → n^2

- Make a plan-graph of depth 'k'
- search a solution
- if success → Plan
- else k = k+1

Time step.

Go back to step 1.

- Partial order step. we can do in some time-step.

Ex:

K = 3

start time — finish time

t = 1	Do 'A'	Do 'B'
t = 2	Do 'C'	
t = 3	Do 'D'	Do 'E'

Depth '3'
'5' Step plan

Can have
▷ Multiple parallel action per time step.

Planning vs Scheduling

Actions are not fixed + ordering/scheduling
▷ Pspace-Complete

Tasks are fixed
▷ N·P Complete

Restricted set of action + Limited → then memory required is also limited

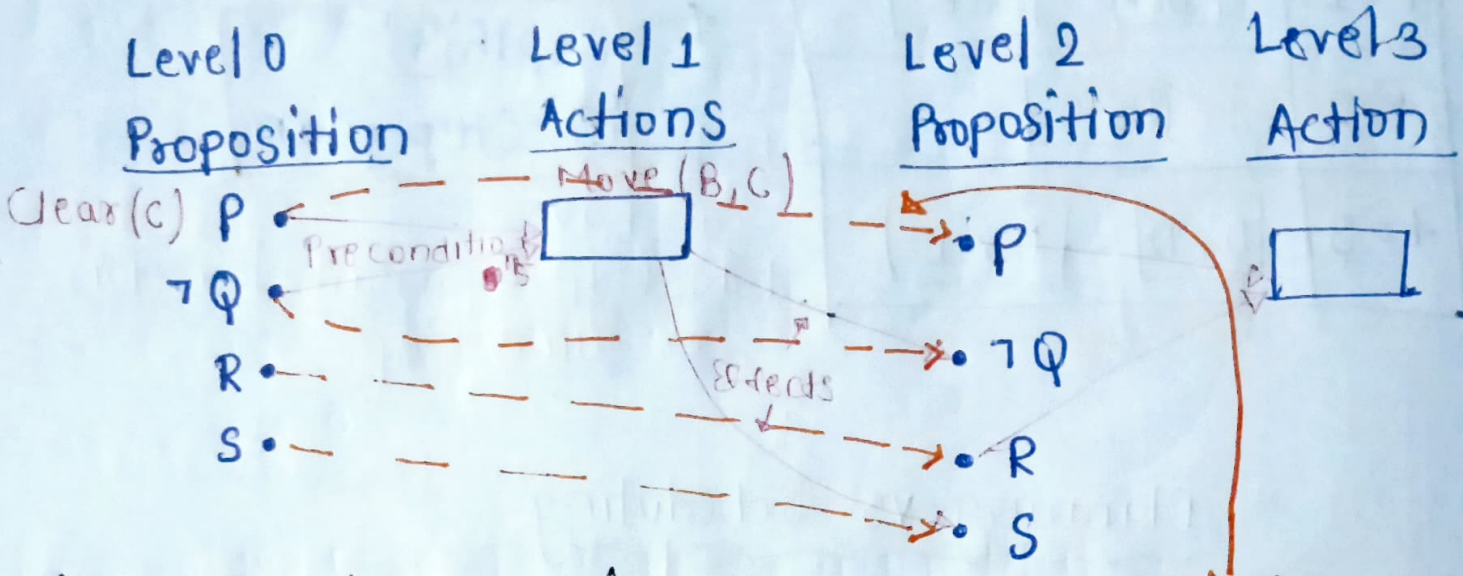
[Length of the plan is also not known]

- Scheduling
- Graph Plan
- Planning

Complexity ↓

(Data Structure) ⟶ {Proposition/Action}

Plan-Graph



(1) Start with the initial condition

(2) Add actions with satisfied pre condition

(3) Add effects of action at previous step

(4) Add maintenance-action

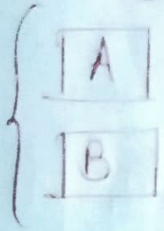
↳ If some proposition is not effected by action it should have a direct connection to $(n+2)^{th}$ level.

Goal (P ∧ R ∧ S) ← check.

MUTEX

(Mutually Exclusive Action)

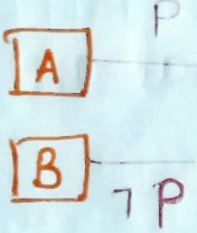
time 't'



← Cannot happen or perform in same time step

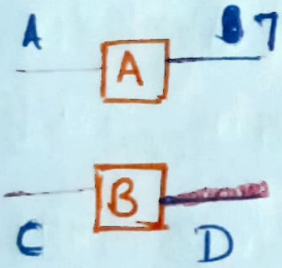
▷ How to find MUTEX Actions ?

① P



MUTEX (Incosistent effect)

②



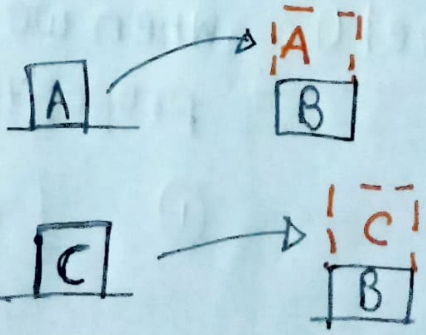
MUTEX (Inference effect)

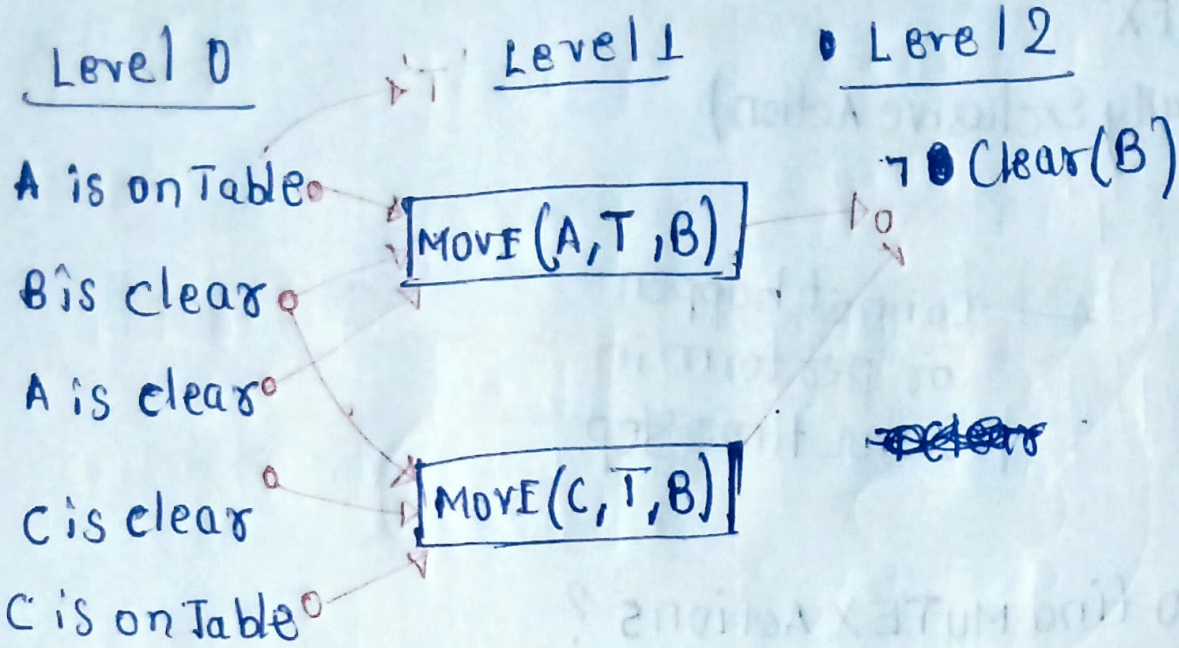
▷ The action deletes the precondition of others.

③ Competing need

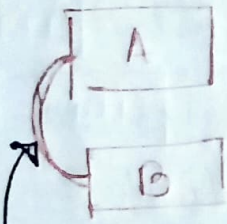
MOVE (A, Table, B)

MOVE (C, Table, B)





▷ Competing need have pre-condition that are mutex at level (i-1)



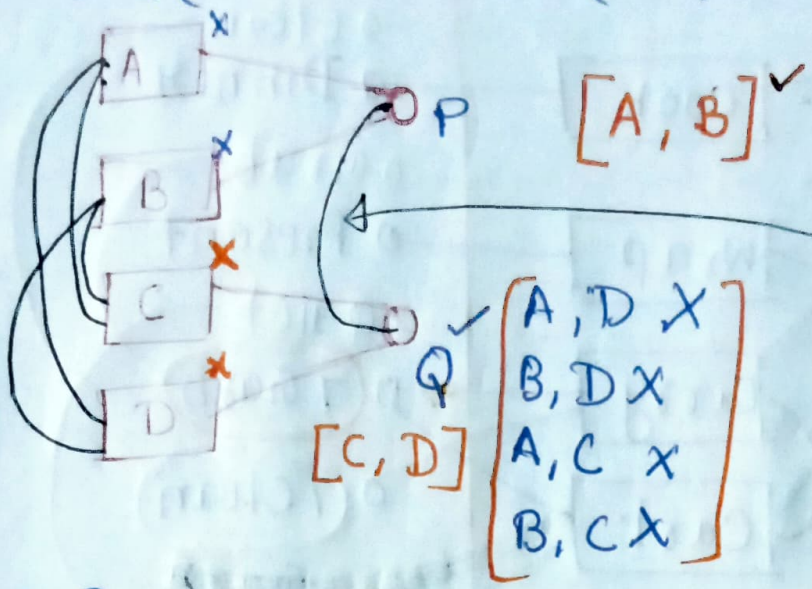
{Means they are mutex}

Level 0 — When we can't put two proposition at the same level?

① $\boxed{\neg P \wedge P}$

↳ MUTEX

② Level(i) Level(i+1)



→ P and Q Can't be true at the level (i+1)

Birthday Dinner

Goal: ¬Garb ∧ Dinner ∧ Present

Initial: Garb ∧ Clean ∧ Quiet

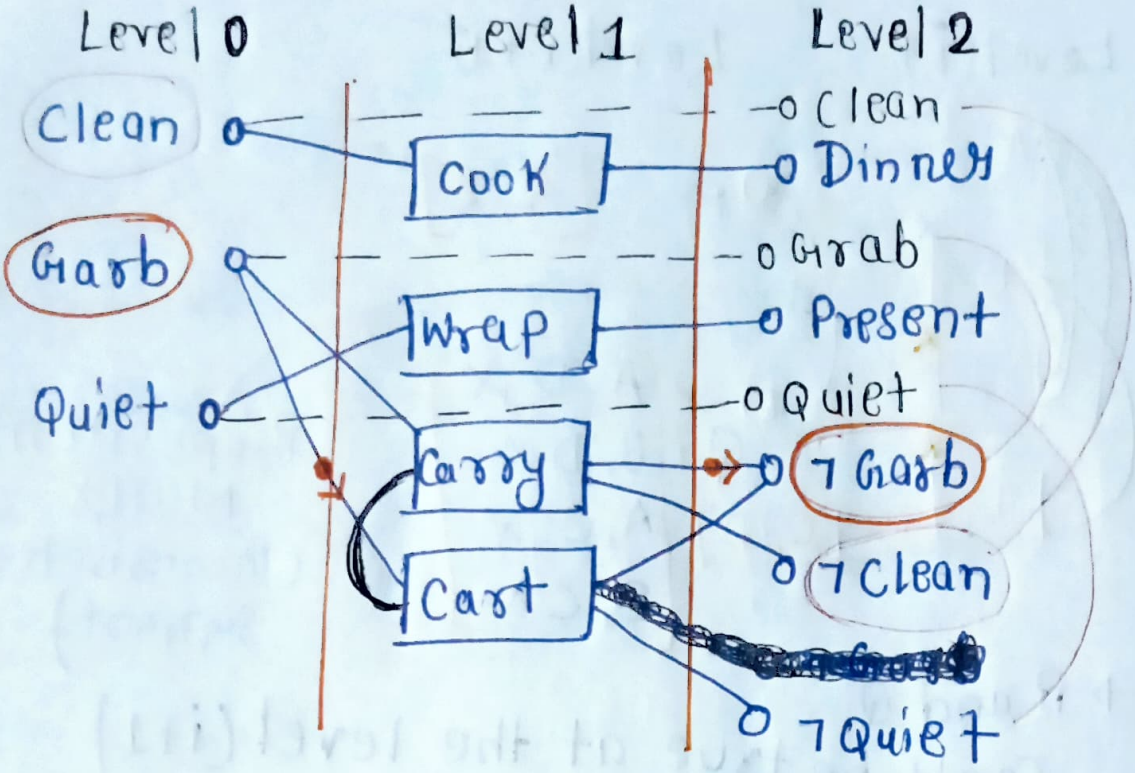
Actions:

Cook
Pre: Clean
Effect: Dinner

Wrap:
Pre: Quiet
Effect: Present

Carry
Pre: Garb
Effect: ¬Garb ∧ ¬Clean

Cart:
Pre: Garb
Effect: ¬Garb ∧ ¬Quiet



→ Proposition Mutex

→ Action Mutex

[SAT Plan]

[Graph Plan]