C_{t-1} Long-Term Memory

Global Task Goal:

```
Put three cupcake in microwave and switch on microwave.
```

Global Instruction:

```
1. From actions import walk <obj>, grab <obj>,
switchon <obj>, switchoff <obj>, open <obj>…
2. You have two hands, so you can only hold a maximum
of two items at the same time…
```

Initial Plan:

```
1. find two pancake and put it in microwave
2. find another pancake and put it in microwave
3. close and switch on the microwave.
```

Current Summary:

```
1. you have put two pancake in the microwave.
```

h_{t-1} Short-Term Memory

Local Instruction:

```
1. if objects INSIDE a container, open the container first.
2. you can not open a cabinet that has been opened
```

Demonstrations:

```
# task goal: put cupcake in microwave and put milk on table
def task():
  # sub-goal thought: find cupcake; rule thought: …
  walk('kitchen(id:50)')
  open('kitchencabinet(id:127)')
  grab('cupcake(id:335)')
  # put the cupcake in microwave
  open('microwave(id:158)')
  putin('cupcake(id:335)', 'microwave(id:158)')
  # sub-goal thought: find milk; rule thought: …
  open('kitchencabinet(id:132)')
  grab('milk(id:332)')
  walk('kitchen(id:50)')
  putback('milk(id:332)', 'table(id:123)')
  # done
```

Sub-Goal:

```
find third pancake and put it in microwave
```

O_t Generated Plan

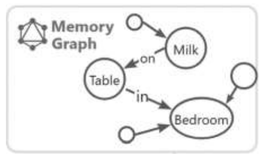
```
def task():
  #sub-goal thought: find third pancake
  #rule thought: I should open fridge first…
  walk(‘kitchen(id:50)’)
  open(‘fridge(id:103)’)
  find(‘pancake(id:336)’)
  grab(‘pancake(id:336)’)
  #sub-goal thought: put third pancakes
  #rule thought: the microwave has been opened…
  walk(‘microwave(id:158)’)
  putin('cupcake(id:336)', 'microwave(id:158)’)
  close('microwave(id:158)’)
  #done
```

Language-based RNN

x_t Observation

```
[pancake(id:336), INSIDE, fridge(id:103)],
[fridge(id:335), INSIDE, kitchen(id:50)],
[pancake(id:335), INSIDE, mircrowave(id158)]
                    …
Fridge(id:103)’s state is closed
microwave(id:158)’s state is opened & turnoff
```

Environment



State Reasoning

C_t Long-Term Memory

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Initial Plan:

```
1. find two pancake and put it in microwave
2. find another pancake and put it in microwave
3. close and switch on the microwave.
```

Current Summary:

```
1. you have put two pancake in the microwave.
2. you have put the third pancake in the microwave
```

h_t Short-Term Memory

Local Instruction:

```
1. you can not open a cabinet that has been opened
```

Demonstrations:

```
# task goal: put cupcake in microwave and switch on microwave
def task():
  # sub-goal thought: find cupcake; rule thought: …
  walk('kitchen(id:50)')
  open('kitchencabinet(id:127)')
  grab('cupcake(id:335)')
  # sub-goal thought: put cupcake in microwave; rule thought: …
  open('microwave(id:158)')
  putin('cupcake(id:335)', 'microwave(id:158)')
  # sub-goal thought: close and switch on microwave…
  close(‘microwave(id:158)')
  switchon(‘microwave(id:158)')
  # done
```

Sub-Goal:

```
Close and switch on the microwave
```