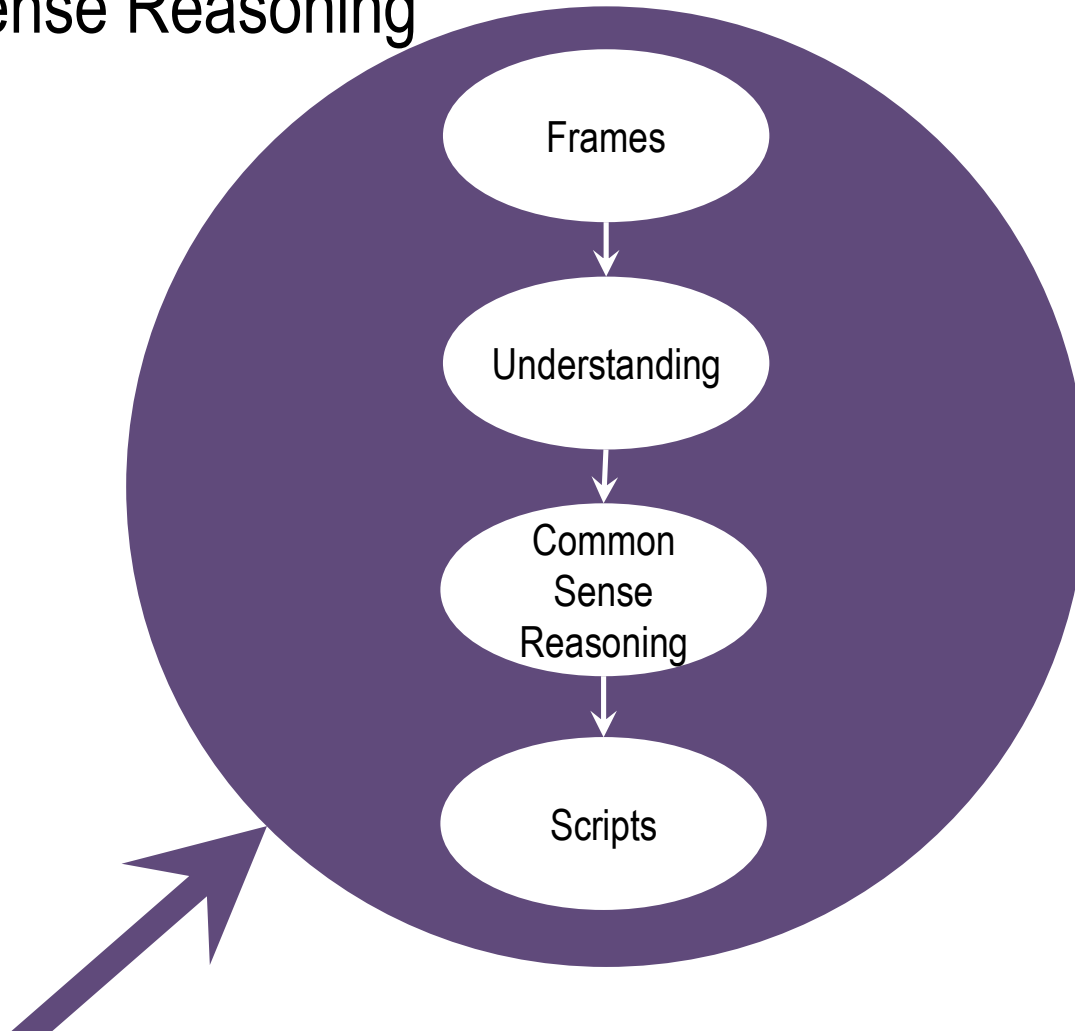




Frames

Common Sense Reasoning



Lesson Preview

- Function of frames
- Properties of frames
- Relationship between frames and previous topics
- Frames for advanced sense-making

Ashok ate a frog.

Is the frog dead or alive?

- dead
- alive

Where is the frog?

- on the table
- on the floor
- in Ashok's stomach

Is Ashok happy or sad?

- happy
- sad

Ashok ate a frog.

Ate

subject : Ashok
object : a frog
location :
time :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy

Ashok ate a frog.

Ate

subject : Ashok
object : a frog
location :
time :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy

David ate a pizza at home.

Ate

subject : David
object : a pizza
location : at home
time :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy

*Angela ate lasagna
with her dad last night
at Olive Garden.*

Ate

```
subject : Angela  
object : lasagna  
location : Olive Garden  
time : night  
utensils :  
object-alive : false  
object-is : in-subject  
subject-mood : happy
```

Ate

subject : Angela

object : lasagna

location : Olive Garden

time : night

utensils :

object-alive : false

object-is : in-subject

subject-mood : happy

Ate

subject : ●
object : lasagna
location : ●
time :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy

Person

name : Angela
surname : Smith

Restaurant

name : Olive Garden
location : Atlanta
price-range : \$\$

Properties of Frames

- *Represent stereotypes*

Ate

subject : Ashok

object : a frog

location :

time :

utensils :

object-alive :

object-is :

subject-mood :

Properties of Frames

- Represent stereotypes
- Provide default values

Ate

```
subject : Ashok
object  : a frog
location :
time    :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy
```

Properties of Frames

- Represent stereotypes
- Provide default values

Ate

```
subject : Ashok
object  : a frog
location :
time    :
utensils :
object-alive : false
object-is : in-subject
subject-mood : sad
```

Animal

#-of-legs :

#-of-arms :

Ant (type of Animal)

#-of-legs : 6

#-of-arms : 0

Human (type of Animal)

#-of-legs : 2

#-of-arms : 2

Properties of Frames

- Represent stereotypes
- Provide default values
- Exhibit inheritance

Animal

#-of-legs :

#-of-arms :

Ant (type of Animal)

#-of-legs : 6

#-of-arms : 0

Human (type of Animal)

#-of-legs : 2

#-of-arms : 2

job :

name :

Properties of Frames

- Represent stereotypes
- Provide default values
- Exhibit inheritance

Animal

#-of-legs :

#-of-arms :

Ant (type of Animal)

#-of-legs : 6

#-of-arms : 0

Human (type of Animal)

#-of-legs : 2

#-of-arms : 2

job :

name :

Class

Properties of Frames

- Represent stereotypes
- Provide default values
- Exhibit inheritance

Human (type of Animal)

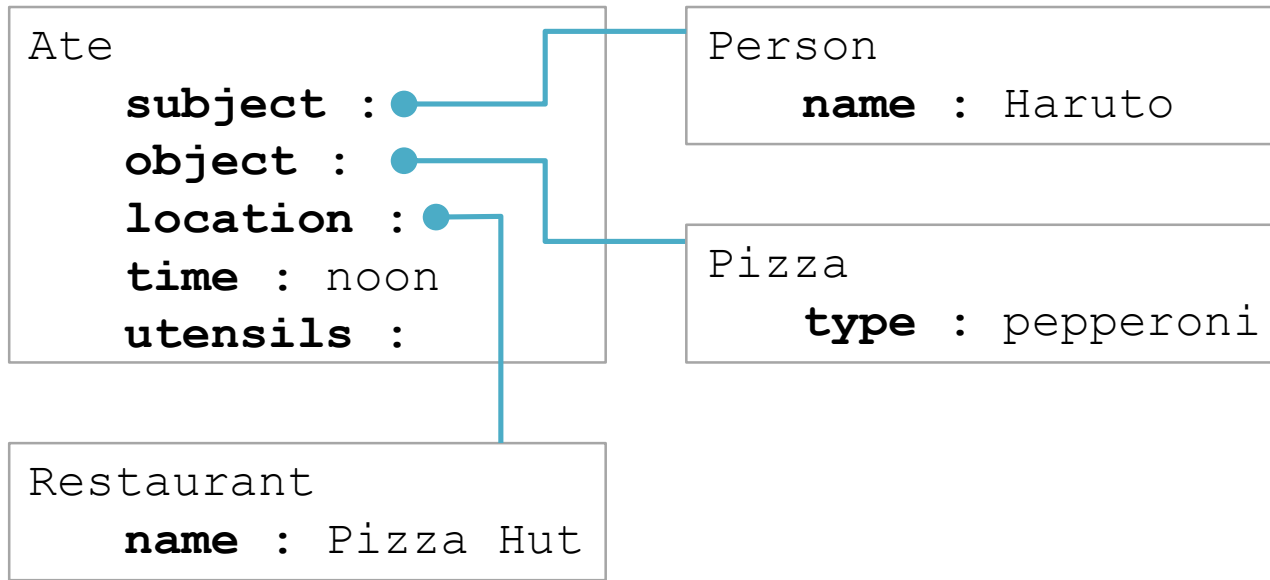
#-of-legs : 2

#-of-arms : 2

job : Professor

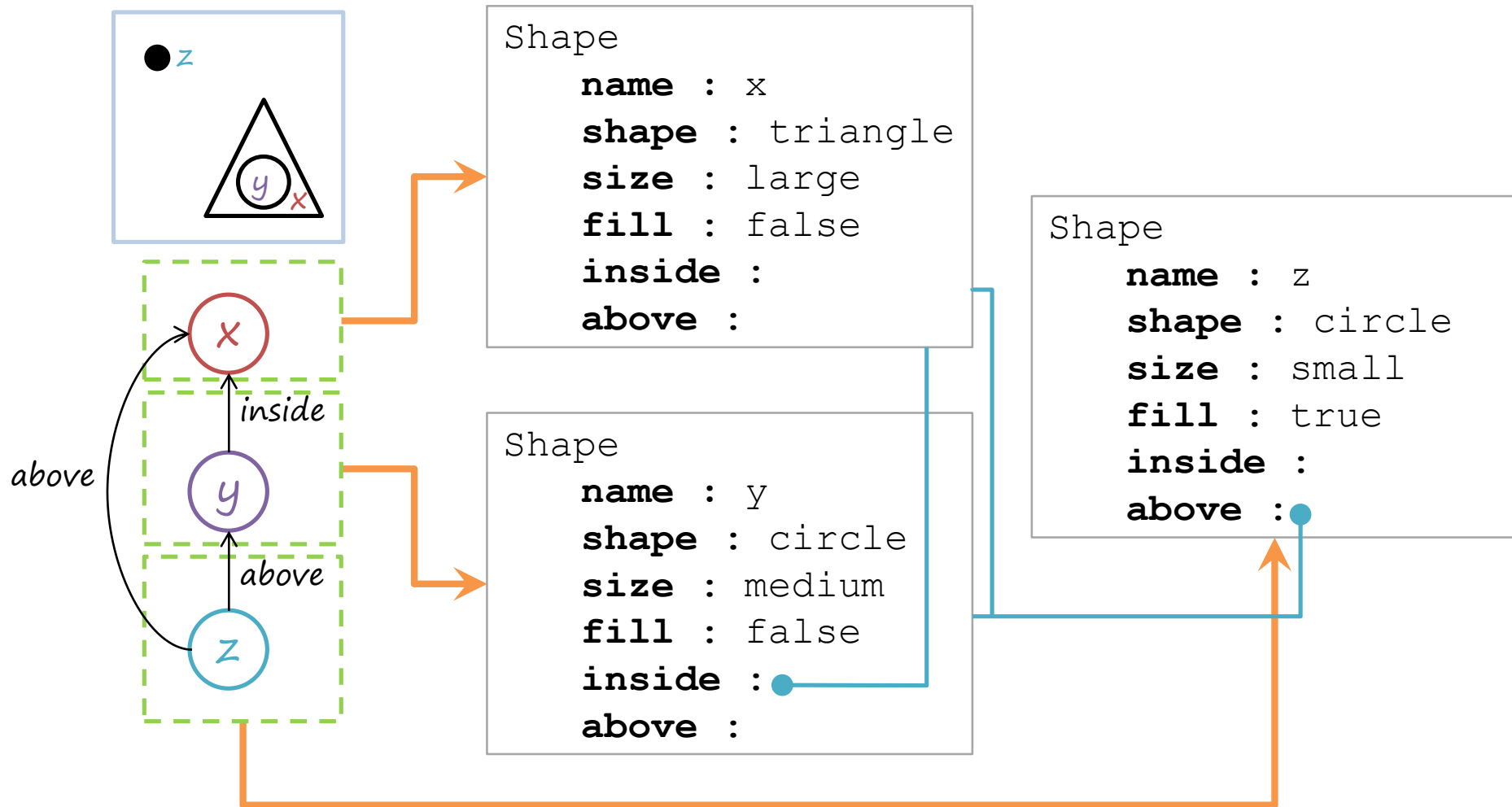
name : Ashok

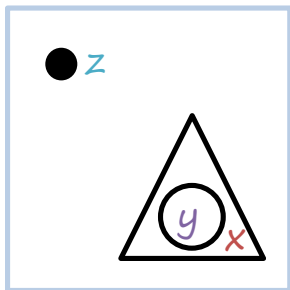
Instance



What sentence is expressed by these frames?

Haruto ate a pepperoni pizza at Pizza Hut at noon.





Shape

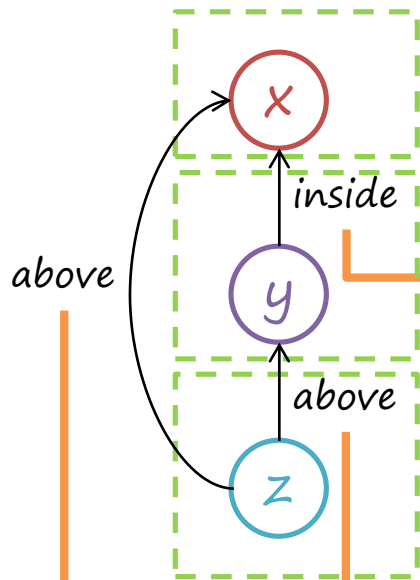
name : x
shape : triangle
size : large
fill : false
inside :
above :

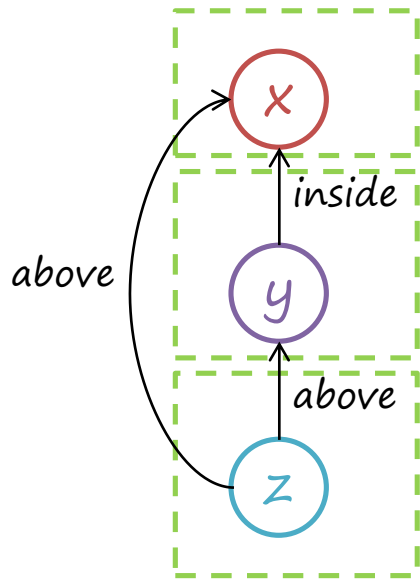
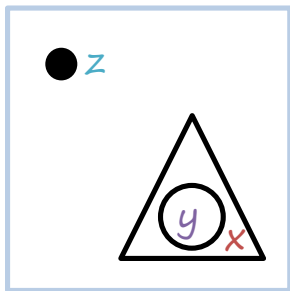
Shape

name : y
shape : circle
size : medium
fill : false
inside : ●
above :

Shape

name : z
shape : circle
size : small
fill : true
inside :
above : ●





Shape

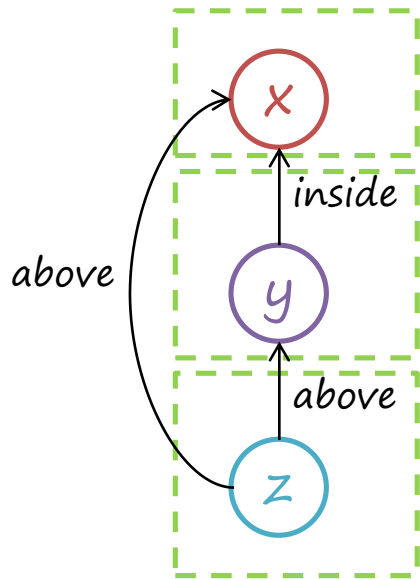
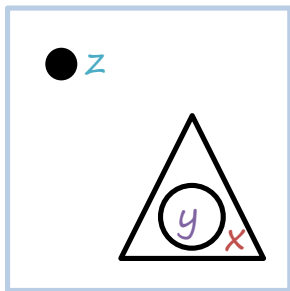
name : x
shape : triangle
size : large
fill : false
inside :
above :

Shape

name : y
shape : circle
size : medium
fill : false
inside : ●
above :

Shape

name : z
shape : circle
size : small
fill : true
inside :
above : ●



Shape

```

name : x
shape : triangle
size : large
fill : false
inside :
above :
  
```

Shape

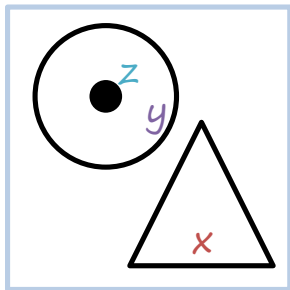
```

name : y
shape : circle
size : medium
fill : false
inside : x
above :
  
```

Shape

```

name : z
shape : circle
size : small
fill : true
inside :
above : x, y
  
```



Complete the
frame
representation
of the figure
above.

Shape

```
name : x
shape : triangle
size : large
fill : false
inside :
above :
```

Shape

```
name : y
shape : circle
size : large
fill : false
inside :
above : x
```

Shape

```
name : z
shape : circle
size : small
fill : true
inside : y
above : x
```

Cognitive System

Metacognition

Procedural

Semantic

Episodic

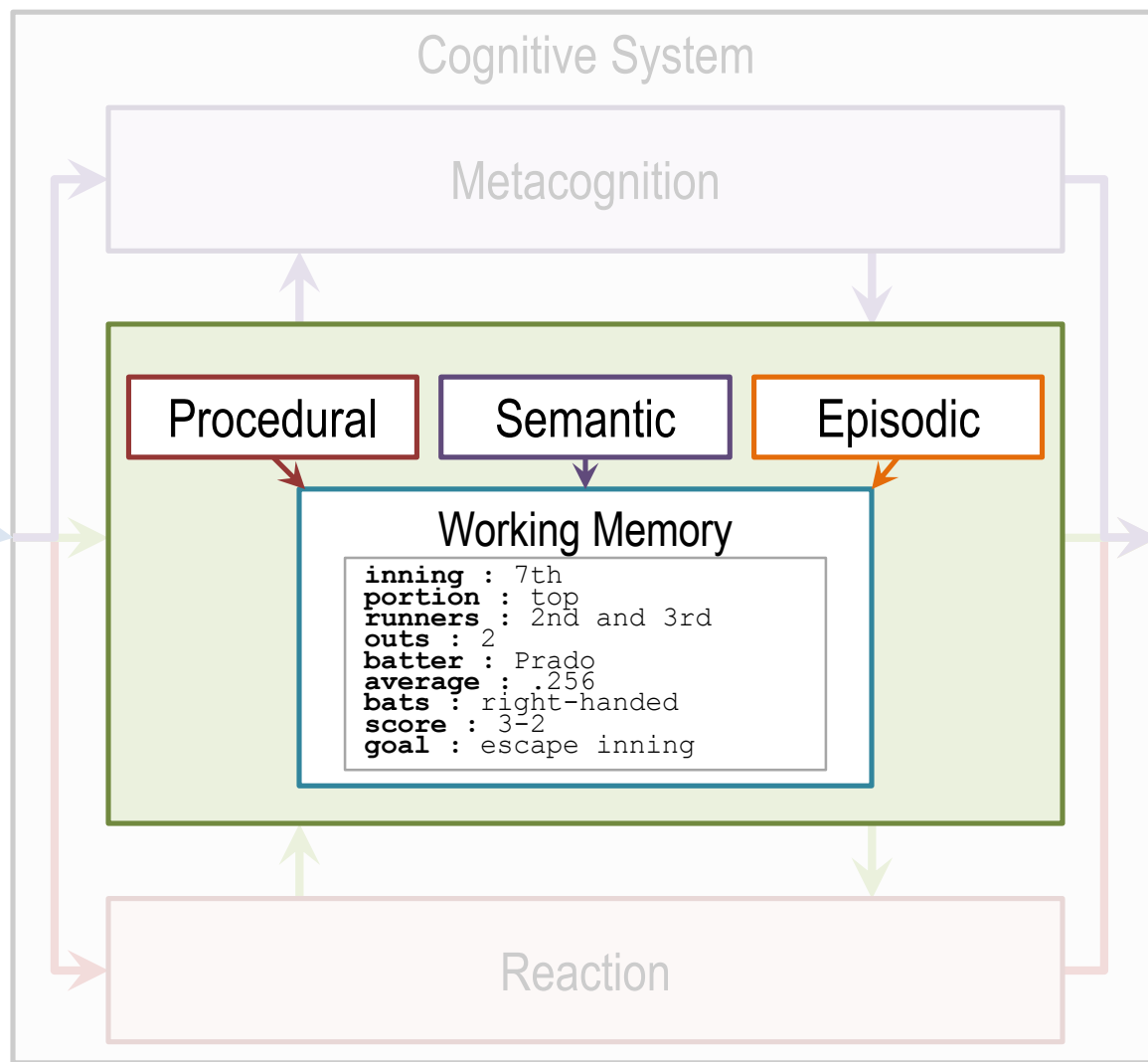
Working Memory

```
inning : 7th  
portion : top  
runners : 2nd and 3rd  
outs : 2  
batter : Prado  
average : .256  
bats : right-handed  
score : 3-2  
goal : escape inning
```

Reaction

Input

Output



Cognitive System

Metacognition

Procedural

Semantic

Episodic

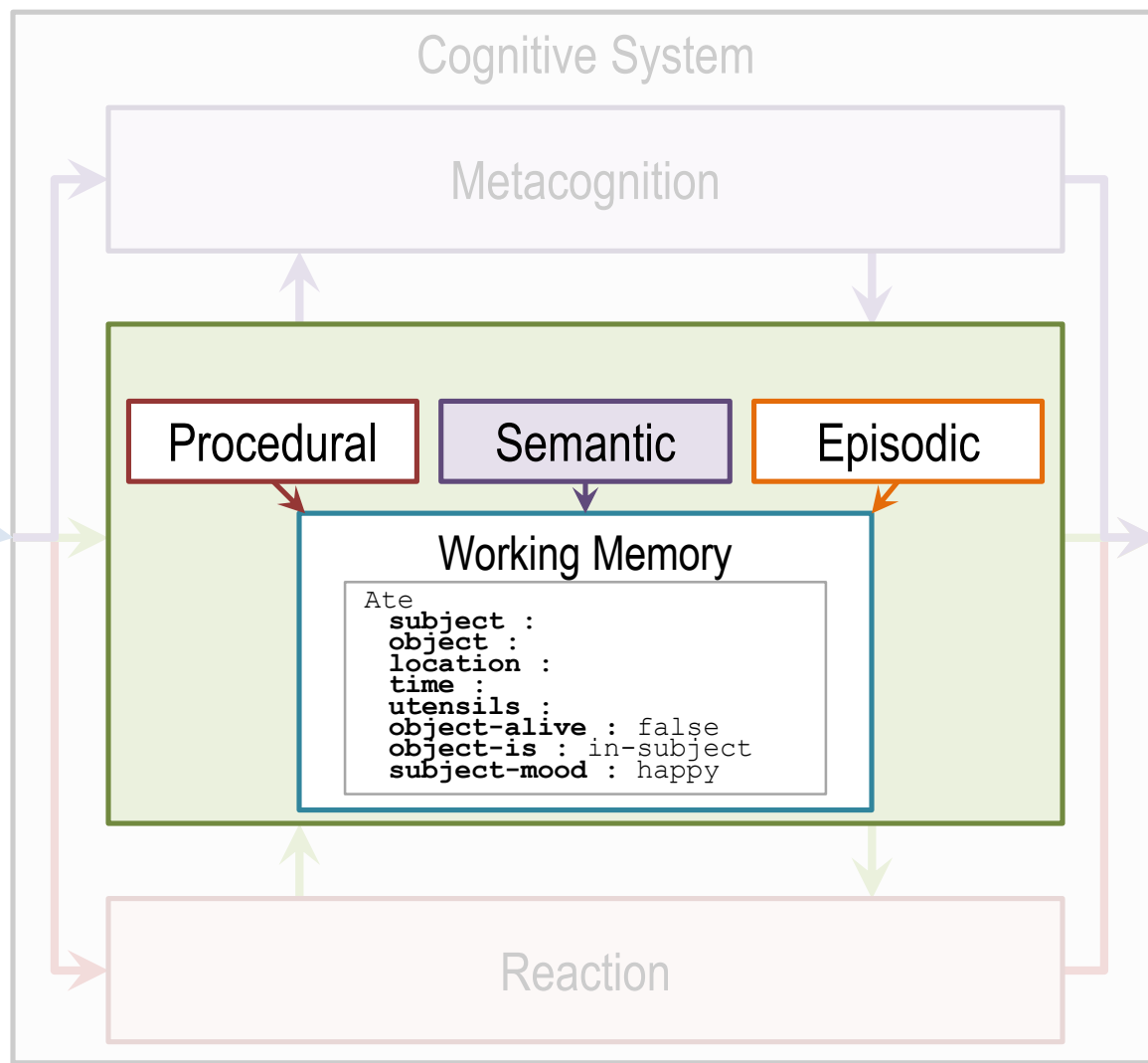
Working Memory

```
Ate
subject :
object :
location :
time :
utensils :
object-alive : false
object-is : in-subject
subject-mood : happy
```

Reaction

Input

Output



Today, an extremely serious earthquake of magnitude 8.5 hit Lower Slabovia, killing 25 people and causing \$500 million in damage.

The President of Lower Slabovia said that the hard-hit area near the Sadie Hawkins fault has been a danger zone for years.

Write a frame representation of this story on the right.

Earthquake

```
day : Today
location : lower Slabovia
damage : $500 million
fatalities : 25
faultline : Sadie Hawkins
magnitude : 8.5
time :
type :
duration :
```


Today, an extremely serious earthquake of magnitude 8.5 hit Lower Slabovia, killing 25 people and causing \$500 million in damage.

The President of Lower Slabovia said that the hard-hit area near the Sadie Hawkins fault has been a danger zone for years.

Today, the **President of Lower Slabovia** killed **25** proposals totaling **\$500 million** for research in **earthquake** prediction. Our Lower Slabovian correspondent calculates that **8.5** research proposals are rejected for every one approved.

There are rumors that the President's science advisor, **Sadie Hawkins**, is at **fault**.

Assignment

How would you use frames to design an agent that could answer Raven's Progressive Matrices?

To recap...

- Structure of frames
- Properties of frames
- Frames with other representations
- Story understanding