

Graph Traversal & Evaluation – Chansey

This document demonstrates a graph traversal and tries to look into the evaluation of a robot's completion of a task.

Q1. A task requesting Chansey (currently at Room 0.01) to come to Room 2.01 is uploaded to the network Task Queue. Does Chansey reach that location?

A. Chansey currently is at Room 0.01. That marks its current position. A task is uploaded to the network and is placed on the Task Queue. The relevant state variables are as follows:

```
"taskQ": {  
  ...  
  ...  
  "@id": "TaskQueue",  
  "tasks": ["<task1>"]  
  ...  
  ...  
}
```

The above portion of the graph is found in `hospital.json`.

As part of Chansey's monitoring actions, the following steps are executed:

- **Check-Task-Queue** which checks if there are tasks in the queue. Since this is now satisfied, **Current-Task** is now updated.
- **Check-Pending-Task** which checks if the robot has accepted a task now finds that there is a pending Current-Task. It sets the appropriate variables and tries to evaluate the goal.

The relevant state variables are now set as follows using the (real world software) IndoorNavigationModule:

```
"deliveryLocation": {  
  ...  
  "@id": "Delivery_Location",  
  "@value": [  
    ...  
    {  
      "@id": "Plan",  
      "generatedPlan": "2.01NavigationPlan"  
    }  
  ]  
}
```

IndoorNavigationModule is a real world software to generate navigation plans for moving indoors (<https://www.mazemap.com/indoor-wayfinding>). This portion of the property graph can be found in `Chansey.json`.

Starting from the goal, we move to the actionPlan. Here the actionPlan generated by the `IndoorNavigationModule` is used to navigate to the destination. Once the action plan is successfully completed/fails, either success/failure along with the step at which it failed it communicated back.

Q2. Assume the task fails at a certain step. How is the performance of the robot evaluated?

A. One way of evaluating the performance of the robot is use evaluate how many steps of the action-plan were completed and how many total steps were present. The weakness of such a method is that it assumes that all steps are equally easy/complex and doesn't look into the cause of failure.

Another way of evaluating the performance of a robot can be to scores that denote the perceived difficulty of each atomic action/action class. These scores can then be used to calculate how well an action plan was completed (completed score vs total available score). But, this still is a cosmetic method of calculating the success of a robot since it doesn't take into account why the failure was caused. Any accurate measure would take into account the cause of failure and if the robot is capable of actions to avoid/overcome that cause of failure.