Excercise 3
Implementing a deliberative Agent

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1 Model Description

1.1 Intermediate States

First of all let us specify the elements that we need to define the state. C is the set of all cities in the topology. D is the set of all the delivery tasks currently in the topology including the ones that are being delivered. A task t is defined by $t \coloneqq (o, d, w)$ where $o, d \in C$, with o being the city where the task originated and d the destination city of the task, w is defined as the weight associated with this task. The state s of an agent is defined by

$$s \coloneqq (c, A, T)$$

where $c \in C$ is the city where the agent currently is, $A \subseteq D$ is the set of avalaible tasks in the topology, $T \subseteq D$ is the set of tasks that the agent is currently delivering.

1.2 Goal State

With the intermediates states defined we can define the goal state by

$$g \coloneqq (c, \emptyset, \emptyset)$$

where $c \in C$ can be any city of the topology and the empty sets representing the fact that all tasks of the topology have been delivered.

1.3 Actions

An agent can do the following actions:

- Move to a neighbour n of the current city c.

$$(c, A, T) \rightarrow (n, A, T)$$

- Pick up a task t in the current city c.

$$(c, A, T) \rightarrow (c, A', T')$$

  where $A' = A \setminus (t)$ and $T' = T \cup (t)$ with the constraint that the sum of the weights of the tasks in T should not exceed the maximum carrying capacity of the vehicle.

- Deliver a task t in the current city c.

$$(c, A, T) \rightarrow (c, A, T')$$

  where $T' = T \setminus (t)$

2 Implementation

2.1 BFS

2.2 A*

2.3 Heuristic Function

3 Results

3.1 Experiment 1: BFS and A* Comparison

3.1.1 Setting

3.1.2 Observations

3.2 Experiment 2: Multi-agent Experiments

3.2.1 Setting

3.2.2 Observations