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Assignment 3

In many people's lives, household chores are an unrewarding burden that they would rather delegate to someone else. Even though many of those household chores are similar in nature, each has their own unique characteristics and can vary from household to household. Both these similarities and differences in chores make them an ideal candidate to be handled autonomously by an artificial intelligence. The agent here will be known as a Chore Bot (CB) with the objective of being able to complete two common chores: doing the laundry, and doing the dishes.

For the purpose of this discussion, the CB will have a set of sensors with which it will use to perceive the world around it, and it will have a set of tools through which it will interact with the world around it. The sensors of the CB will include visual information from cameras, scent information from an electronic nose, and wetness information from a moisture sensor. The tools will include appendages with which it can push, pull, grab, hold, lift, and rotate objects.

Doing the laundry

The process for 'doing the laundry', like many chores is well defined, and able to be defined through a series of several discrete actions. These actions will be run as a script, and grouped into a set of scenes and tracks which will allow for both a more modular process, and

allow the agent to build analogous scripts for completing other chores. The agent has the overall goal of turning a set of dirty items into clean items.

1. Collect dirty laundry

2. Group articles of laundry according to characteristics

3. Place a group of laundry into clothes washing machine with soap

4. Select appropriate wash cycle and settings, and turn on washing machine

5. Wait for washing machine to complete operations

6. Remove laundry from washing machine

7. Place laundry into clothes drying machine

8. Select appropriate dry cycle and settings, and turn on drying machine

9. Wait for drying machine to complete operations

10. Remove laundry from drying machine

11. Fold laundry and place in dresser or hang laundry in closet

```
Script
    script: do-laundry
    track:
    props: laundry-basket, laundry-item, clothes-washer,
           clothes-dryer, closet, dresser
    roles: agent
    entry: laundry-item is in laundry-basket
    result: laundry-item is clean,
            laundry-item is dry,
            laundry-item is in closet or dresser
```

These actions can be grouped into 4 basic scenes: sorting the laundry, washing the laundry, drying the laundry, and storing the laundry. Each of these scenes is designed to complete a specific goal. Sorting the laundry will allow the agent to pick a specific track for washing the laundry (light colors, dark colors, bleachable, requires handwashing), pick a specific track for

drying the laundry (machine dry, hang dry), as well as determining if there is a sufficient quantity of laundry of a particular type in order to efficiently utilize the washing/drying facilities. Washing the laundry will allow the agent to change the state of dirty laundry into clean, but wet laundry. Drying the laundry will allow the agent to change the state of clean, but wet laundry into dry laundry. Storing the laundry will allow the agent to change the state of clean, dry laundry into a ready-to-wear state.

Doing the dishes

'Doing the dishes' is analogically very similar to the process of 'doing the laundry'. While the exact execution of 'doing the dishes' the different, the same methodology can be applied.

1. Collect dirty dishes

2. Group dishes according to characteristics

3. Places dishes into dishwasher with soap

4. Select appropriate wash and dry settings, and turn on dishwasher

5. Wait for dishwasher to complete operations

6. Remove dishes from dishwasher

7. Place dishes in cabinet

These actions can be grouped into 3 basic scenes: sorting the dishes, cleaning the dishes, storing the dishes. Just as with the laundry script, each scene is designed to complete a specific goal. Sorting the dishes will allow the agent to pick a specific track for cleaning dishes (machine-wash, hand-wash), and select appropriate dish location in the dishwasher and dishwasher settings based upon the properties of a dish (delicate, plastic, small, large, sanitizable). Cleaning the

dishes will allow the agent to change the state of dirty dishes into clean and dry dishes. Storing

the dishes will allow the agent to change the state of clean, dry dishes into ready-to-use dishes.

```
Script
     script: do-dishes
     track:
     props: sink, dish, dishwasher, cabinet
     roles: agent
     entry: dish is in sink
     result: dish is clean,
             dish is dry,
             dish is in cabinet
```

Using analogical reasoning

The primary difference between the scenes from doing the laundry to doing the dishes is

that the two scenes: washing the laundry, drying the laundry are combined with respect to dishes:

cleaning the dishes. This can be demonstrated by mapping the before-state of washing the

laundry and the end state of drying the laundry to the before-state and after-state of cleaning the

dishes. Both sets of scenes alter the state of their respective items from 'dirty' to 'clean and dry'.

By identifying and mapping the relationships between these two types of chores, it will

better allow the agent to adapt to new scenarios in either chore. For example, if we wish to

expand upon the capabilities of the agent to handle hand-washing of clothing by adding a new

track, that could easily be transferred to the dishwashing chore. However, our agent does not

necessarily need to be limited to only these two chores. By abstracting the scripts and mapping

state representations into more generic concepts we can identify pragmatic and semantic

similarities, the agent could accomplish other chores. From the specific chores, we can extract a

concept known as 'cleaning', defining it as changing the state of an item or set of items from

'dirty' to 'ready-to-use'. This concept can be further applied to chores like: scooping the cat litter

box, dusting the furniture, and taking out the trash. Each of these chores involves an element of

item classification, that is, identifying properties of an item to determine how it should be

cleaned, and how it is considered 'dirty'.