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Fall 2024 | COM316: Artificial Intelligence
Homework 12: Scripts and Reasoning

***For this homework, add any needed fillers to the slots as appropriate and for each scene, develop an event list for the scene (3 to 6 events each).***

**PTRANS**: The transfer of location of an object
**ATRANS**: The transfer of ownership, possession, or control of an object
**MTRANS**: The transfer of mental information between agents
**MBUILD**: The construction of a thought or of new information by an agent
**ATTEND**: The act of focusing attention of a sense organ toward an object
**GRASP**: The grasping of an object by an actor so that it may be manipulated
**PROPEL**: The application of a physical force to an object
**MOVE**: The movement of a bodypart of an agent by that agent
**INGEST**: The taking in of an object (food, air, water, etc.) by an animal
**EXPEL**: The expulsion of an object by an animal
**SPEAK**: The act of producing sound, including non-communicative sounds

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**Props:** tables, chairs, menu, utensils, plates, napkins, food, drink, bill, cash register
**Roles:** customer, cook, waiter, bus boy, manager
**Entry Conditions:** customer is hungry, customer has money, restaurant is open, restaurant has open table,
**Results:** customer is not hungry, customer has less money, customer has more energy, customer is satisfied/dissatisfied
**Scenes:** entering, ordering, eating, paying, exiting

**Scene-1: Entering:**

customer PTRANS customer into restaurant
customer ATTEND eyes to tables
customer MBUILD where to sit
customer PTRANS to chosen table
customer MOVE from stand to sit

**Scene-2: Ordering:**

waiter PTRANS table
waiter ATTEND new customer at table
waiter EXPEL menu to customer
customer MBUILD their order
customer MTRANS order to waiter
waiter PTRANS kitchen

**Scene-3: Eating:**

waiter PTRANS table
waiter ATRANS food to customer
waiter PTRANS kitchen
customer GRASP utensils
customer PROPEL food to mouth
customer INGEST food
customer MBUILD satisfaction

**Scene-4: Paying:**

waiter PTRANS table
waiter EXPEL bill
customer GRASP wallet
customer EXPEL money
waiter PTRANS to cash register
waiter PTRANS table
waiter ATRANS change
customer MBUILD tip
customer ATRANS tip to waiter

**Scene-5: Exiting**

customer MOVE from sitting to standing
customer PTRANS from table to exit
customer SPEAK farewell to staff
customer PTRANS from exit to the outer world

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**Reasoning from Past Examples**

We need a way to reason without specific knowledge about the situation. If a human came to an obstacle that was a wooden box but not a crate and he knew a crate was a passable obstacle, he would step on the wooden box. He would draw an analogy between the wooden box and the crate and realize that if one is passable, the other probably is too. With our current system, the robot would only consider the wooden box as passable if it was specifically designated to do so in the given rules. Suggest and explain a method to deal with this. How would you expand your method to include learning?

Note: This question is not specifically associated with thematic-role frames but could be with frames in general. In addition, it is not the inductive learning we did in the last HW. As we discussed, inductive learning requires several examples and near misses to make the concept more specific. In addition, if the robot came upon something not matching the concept, it had no idea as to whether it is passable or not.

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We can explain our solution by comparing a crate and a wooden box as the given example does. Before explaining our approach, this is how would the attributes of these objects would look like:

**CRATE**

- Type: Obstacle
- Material: Wood
- Shape: Cube
- Size: Medium
- Passable: Yes

**WOODEN BOX**

- Type: Obstacle
- Material: Wood
- Shape: Cube
- Size: ?
- Passable: Unknown

In our solution, when the program encounters a solution that has not been seen before, it will review the current knowledge frames and look for the frame with the largest similarity to the new frame.

We can have a built-in threshold mechanism to decide if the similarity is enough. For example, in the above example, we can see that three attributes out of 4 match, which is a 75% similarity. If we determine a threshold of 50%, this would be classified the same as the known frame, making the wooden box passable.

Counting all the attributes the same weight can cause some issues. For example, if we had a color attribute of the objects, in most cases, this would not be the deal-breakers like height or stability. In our logic system, we can make the color weigh less than the deal-breakers (height, stability, size, etc.) so that our program does not make wrong conclusions. At the same time, these weights can be adjusted during the training process to learn from experience.

To explain the concept of deal-breakers in more depth, to open the idea of deal-breakers a bit more, when evaluating a new frame, our program can go through the old frames and check if only a single attribute results in a change in passability. In this case, our robot can decide whether this attribute will be a deal-breaker and significantly increase its weight. This system is similar to the near-miss examples from the previous weeks, but the difference is that our robot can make deductions about this, which is a deal-breaker without having previous information.

This approach makes our robot closer to human-like thinking as it can sense the important information in an information cluster and make decisions based on ranked importance.