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AI EXPERIMENT 9

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AI Experiment 9

Aim : To implement / demonstrate any algorithm (FSSP, BSSP, Partial Order, Total Order) with suitable example.

Theory:

1. In total order planning of a robot assembling a sandwich, actions are steps the robot can take, each with specific preconditions & effects.
2. Goal is to generate a plan of sequence actions - that lead to desired final state - a completed sandwich with peanut butter & jelly.
3. Scenario involves 6 actions:
   a) Get Bread
   b) Get peanut butter
   c) Spread peanut butter
   d) Get Jelly
   e) Spread jelly
   f) Combine bread with peanut butter & jelly.
4. Each action has necessary conditions to perform the action & effects what action produces.
   For eg: 'Get Bread' has no pre-condition & produces 'Bread' while 'Spread jelly' requires both Jelly & Bread & produces bread with Jelly.

Total planning algorithm generates a plan by iteratively selection actions whose pre conditions match the current State. It ensures the effects of chosen action contributing to reach the goal.

Conclusion:

Hence, we implement Total Order Planning algorithm & understood how it works. Above we discussed with an example of how to make peanut bread & with the help of code we tried to make a pizza.

Code :

```
class Action:
    def __init__(self, name, preconditions, effects):
        self.name = name
        self.preconditions = preconditions
        self.effects = effects

def total_order_planning(actions, goal):
    plan = []
    current_state = set()

    while not goal <= current_state:
        added = False

        for action in actions:
            if action not in plan and action.preconditions <= current_state:
                plan.append(action)
                current_state |= action.effects
                added = True
                Break

        if not added:
            print("Goal cannot be achieved.")
            return None

    return plan

# Define actions with their preconditions and effects for making pizza
actions = [
    Action("Buy Pizza Dough", set(), {"Pizza Dough"}),
    Action("Preheat Oven", set(), {"Oven Preheated"}),
    Action("Roll Out Dough", {"Pizza Dough"}, {"Rolled Out Dough"}),
    Action("Spread Pizza Sauce", {"Rolled Out Dough"}, {"Dough with Sauce"}),
    Action("Grate Cheese", set(), {"Grated Cheese"}),
    Action("Add Cheese to Dough", {"Dough with Sauce", "Grated Cheese"}, {"Pizza with Cheese"}),
    Action("Chop Vegetables", set(), {"Chopped Vegetables"}),
    Action("Add Vegetables to Pizza", {"Pizza with Cheese", "Chopped Vegetables"}, {"Homemade Pizza"}),
    Action("Bake Pizza", {"Homemade Pizza", "Oven Preheated"}, {"Baked Pizza"})
]

pizza_goal = {"Baked Pizza"}

pizza_plan = total_order_planning(actions, pizza_goal)

if pizza_plan:
    print("\nTotal Order Plan for Homemade Pizza:")
    for action in pizza_plan:
        print(action.name)
print('\n')
```

Output :

```
PS D:\SEM-5\AI\EXPERIMENTS> python -u "d:\SEM-5\AI\EXPERIMENTS\EXP9.py"

Total Order Plan for Homemade Pizza:
Buy Pizza Dough
Preheat Oven
Roll Out Dough
Spread Pizza Sauce
Grate Cheese
Add Cheese to Dough
Chop Vegetables
Add Vegetables to Pizza
Bake Pizza


PS D:\SEM-5\AI\EXPERIMENTS>
```