Report on
Artificial Intelligence Lab Project

Project Team:

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The IDEA:

There is a new startup restaurant which provides three types of food services.

- They are: 1. Dine in the restaurant 2. Home Delivery 3. Fast Home Delivery.
- The restaurant sells three types of foods: Burger, Pitha and Ice-cream.
- Burger costs 35 bucks, Ice-cream costs 25 bucks and Pitha costs 20 bucks.
- In Dine-in, customers can order all three foods in different quantities and foods will be served at the restaurant's table by the waiter and there will be no delivery cost for this.
- Each types of agent have different capacity of delivering foods.
- In both deliveries, customers can only order Burger and Pitha of different quantities and foods will be delivered by the delivery man.
- One order will contain only One type of food.
- Food can be delivered to different areas inside the city and delivery charge will vary depending on the areas.

The PROCESS:

We have used:

- **Metric-FF** as a planning system.
- Classical(conditional) and Numerical planning to model the problem.

Domain File Name: restaurant_withNumerics_domain

Requirements (features of PDDL used) :

- :strips
- :typing
- :action-costs
- :fluents

Typing:

- Object: location(location of food delivery), agent(medium of delivery), food(food items).
- Agent: waiter(to serve food at restaurant), deliver_man(for home delivery), special_van(for fast home delivery).
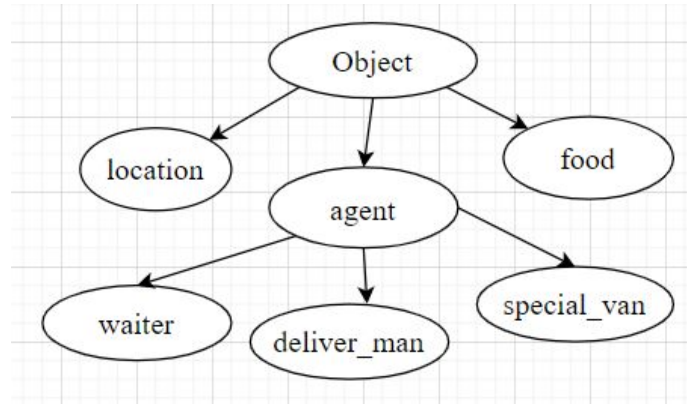
Figure: Typing

Predicates:
- At (agent 'a' at location 'l').
- checkIceCream (checks whether both food items(f1, f2) are ice cream or not).

Functions:
- Functions for delivery services,takes location and food item
  - Home_delivery
  - Quick_home_delivery
  - enjoy_dineIn
- Function for free capacity of an agent
  - Free_capacity
- For distance of 2 locations
  - Distance
- for checking agent's per_km_cost
  - Per_km_distance
- for price of food item
  - foodPrice
- cost functions for calculating food, delivery and total cost
  - totalCost
  - Delivery-cost
  - food-cost

Actions:
- deliver_At_Home (food delivered at home by delivery man, can't order ice cream, delivery charge)
- In_Dine (food served at restaurant by waiter, can order all food, no delivery charge)

- deliver_By_SpecialVan (food delivered at home by special van, can't order ice cream, delivery charge)
- Drive (delivering food by special_van, delivery_van)

Problem File Name: restaurant_withNumerics_problem

Initial State:

- Initial places of all the services at Shop. Example: Delivary_Van at Shop
- Food carrying capacity of different services/Unused capacity are different. Example: Free capacity of Delivary_Van is 50
- Food Orders. Example: (= (quick_home_delivery Reazuddin_Bazar Pitha) 2)
- For checking if the food item is IceCream. This item can only be served for Dine in Service at Shop. (checkIceCream IceCream IceCream)
- Distances of Different Locations in km
- Per_km_cost of different services in taka
- Food Prices of different food items
- cost functions for calculating food, delivery and total cost

Goal state:
- After successfully delivering Food the quantity of ordered food items.
- The goal place of all the services after all deliveries is Shop. Example: Delivary_Van at Shop
- objective function / plan metric: **(:metric minimize (total-cost))**

Problems that we faced:
- At the beginning, we used only the Classical planning then we shifted to numeric planning.
- Online planner was not enough for this project so we had to use FF-X planner first. But as it was not working for cost functions so again we shifted to Metric-FF planner.

Future Scope:
- Order of multiple food items all together
- Customerwise order and delivery