

USC Ground Truth Documentation

October 9, 2018

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1 Background

We use influence diagrams as the underlying graph structure for our ground truth. Here is a simple influence diagram for a simulation of two actors, showing the three types of nodes and some possible links (always directed) among them:

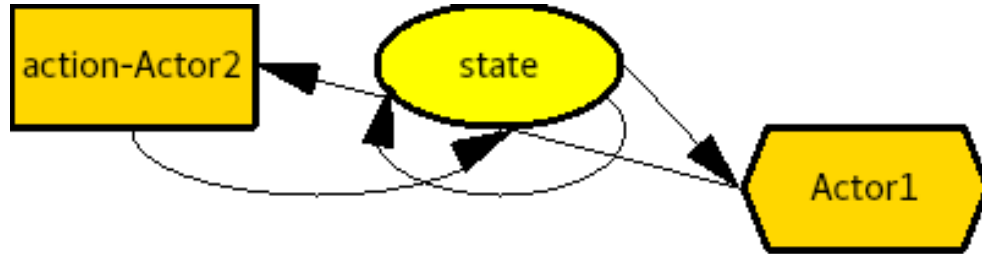


Figure 1: Simple influence diagram

- Rectangular nodes are possible actions for a particular agent (“Actor 1”, indicated by color) representing a potential behavior. They are labeled with a verb (“action”) and an optional object of the verb (“Actor2”). An action node has a binary value, indicating whether or not the action was chosen.
- Oval nodes are state variables. Their value is potentially a probability distribution over a domain of possible values. All true state variables will be certain (i.e., 100% probability for a single value), but agents’ perceptions of the true state will often be uncertain.
- Hexagonal nodes are utility or reward nodes. They represent an expected value computation by the agent (“Actor1”). The node’s value is a table with each row corresponding to a possible action choice and its expected utility.
- Links from action nodes to state nodes specify an effect that the action has on the value of the state. In the following specifications of these effects, a variable name followed by a ‘ will denote the value of the variable after the action is performed.
- Links from one state node to another specify an influence that the value of the first state node has on the effect of at least one action on the second state node.
- Links from a state node to an agent’s utility node specify that the state node is an input to the expected value calculation performed by that agent. There is a real-valued weight from $(0,1]$ on each link specifying the priority of that variable’s influence on that agent’s reward calculation (higher values mean higher priority).
- Links from utility nodes to action nodes indicate that the expected value calculation then determines whether or not that action is chosen. In the simulations described here, we use a strict maximization, so that the action choice is deterministic (i.e., the action with the highest expected value is performed, with ties broken by a pre-determined fixed order).
- Therefore, in the above simple ground truth, whether or not “Actor1” chooses to do “action” to “Actor2” influences the subsequent value of the variable “state” (link from rectangle to oval). The subsequent value of “state” also depends on its prior value (link from oval to itself). “Actor1”’s expected value of doing “action” to “Actor2” is a function of the value of “state” (link from oval to hexagon), and this expected value influences whether or not “Actor1” chooses to do so (link from hexagon to rectangle).

Any real values (e.g., initial values of variables, conditional probability table values, reward weights) will be drawn from either a set $\{0, 0.5, 1\}$ or $\{0, 0.2, 0.4, 0.6, 0.8, 1\}$, depending on the appropriate granularity needed.

2 State

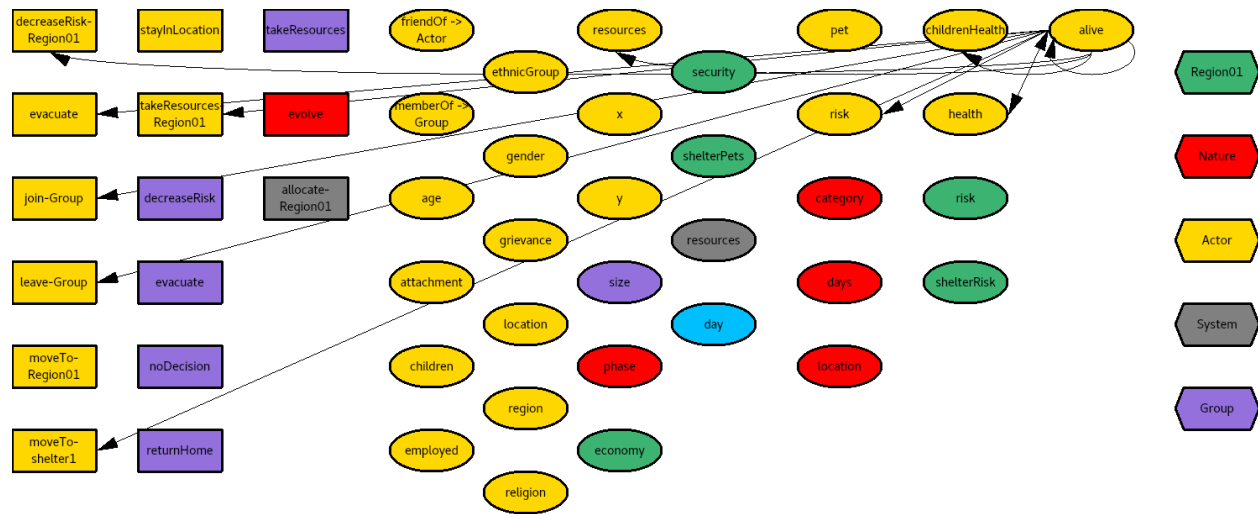
2.1 Actor's age

Type: Integer

psychsim/domains/groundtruth/actor.py:66

2.2 Actor's alive

Type: Boolean



psychsim/domains/groundtruth/actor.py:190

2.2.1 Default change in Actor's alive

psychsim/domains/groundtruth/actor.py:464

IF Actor's alive

THEN : IF Actor's health' > 0.01

THEN : Actor's alive' ← true

ELSE : Actor's alive' ← false

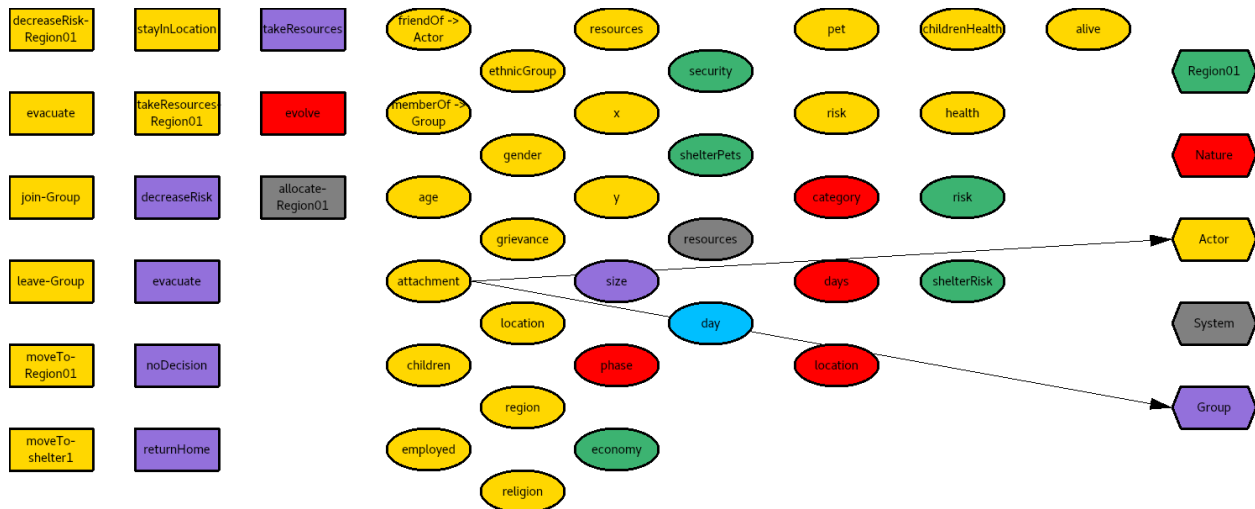
ELSE : Actor's alive' ← Actor's alive

2.3 Actor's attachment

Attachment style

Type: String

Values: anxious, avoidant, secure



psychsim/domains/groundtruth/actor.py:101

2.4 Actor's category

Type: Integer

psychsim/domains/groundtruth/actor.py:648

2.5 Actor's center

Type: String

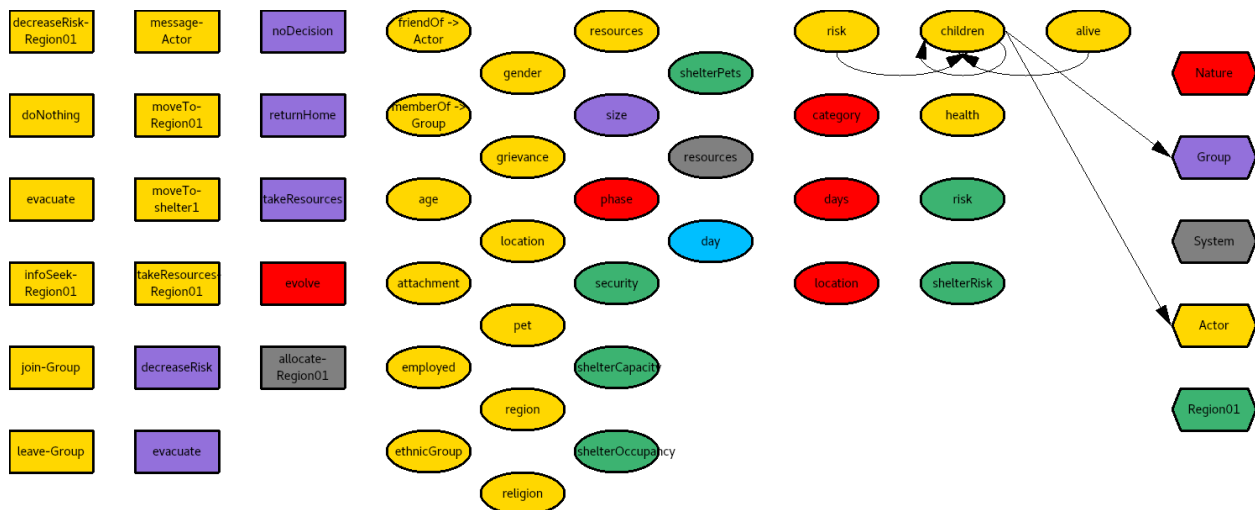
Values: Region01, none

psychsim/domains/groundtruth/actor.py:643

2.6 Actor's children

Number of children

Type: Real

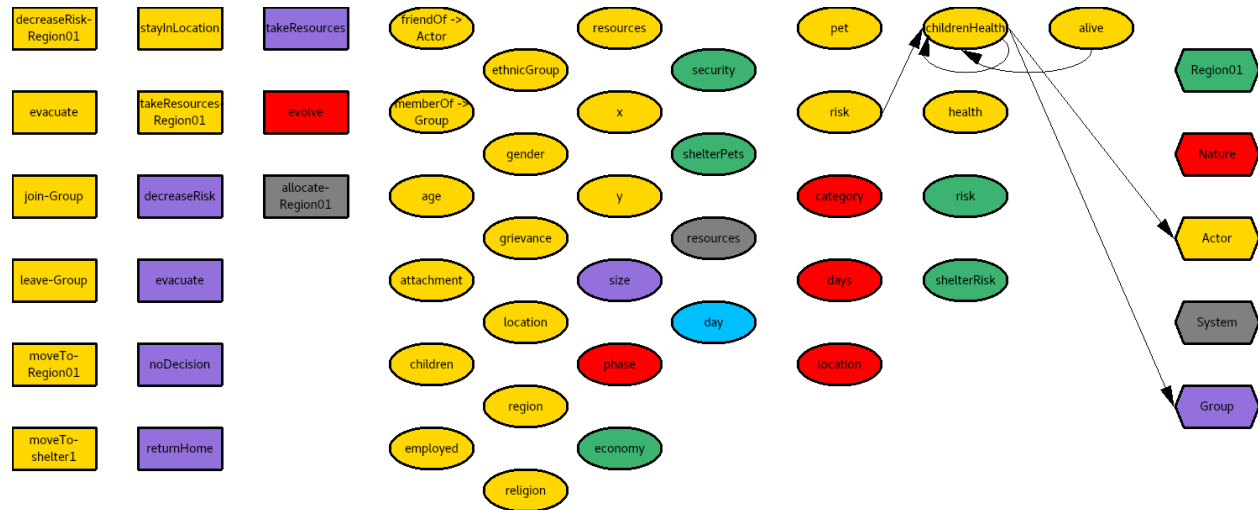


psychsim/domains/groundtruth/actor.py:75

2.7 Actor's childrenHealth

Current level of children's physical wellbeing

Type: Real



psychsim/domains/groundtruth/actor.py:212

2.7.1 Default change in Actor's childrenHealth

psychsim/domains/groundtruth/actor.py:455

IF Actor's alive

THEN : IF Actor's risk' ∈

[0,0.2]: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

(0.2,0.4]:

20%: Actor's childrenHealth' ← 60%·Actor's childrenHealth

80%: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

(0.4,0.6]:

40%: Actor's childrenHealth' ← 60%·Actor's childrenHealth

60%: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

(0.6,0.8]:

60%: Actor's childrenHealth' ← 60%·Actor's childrenHealth

40%: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

(0.8,1.0]:

80%: Actor's childrenHealth' ← 60%·Actor's childrenHealth

19%: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

(1.0,1]:

100%: Actor's childrenHealth' ← 60%·Actor's childrenHealth

0%: Actor's childrenHealth' ← 60%·Actor's childrenHealth+0.24

ELSE : Actor's childrenHealth' ← 0.00

2.8 Actor's days

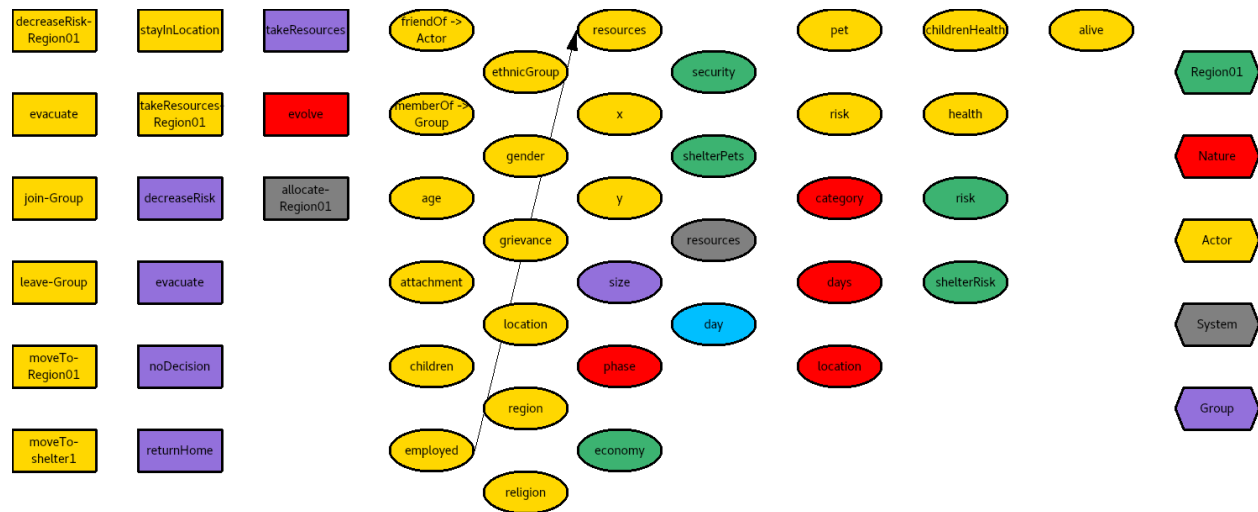
Type: Integer

psychsim/domains/groundtruth/actor.py:638

2.9 Actor's employed

Has a full-time job

Type: Boolean



psychsim/domains/groundtruth/actor.py:83

2.10 Actor's ethnicGroup

Ethnicity of actor

Type: String

Values: majority, minority

psychsim/domains/groundtruth/actor.py:39

2.11 Actor's gender

Type: String

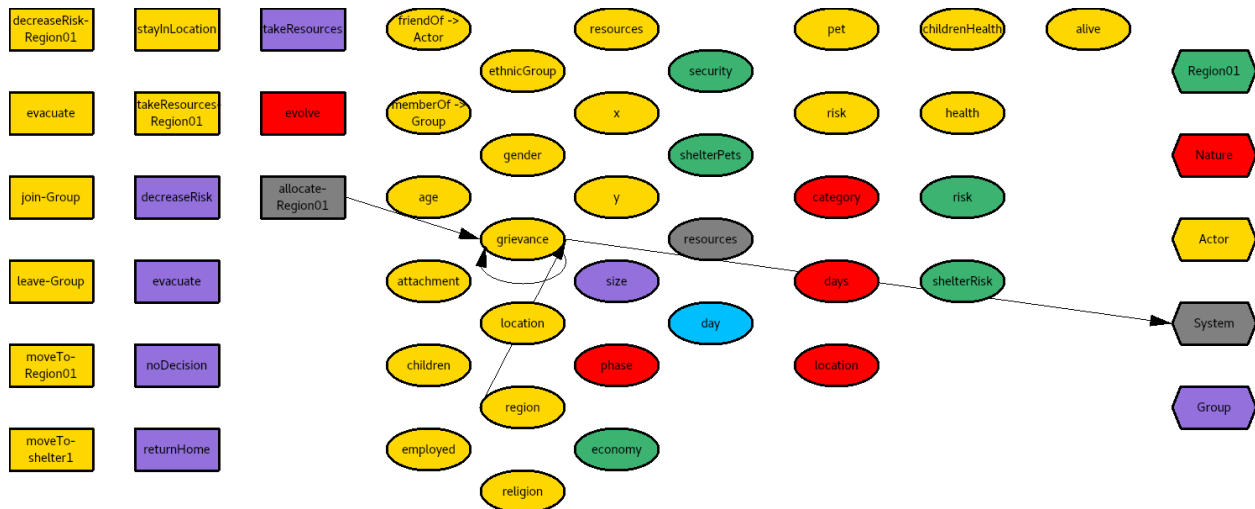
Values: female, male

psychsim/domains/groundtruth/actor.py:58

2.12 Actor's grievance

Current level of grievance felt toward system

Type: Real



psychsim/domains/groundtruth/actor.py:248

2.12.1 Effect of System-allocate-Region01 on Actor's grievance

psychsim/domains/groundtruth/system.py:53

IF Actor's region=Region01

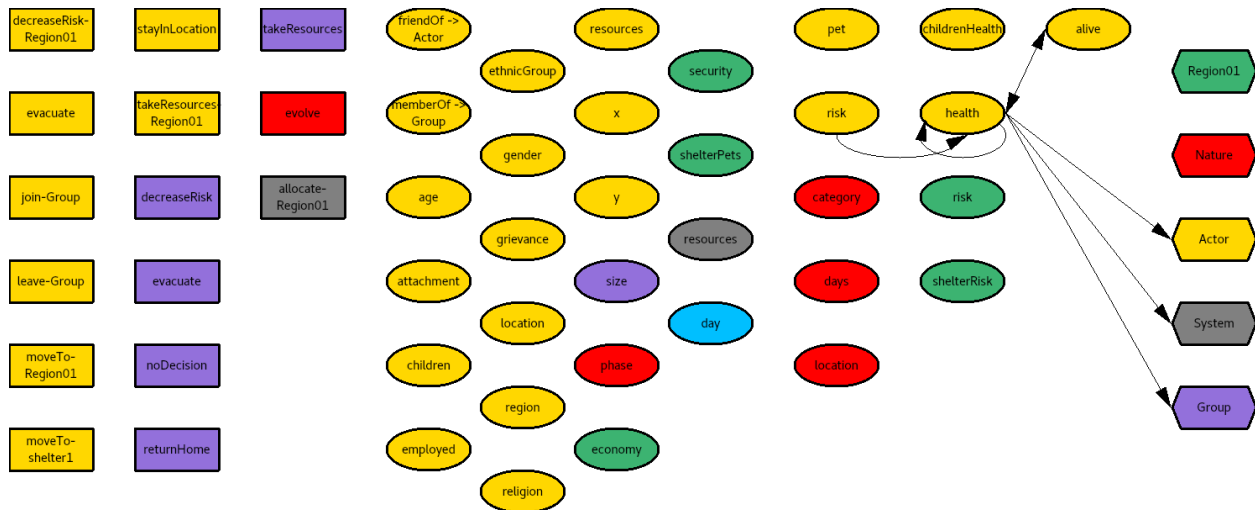
THEN : Actor's grievance' $\leftarrow 80\% \cdot \text{Actor's grievance}$

ELSE : Actor's grievance' $\leftarrow 80\% \cdot \text{Actor's grievance} + 0.20$

2.13 Actor's health

Current level of physical wellbeing

Type: Real



psychsim/domains/groundtruth/actor.py:194

2.13.1 Default change in Actor's health

psychsim/domains/groundtruth/actor.py:442

IF Actor's alive

THEN : IF Actor's risk' \in

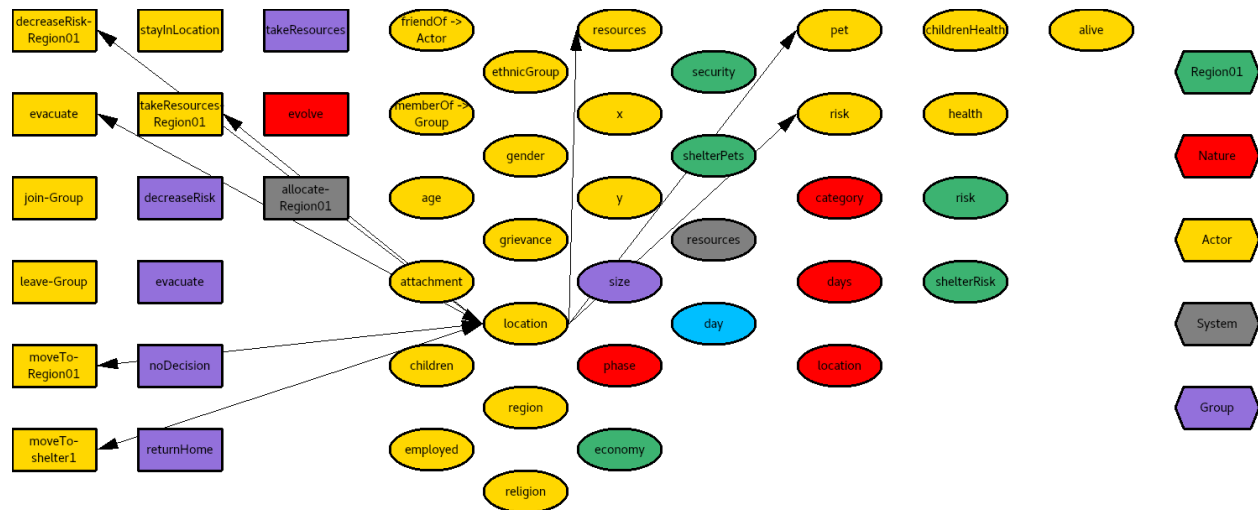
$[0,0.2]: \text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 $(0.2,0.4]:$
 20%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health}$
 80%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 $(0.4,0.6]:$
 40%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health}$
 60%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 $(0.6,0.8]:$
 60%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health}$
 40%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 $(0.8,1.0]:$
 80%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health}$
 19%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 $(1.0,1]:$
 100%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health}$
 0%: $\text{Actor's health}' \leftarrow 60\% \cdot \text{Actor's health} + 0.24$
 ELSE : $\text{Actor's health}' \leftarrow 0.00$

2.14 Actor's location

Current location

Type: String

Values: Region01, evacuated, shelter1



psychsim/domains/groundtruth/actor.py:187

2.14.1 Effect of Actor-evacuate on Actor's location

psychsim/domains/groundtruth/actor.py:399

$\text{Actor's location}' \leftarrow \text{evacuated}$

2.14.2 Effect of Actor-moveTo-Region01 on Actor's location

psychsim/domains/groundtruth/actor.py:406

$\text{Actor's location}' \leftarrow \text{Region01}$

2.14.3 Effect of Actor-moveTo-shelter1 on Actor's location

psychsim/domains/groundtruth/actor.py:396

Actor's location' ← shelter1

2.15 Actor's perceivedChildrenHealth

Type: Real

psychsim/domains/groundtruth/actor.py:679

2.16 Actor's perceivedHealth

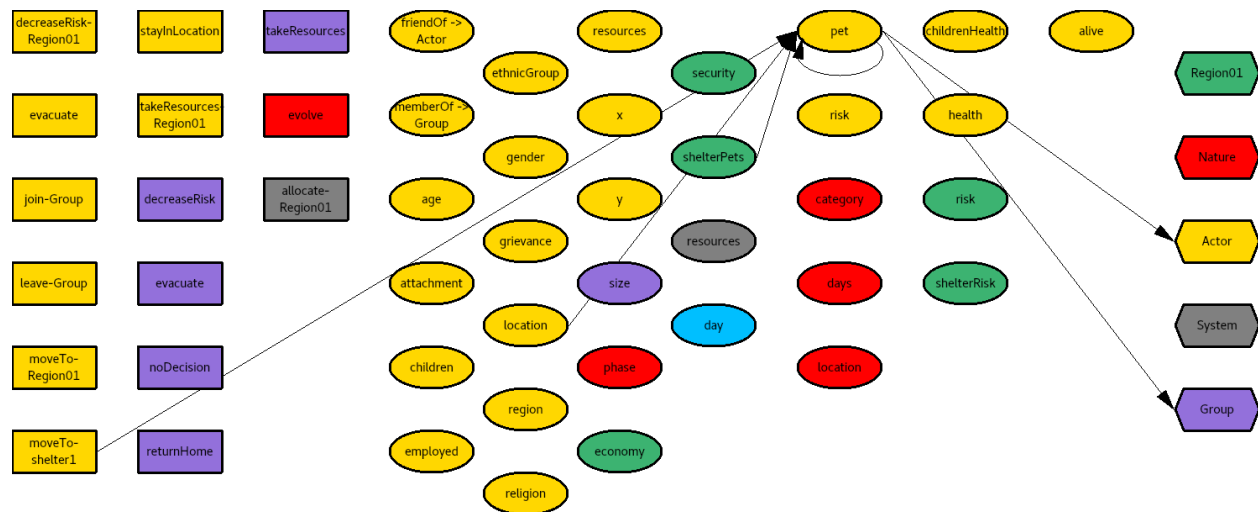
Type: Real

psychsim/domains/groundtruth/actor.py:674

2.17 Actor's pet

Owns a pet

Type: Boolean



psychsim/domains/groundtruth/actor.py:88

2.17.1 Effect of Actor-moveTo-shelter1 on Actor's pet

psychsim/domains/groundtruth/actor.py:577

IF Actor's location' = shelter1

THEN : IF Region01's shelterPets

THEN : Actor's pet' ← Actor's pet

ELSE : Actor's pet' ← false

ELSE : Actor's pet' ← Actor's pet

2.18 Actor's phase

Type: String

Values: active, approaching, none

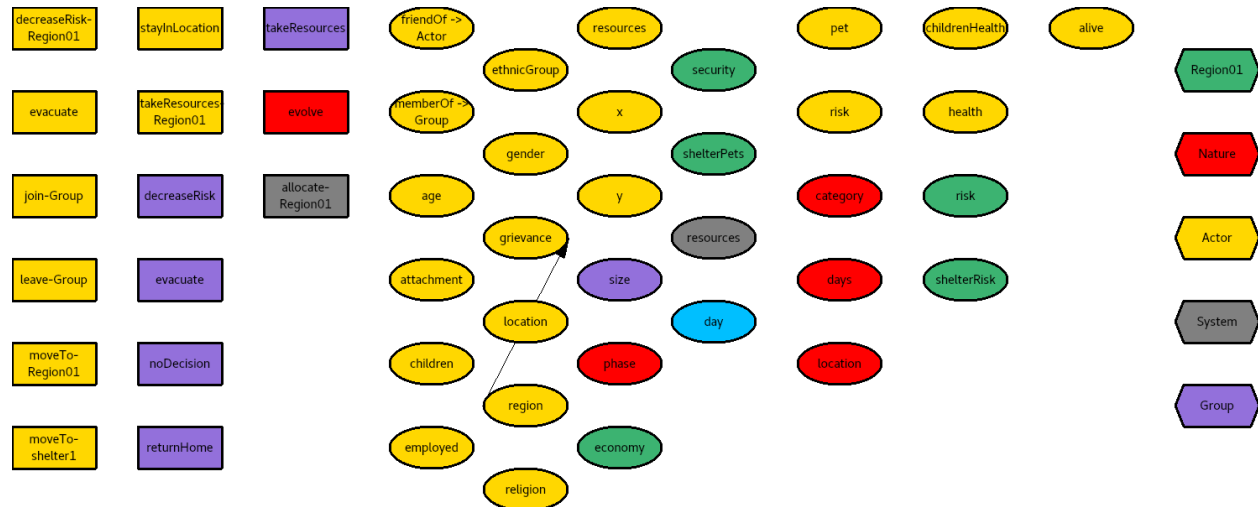
psychsim/domains/groundtruth/actor.py:634

2.19 Actor's region

Region of residence

Type: String

Values: Region01



psychsim/domains/groundtruth/actor.py:150

2.20 Actor's religion

Religious affiliation of actor

Type: String

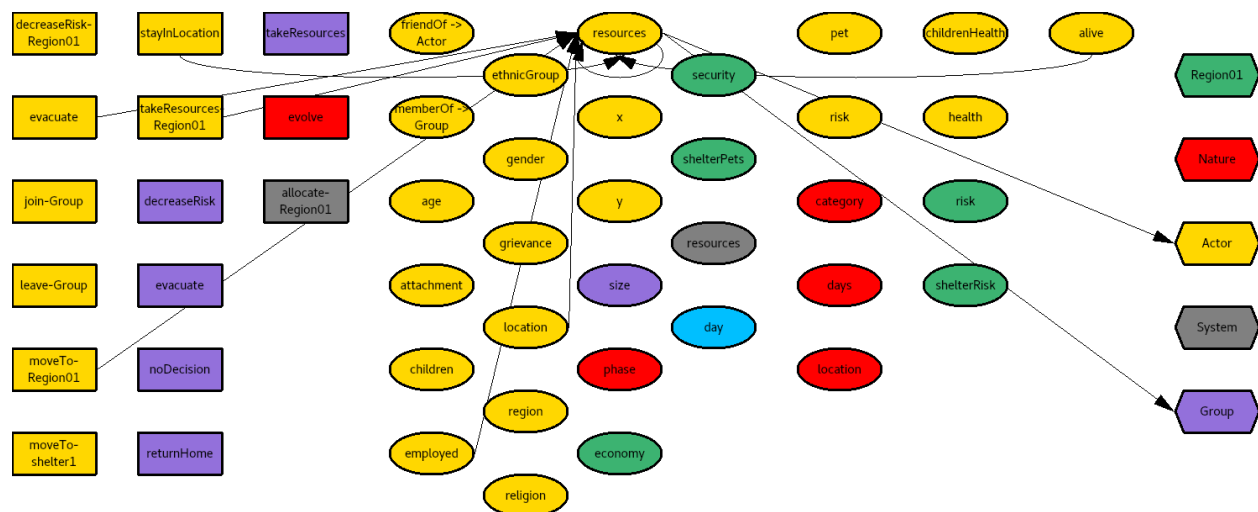
Values: majority, minority, none

psychsim/domains/groundtruth/actor.py:47

2.21 Actor's resources

Material resources (wealth) currently owned

Type: Real



psychsim/domains/groundtruth/actor.py:216

2.21.1 Effect of Actor-evacuate on Actor's resources

```
psychsim/domains/groundtruth/actor.py:501
IF Actor's resources>0.20
    THEN : Actor's resources'  $\leftarrow$  Actor's resources-0.20
    ELSE : Actor's resources'  $\leftarrow$  0.00
```

2.21.2 Effect of Actor-moveTo-Region01 on Actor's resources

```
psychsim/domains/groundtruth/actor.py:493
IF Actor's alive
    THEN : IF Actor's employed
        THEN : Actor's resources'  $\leftarrow$  80%·Actor's resources+0.20
        ELSE : Actor's resources'  $\leftarrow$  Actor's resources
    ELSE : Actor's resources'  $\leftarrow$  Actor's resources
```

2.21.3 Effect of Actor-stayInLocation on Actor's resources

```
psychsim/domains/groundtruth/actor.py:482
IF Actor's alive
    THEN : IF Actor's employed
        THEN : IF Actor's location={ 'evacuated', 'Region01' }
            THEN : Actor's resources'  $\leftarrow$  80%·Actor's resources+0.20
            ELSE : Actor's resources'  $\leftarrow$  Actor's resources
        ELSE : Actor's resources'  $\leftarrow$  Actor's resources
    ELSE : Actor's resources'  $\leftarrow$  Actor's resources
```

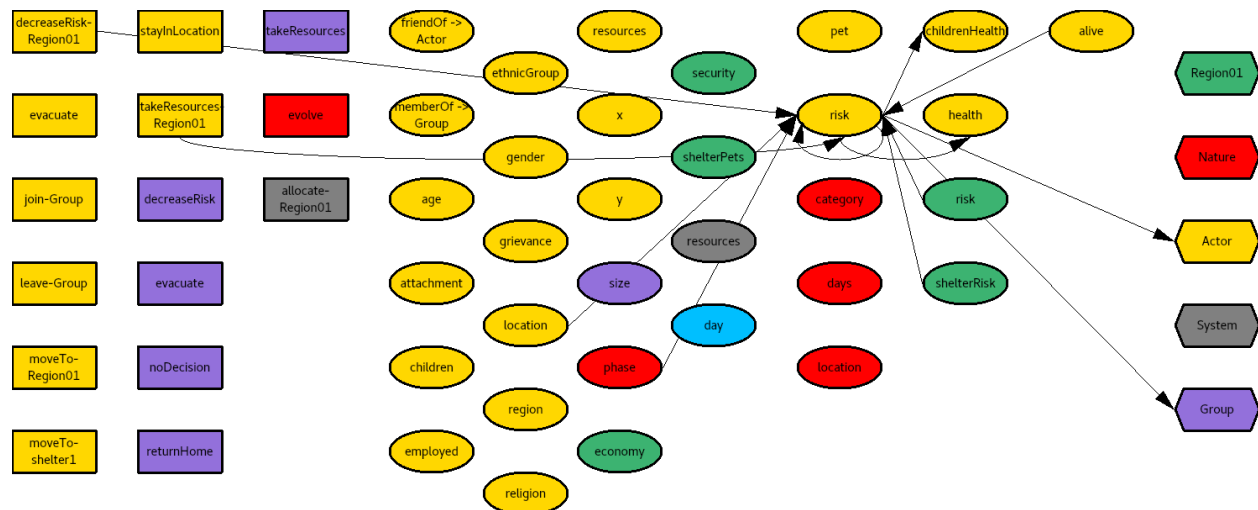
2.21.4 Effect of Actor-takeResources-Region01 on Actor's resources

```
psychsim/domains/groundtruth/actor.py:544
Actor's resources'  $\leftarrow$  80%·Actor's resources+0.20
```

2.22 Actor's risk

Current level of risk from hurricane

Type: Real



```
psychsim/domains/groundtruth/actor.py:236
```

2.22.1 Effect of Actor-decreaseRisk-Region01 on Actor's risk

psychsim/domains/groundtruth/actor.py:526

Actor's risk' $\leftarrow 80\% \cdot \text{Actor's risk} + 0.20$

2.22.2 Effect of Actor-takeResources-Region01 on Actor's risk

psychsim/domains/groundtruth/actor.py:551

IF Nature's phase=none

THEN : Actor's risk' $\leftarrow 19\% \cdot \text{Actor's risk} + 0.80$

ELSE : Actor's risk' $\leftarrow 40\% \cdot \text{Actor's risk} + 0.60$

2.22.3 Default change in Actor's risk

psychsim/domains/groundtruth/actor.py:429

IF Actor's alive

THEN : IF Actor's location'=shelter1

THEN : Actor's risk' $\leftarrow \text{Region01's shelterRisk}$

ELSE : IF Actor's location'=evacuated

THEN : Actor's risk' $\leftarrow 9\% \cdot \text{Actor's risk}$

ELSE : Actor's risk' $\leftarrow \text{Region01's risk}$

ELSE : Actor's risk' $\leftarrow 0.00$

2.23 Actor's x

Representation of residence's longitude

Type: Real

psychsim/domains/groundtruth/actor.py:161

2.24 Actor's y

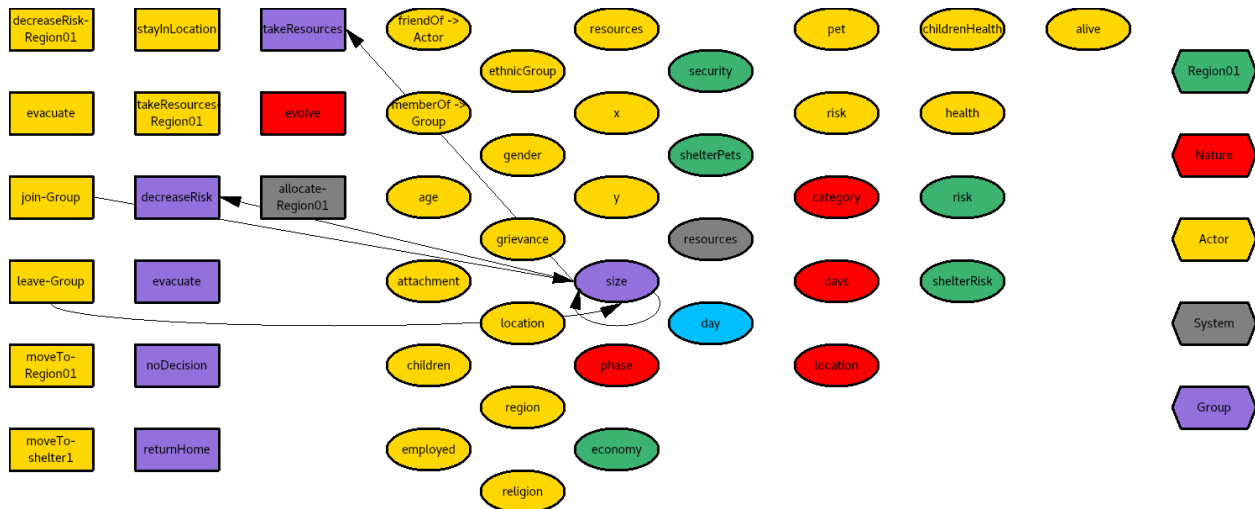
Representation of residence's latitude

Type: Real

psychsim/domains/groundtruth/actor.py:163

2.25 Group's size

Type: Integer



psychsim/domains/groundtruth/group.py:24

2.25.1 Effect of Actor-join-Group on Group's size

psychsim/domains/groundtruth/group.py:113

$\text{Group's size}' \leftarrow \text{Group's size} + 1$

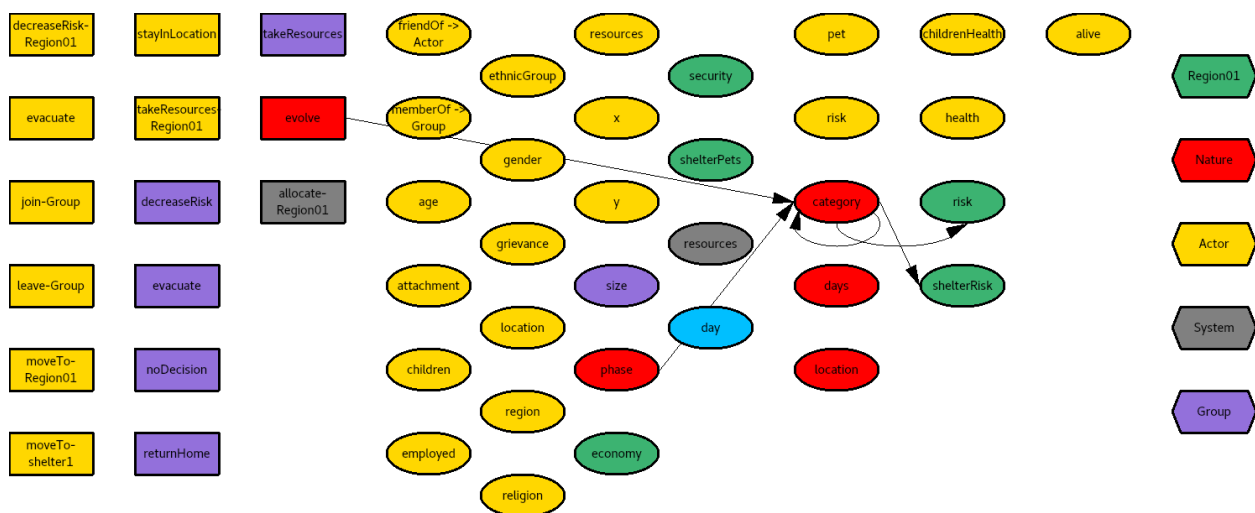
2.25.2 Effect of Actor-leave-Group on Group's size

psychsim/domains/groundtruth/group.py:124

$\text{Group's size}' \leftarrow \text{Group's size} - 1$

2.26 Nature's category

Type: Integer



psychsim/domains/groundtruth/nature.py:26

2.26.1 Effect of Nature-evolve on Nature's category

psychsim/domains/groundtruth/nature.py:80

IF Nature's phase'

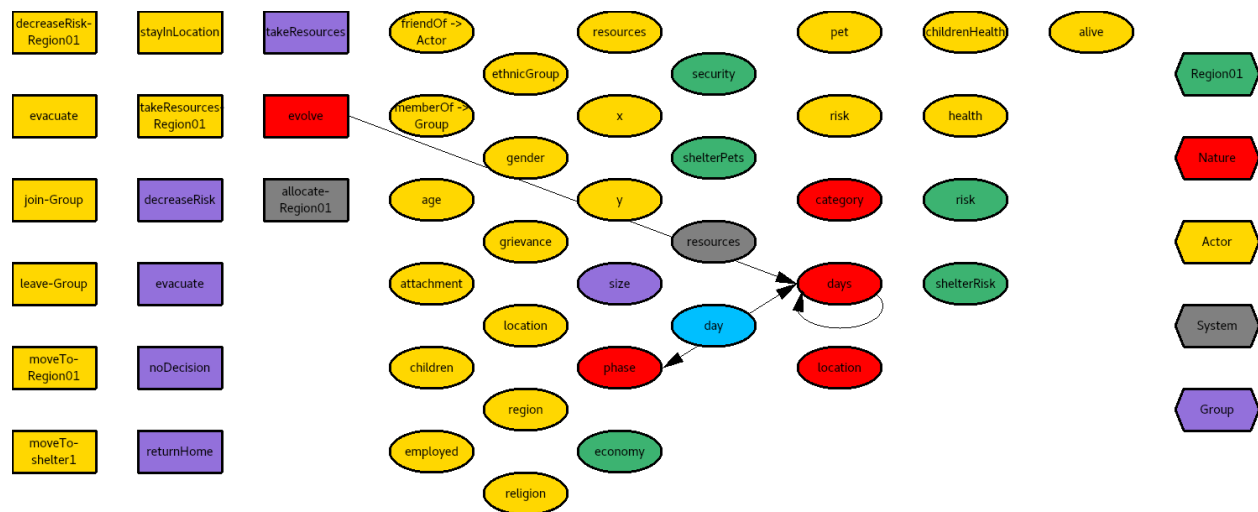

```

= approaching: IF Nature's category=0
  THEN :
    20%: Nature's category' ← 1
    20%: Nature's category' ← 2
    20%: Nature's category' ← 3
    20%: Nature's category' ← 4
    20%: Nature's category' ← 5
  ELSE : IF Nature's category=1
    THEN :
      60%: Nature's category' ← Nature's category
      40%: Nature's category' ← 2
    ELSE : IF Nature's category=5
      THEN :
        40%: Nature's category' ← 4
        60%: Nature's category' ← Nature's category
      ELSE :
        20%: Nature's category' ← Nature's category - 1
        60%: Nature's category' ← Nature's category
        20%: Nature's category' ← Nature's category + 1
= active: Nature's category' ← Nature's category
= none: Nature's category' ← 0

```

2.27 Nature's days

Type: Integer



psychsim/domains/groundtruth/nature.py:18

2.27.1 Effect of Nature-evolve on Nature's days

psychsim/domains/groundtruth/nature.py:54

```

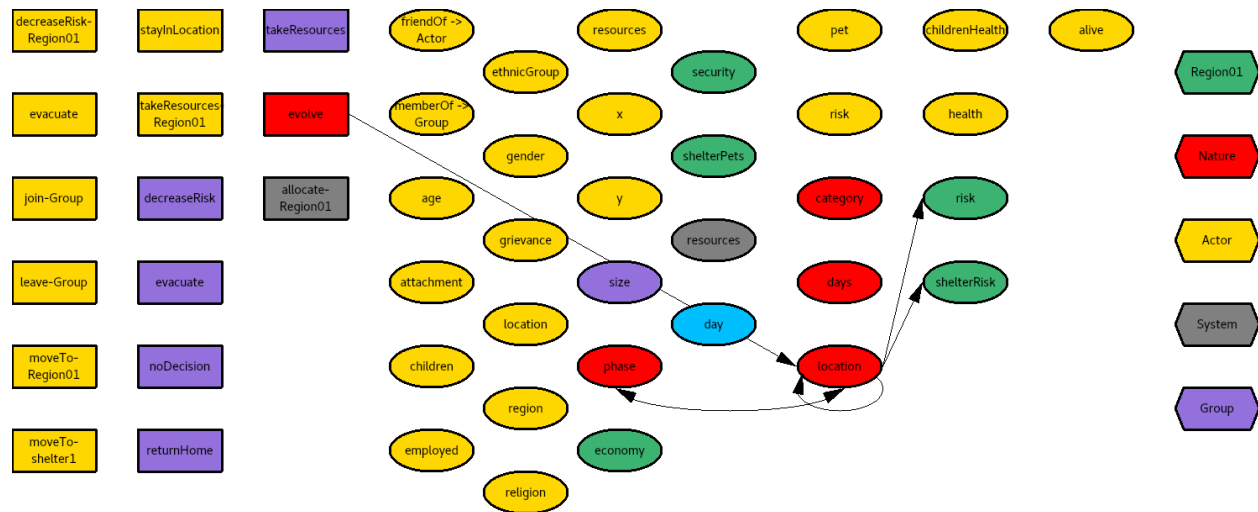
IF Nature's phase=Nature's phase'
  THEN : Nature's days' ← Nature's days+1
  ELSE : Nature's days' ← 0

```

2.28 Nature's location

Type: String

Values: Region01, none



psychsim/domains/groundtruth/nature.py:23

2.28.1 Effect of Nature-evolve on Nature's location

psychsim/domains/groundtruth/nature.py:111

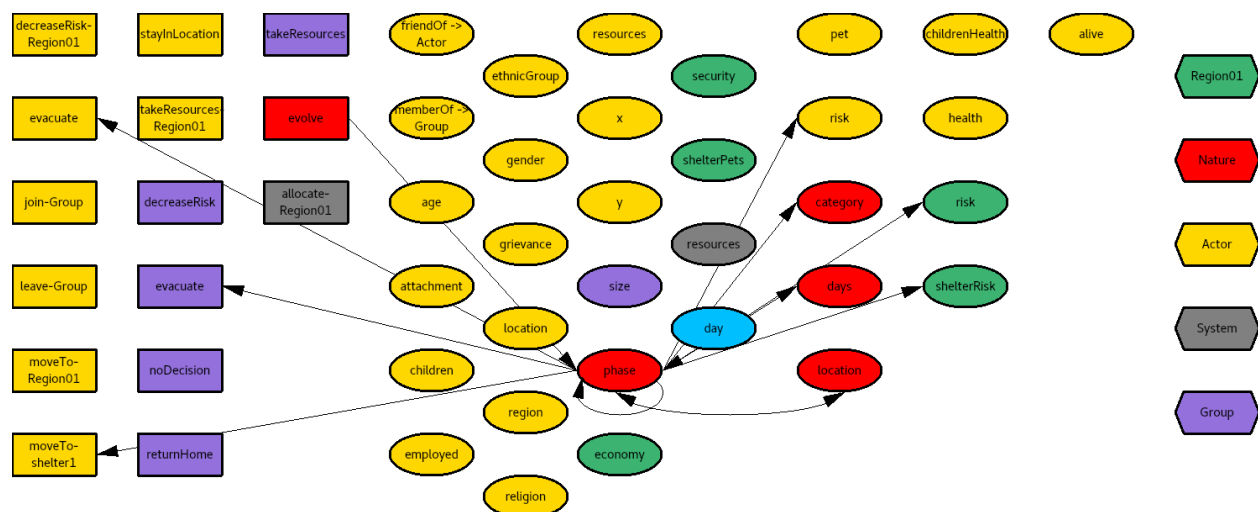
IF Nature's phase'

- = approaching: IF Nature's location=none
THEN : Nature's location' ← Region01
ELSE : Nature's location' ← Nature's location
- = active: IF Nature's location
OTHERWISE : Nature's location' ← Nature's location
= Region01: Nature's location' ← none
- = none: Nature's location' ← none

2.29 Nature's phase

Type: String

Values: active, approaching, none



psychsim/domains/groundtruth/nature.py:16

2.29.1 Effect of Nature-evolve on Nature's phase

psychsim/domains/groundtruth/nature.py:49

IF Nature's phase

= none: IF Nature's days>1

THEN :

80%: Nature's phase' ←approaching

19%: Nature's phase' ←none

ELSE : Nature's phase' ←none

= approaching: IF Nature's days>1

THEN :

80%: Nature's phase' ←active

19%: Nature's phase' ←approaching

ELSE : Nature's phase' ←approaching

OTHERWISE : IF Nature's location=none

THEN : Nature's phase' ←none

ELSE : Nature's phase' ←active

2.30 Region01's economy

Current economic level of region

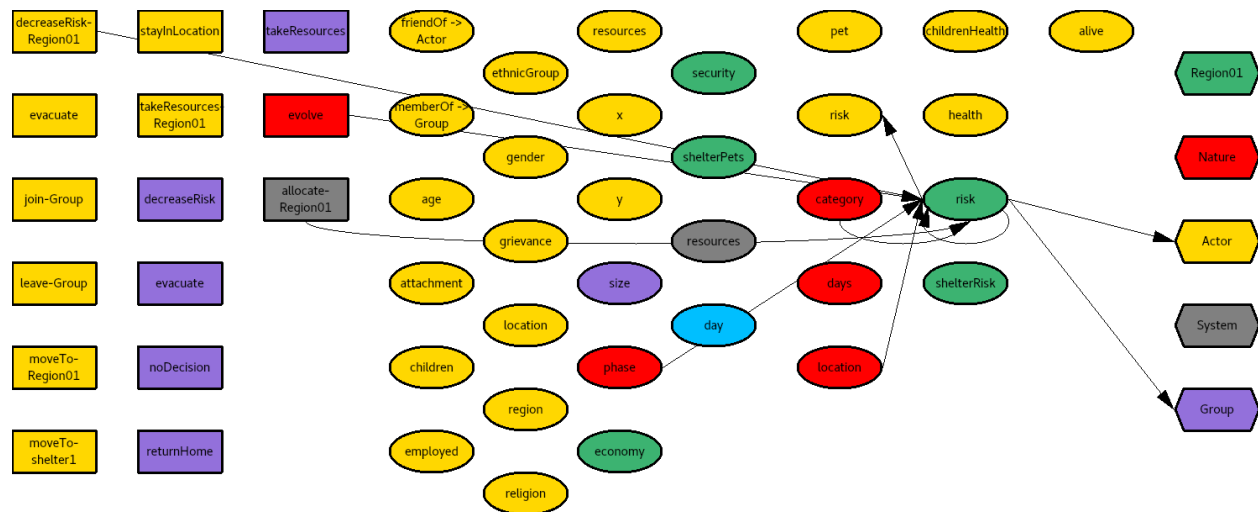
Type: Real

psychsim/domains/groundtruth/region.py:77

2.31 Region01's risk

Level of risk from hurricane

Type: Real



psychsim/domains/groundtruth/region.py:51

2.31.1 Effect of Actor-decreaseRisk-Region01 on Region01's risk

psychsim/domains/groundtruth/actor.py:521

Region01's risk' ←80%·Region01's risk

2.31.2 Effect of Nature-evolve on Region01's risk

psychsim/domains/groundtruth/nature.py:129

IF Nature's phase'=active

THEN : IF Nature's location'

OTHERWISE : Region01's risk' $\leftarrow 80\% \cdot \text{Region01's risk}$

= Region01: IF Nature's category

= 1: Region01's risk' $\leftarrow 80\% \cdot \text{Region01's risk} + 0.20$

= 2: Region01's risk' $\leftarrow 60\% \cdot \text{Region01's risk} + 0.40$

= 3: Region01's risk' $\leftarrow 39\% \cdot \text{Region01's risk} + 0.60$

= 4: Region01's risk' $\leftarrow 19\% \cdot \text{Region01's risk} + 0.80$

= 5: Region01's risk' $\leftarrow 0\% \cdot \text{Region01's risk} + 1.00$

ELSE : Region01's risk' $\leftarrow 80\% \cdot \text{Region01's risk}$

2.31.3 Effect of System-allocate-Region01 on Region01's risk

psychsim/domains/groundtruth/system.py:41

Region01's risk' $\leftarrow 80\% \cdot \text{Region01's risk}$

2.32 Region01's security

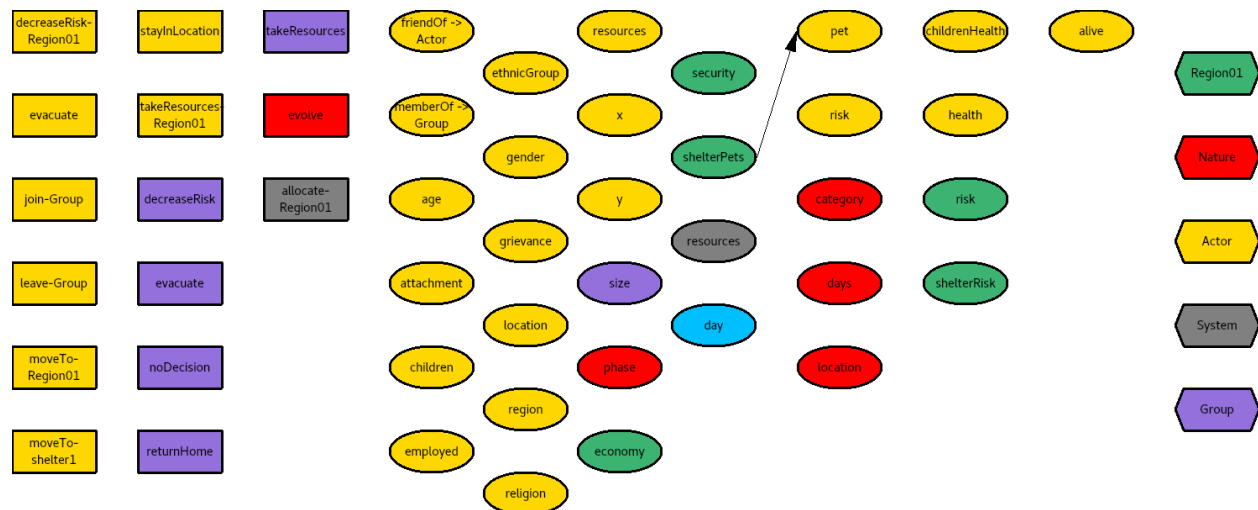
Level of law enforcement in region

Type: Real

psychsim/domains/groundtruth/region.py:64

2.33 Region01's shelterPets

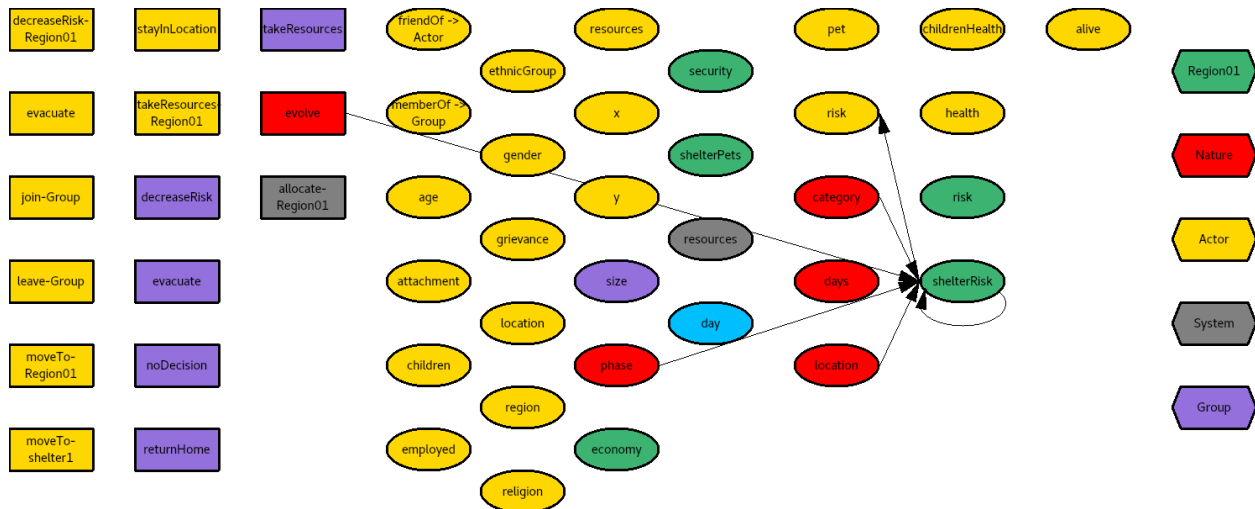
Type: Boolean



psychsim/domains/groundtruth/region.py:88

2.34 Region01's shelterRisk

Type: Real



psychsim/domains/groundtruth/region.py:82

2.34.1 Effect of Nature-evolve on Region01's shelterRisk

psychsim/domains/groundtruth/nature.py:144

IF Nature's phase'=active

THEN : IF Nature's location'=Region01

THEN : IF Nature's category

= 1: Region01's shelterRisk' ← Region01's shelterRisk

= 2: Region01's shelterRisk' ← 80%·Region01's shelterRisk+0.20

= 3: Region01's shelterRisk' ← 60%·Region01's shelterRisk+0.40

= 4: Region01's shelterRisk' ← 39%·Region01's shelterRisk+0.60

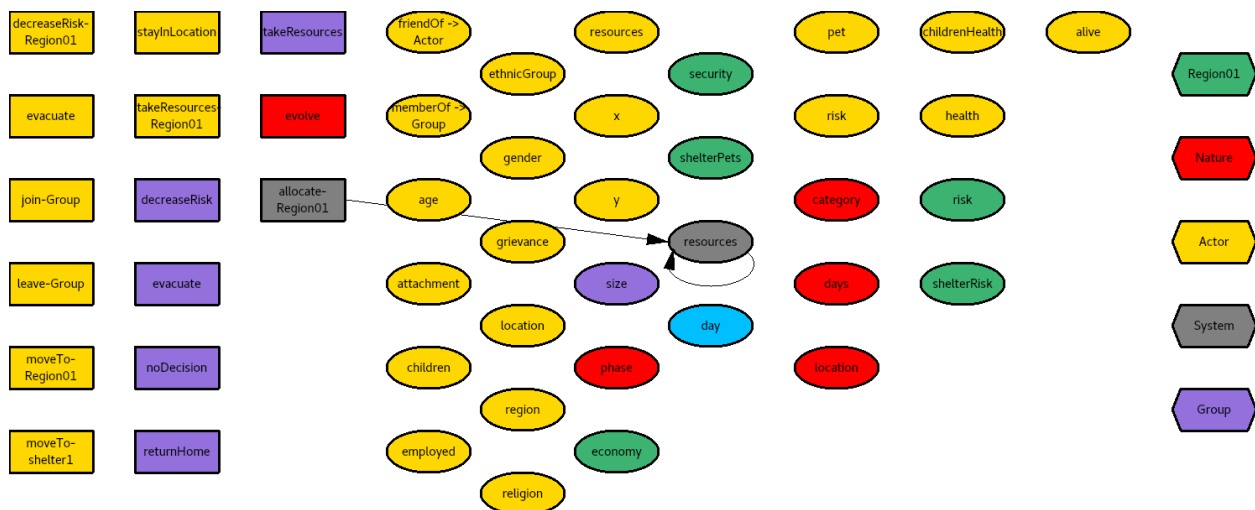
= 5: Region01's shelterRisk' ← 19%·Region01's shelterRisk+0.80

ELSE : Region01's shelterRisk' ← Region01's shelterRisk

ELSE : Region01's shelterRisk' ← 80%·Region01's shelterRisk

2.35 System's resources

Type: Integer



psychsim/domains/groundtruth/system.py:20

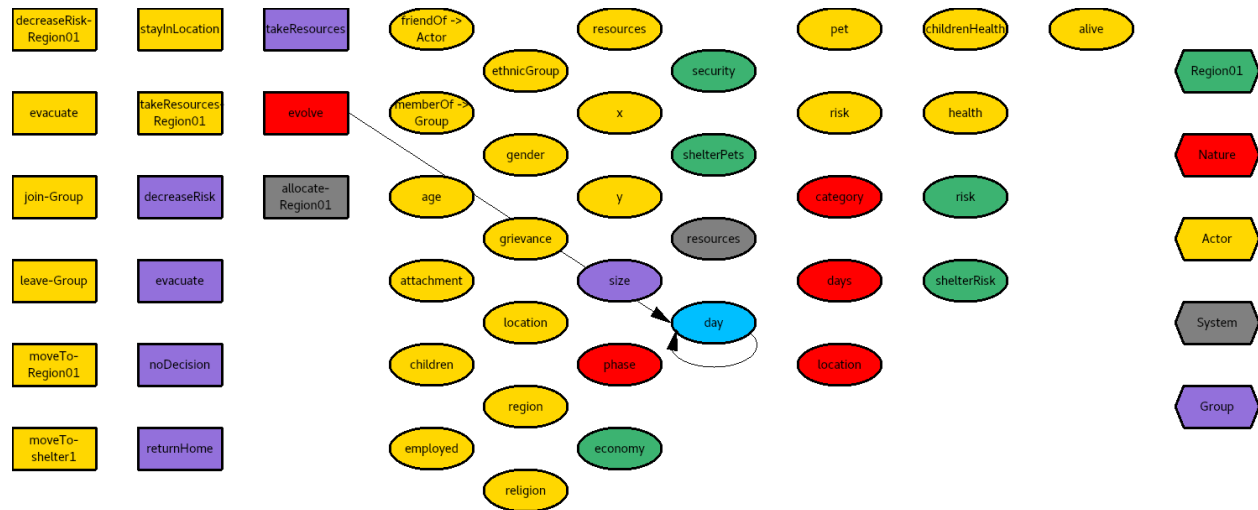
2.35.1 Effect of System-allocate-Region01 on System's resources

psychsim/domains/groundtruth/system.py:43

System's resources' ← System's resources

2.36 day

Type: Integer



psychsim/domains/groundtruth/__main__.py:710

2.36.1 Effect of Nature-evolve on day

psychsim/domains/groundtruth/nature.py:149

day' ← day+1

3 Relations

3.1 Actor friendOf Actor

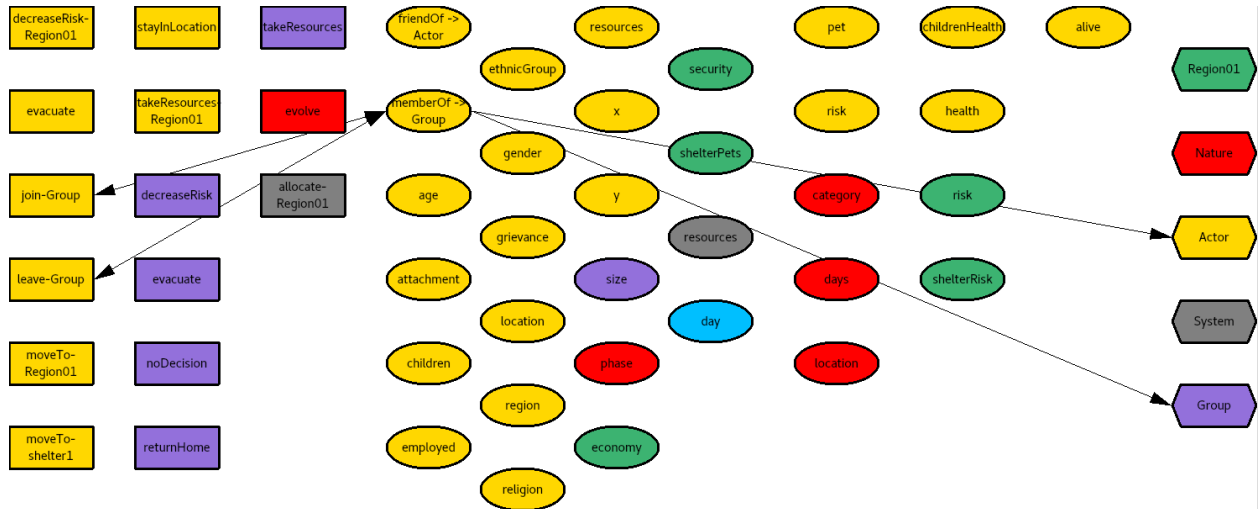
{'codePtr': True}

Type: Boolean

3.2 Actor memberOf Group

{'codePtr': True}

Type: Boolean



3.2.1 Effect of Actor-join-Group on Actor memberOf Group

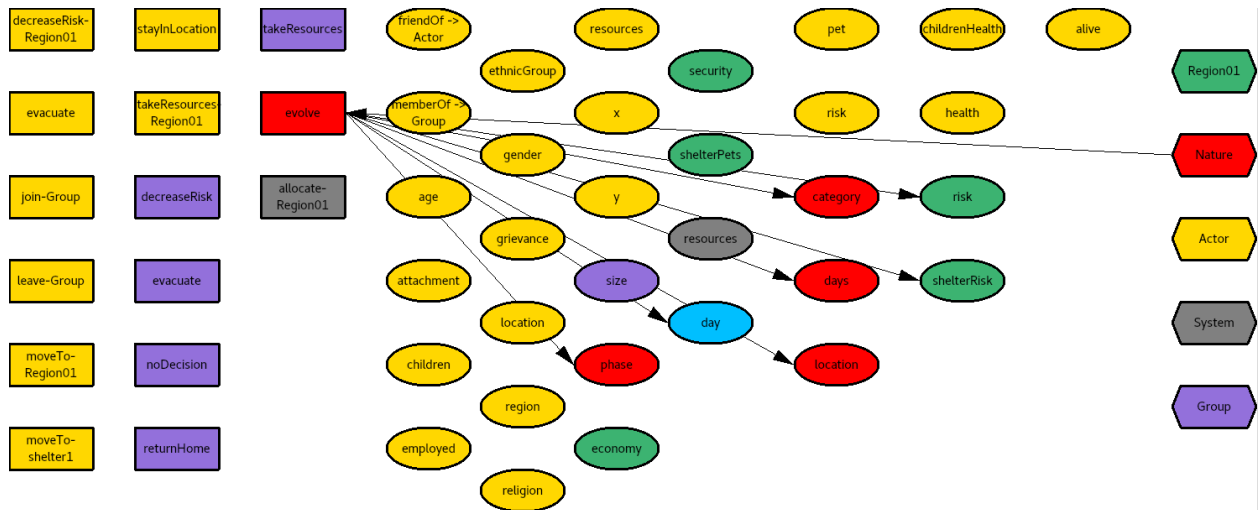
Actor memberOf Group' \leftarrow true

3.2.2 Effect of Actor-leave-Group on Actor memberOf Group

Actor memberOf Group' \leftarrow false

4 Actions

4.1 Nature evolve



4.1.1 Effect on Nature's category of Nature evolve

IF Nature's phase'

= approaching: IF Nature's category=0

THEN :

20%: Nature's category' \leftarrow 1

20%: Nature's category' \leftarrow 2

20%: Nature's category' \leftarrow 3

20%: **Nature's category'** \leftarrow 4
 20%: **Nature's category'** \leftarrow 5
 ELSE : IF **Nature's category**=1
 THEN :
 60%: **Nature's category'** \leftarrow **Nature's category**
 40%: **Nature's category'** \leftarrow 2
 ELSE : IF **Nature's category**=5
 THEN :
 40%: **Nature's category'** \leftarrow 4
 60%: **Nature's category'** \leftarrow **Nature's category**
 ELSE :
 20%: **Nature's category'** \leftarrow **Nature's category** - 1
 60%: **Nature's category'** \leftarrow **Nature's category**
 20%: **Nature's category'** \leftarrow **Nature's category** + 1
 = **active**: **Nature's category'** \leftarrow **Nature's category**
 = **none**: **Nature's category'** \leftarrow 0

4.1.2 Effect on Nature's days of Nature evolve

IF **Nature's phase**=**Nature's phase'**
 THEN : **Nature's days'** \leftarrow **Nature's days** + 1
 ELSE : **Nature's days'** \leftarrow 0

4.1.3 Effect on Nature's location of Nature evolve

IF **Nature's phase'**
 = **approaching**: IF **Nature's location**=**none**
 THEN : **Nature's location'** \leftarrow **Region01**
 ELSE : **Nature's location'** \leftarrow **Nature's location**
 = **active**: IF **Nature's location**
 OTHERWISE : **Nature's location'** \leftarrow **Nature's location**
 = **Region01**: **Nature's location'** \leftarrow **none**
 = **none**: **Nature's location'** \leftarrow **none**

4.1.4 Effect on Nature's phase of Nature evolve

IF **Nature's phase**
 = **none**: IF **Nature's days**>1
 THEN :
 80%: **Nature's phase'** \leftarrow **approaching**
 19%: **Nature's phase'** \leftarrow **none**
 ELSE : **Nature's phase'** \leftarrow **none**
 = **approaching**: IF **Nature's days**>1
 THEN :
 80%: **Nature's phase'** \leftarrow **active**
 19%: **Nature's phase'** \leftarrow **approaching**
 ELSE : **Nature's phase'** \leftarrow **approaching**
 OTHERWISE : IF **Nature's location**=**none**
 THEN : **Nature's phase'** \leftarrow **none**
 ELSE : **Nature's phase'** \leftarrow **active**

4.1.5 Effect on Region01's risk of Nature evolve

IF **Nature's phase'**=**active**
 THEN : IF **Nature's location'**

OTHERWISE : $\text{Region01's risk}' \leftarrow 80\% \cdot \text{Region01's risk}$
 = **Region01: IF Nature's category**
 = 1: $\text{Region01's risk}' \leftarrow 80\% \cdot \text{Region01's risk} + 0.20$
 = 2: $\text{Region01's risk}' \leftarrow 60\% \cdot \text{Region01's risk} + 0.40$
 = 3: $\text{Region01's risk}' \leftarrow 39\% \cdot \text{Region01's risk} + 0.60$
 = 4: $\text{Region01's risk}' \leftarrow 19\% \cdot \text{Region01's risk} + 0.80$
 = 5: $\text{Region01's risk}' \leftarrow 0\% \cdot \text{Region01's risk} + 1.00$
 ELSE : $\text{Region01's risk}' \leftarrow 80\% \cdot \text{Region01's risk}$

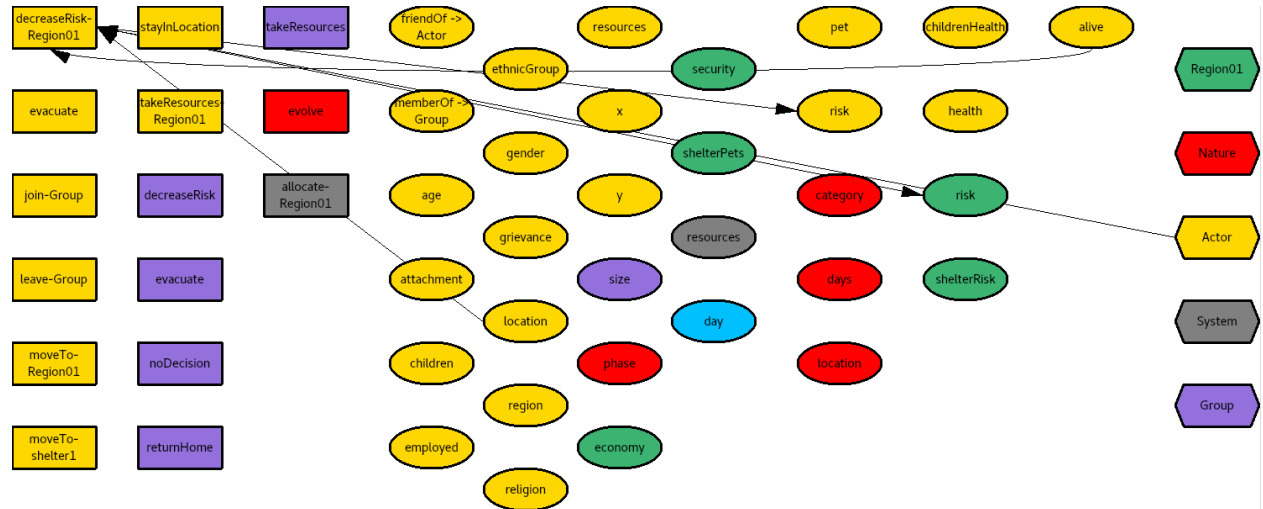
4.1.6 Effect on Region01's shelterRisk of Nature evolve

IF Nature's phase' = active
 THEN : IF Nature's location' = Region01
 THEN : IF Nature's category
 = 1: $\text{Region01's shelterRisk}' \leftarrow \text{Region01's shelterRisk}$
 = 2: $\text{Region01's shelterRisk}' \leftarrow 80\% \cdot \text{Region01's shelterRisk} + 0.20$
 = 3: $\text{Region01's shelterRisk}' \leftarrow 60\% \cdot \text{Region01's shelterRisk} + 0.40$
 = 4: $\text{Region01's shelterRisk}' \leftarrow 39\% \cdot \text{Region01's shelterRisk} + 0.60$
 = 5: $\text{Region01's shelterRisk}' \leftarrow 19\% \cdot \text{Region01's shelterRisk} + 0.80$
 ELSE : $\text{Region01's shelterRisk}' \leftarrow \text{Region01's shelterRisk}$
 ELSE : $\text{Region01's shelterRisk}' \leftarrow 80\% \cdot \text{Region01's shelterRisk}$

4.1.7 Effect on day of Nature evolve

$\text{day}' \leftarrow \text{day} + 1$

4.2 Actor decreaseRisk Region01



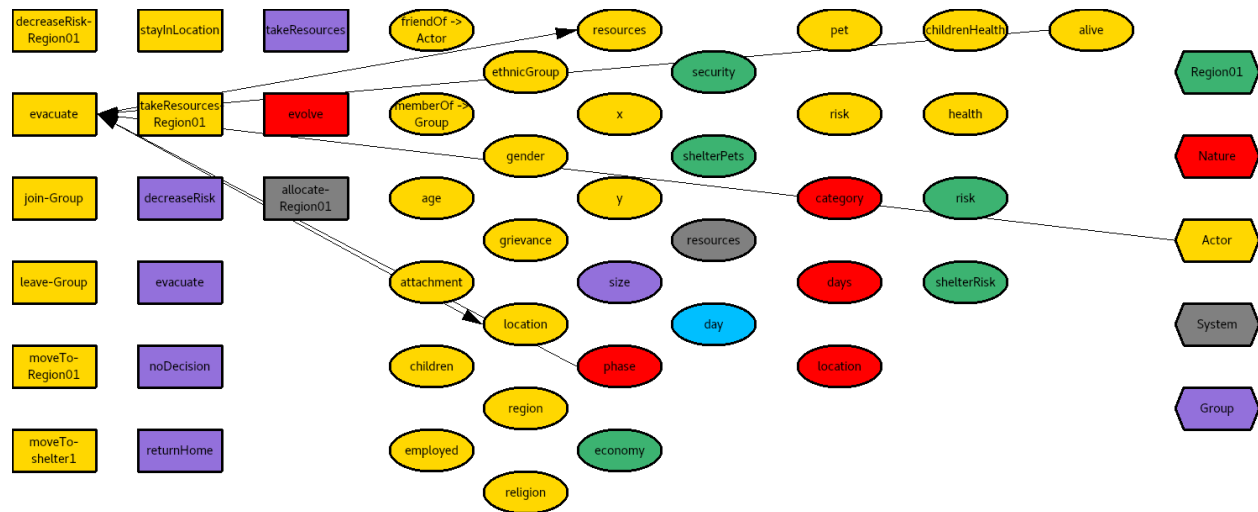
4.2.1 Applicability of Actor decreaseRisk Region01

IF Actor's location = Region01
 THEN : IF Actor's alive
 THEN : true
 ELSE : false
 ELSE : false

Actor's risk' $\leftarrow 80\% \cdot \text{Actor's risk} + 0.20$

Region01's risk' $\leftarrow 80\% \cdot$ Region01's risk

4.3 Actor evacuate



4.3.1 Applicability of Actor evacuate

```

IF Nature's phase=none
    THEN : false
ELSE : IF Actor's location=evacuated
    THEN : false
    ELSE : IF Actor's alive
        THEN : true
        ELSE : false

```

4.3.2 Effect on Actor's location of Actor evacuate

Actor's location' \leftarrow evacuated

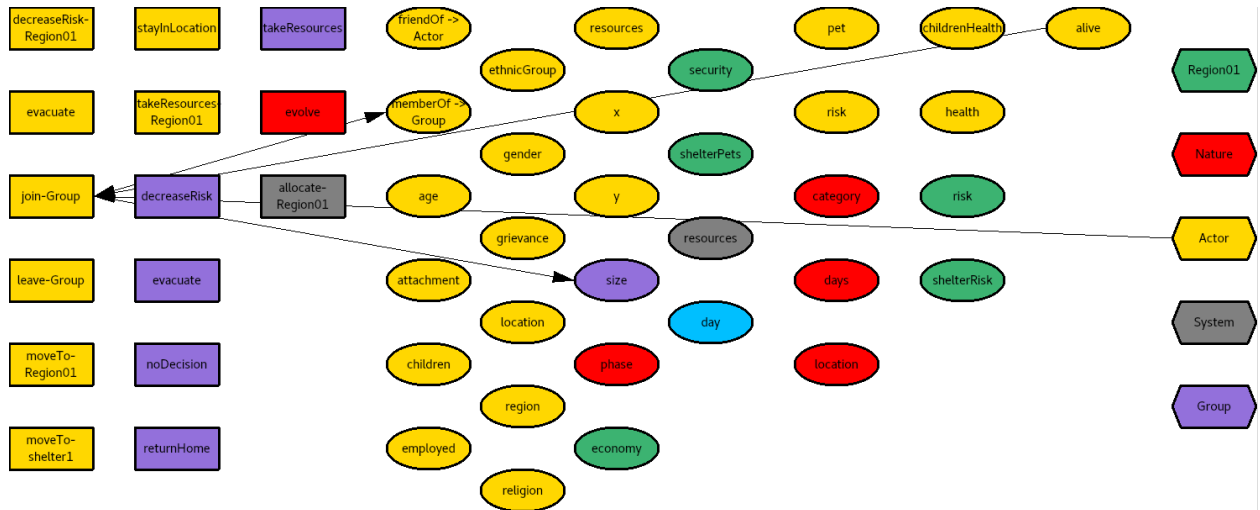
4.3.3 Effect on Actor's resources of Actor evacuate

```

IF Actor's resources>0.20
  THEN : Actor's resources'←Actor's resources−0.20
  ELSE : Actor's resources'←0.00

```

4.4 Actor join Group



4.4.1 Applicability of Actor join Group

IF Actor's alive

THEN : IF Actor memberOf Group

THEN : false

ELSE : true

ELSE : false

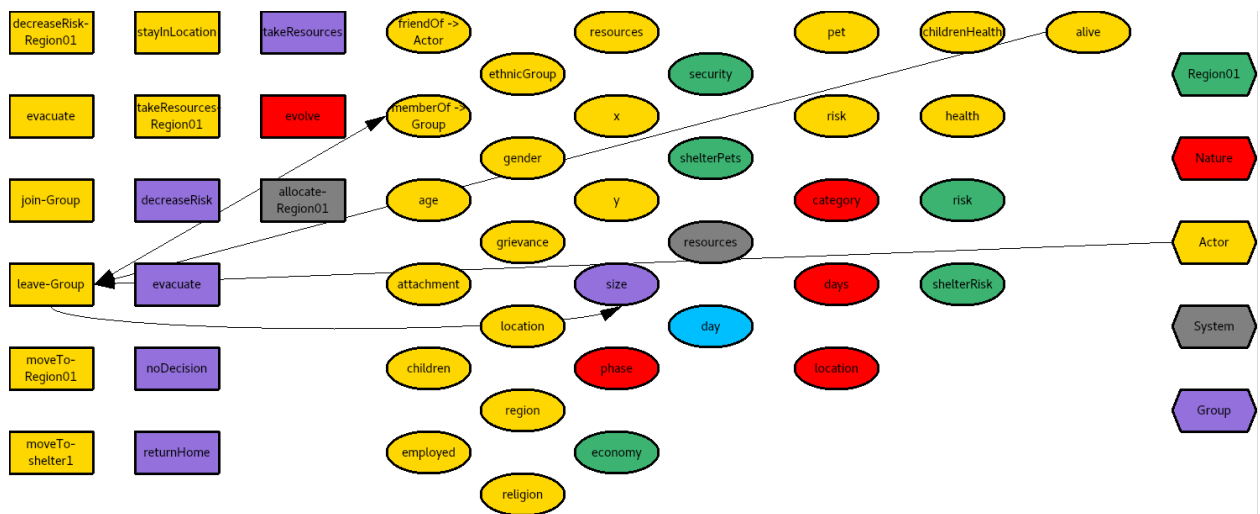
4.4.2 Effect on Actor memberOf Group of Actor join Group

Actor memberOf Group' \leftarrow true

4.4.3 Effect on Group's size of Actor join Group

Group's size' \leftarrow Group's size + 1

4.5 Actor leave Group



4.5.1 Applicability of Actor leave Group

IF Actor's alive

THEN : IF Actor memberOf Group

THEN : true

ELSE : false

ELSE : false

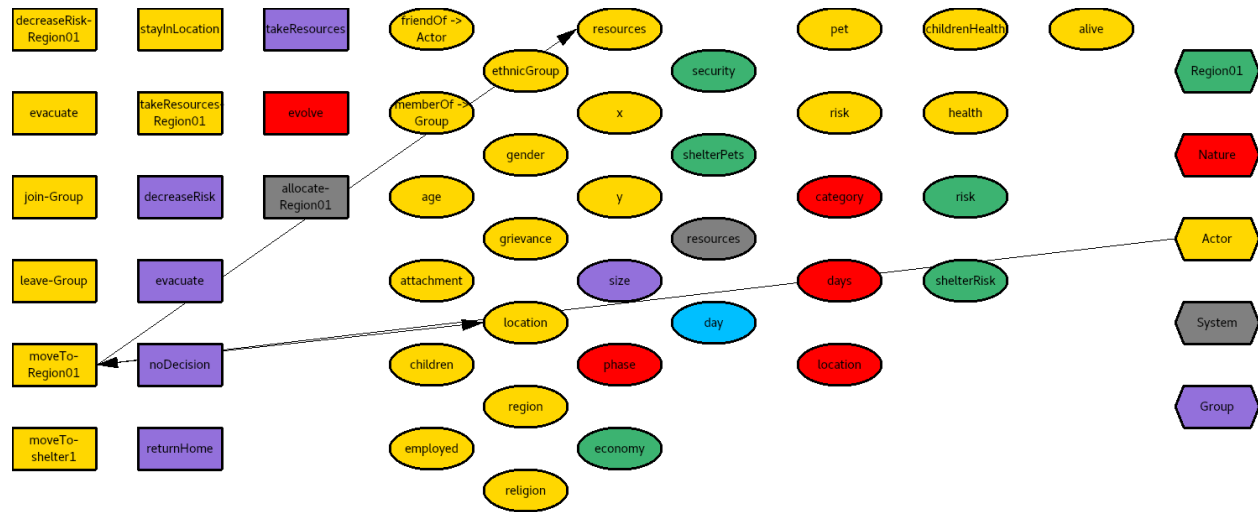
4.5.2 Effect on Actor memberOf Group of Actor leave Group

Actor memberOf Group' \leftarrow false

4.5.3 Effect on Group's size of Actor leave Group

Group's size' \leftarrow Group's size - 1

4.6 Actor moveTo Region01



4.6.1 Applicability of Actor moveTo Region01

IF Actor's location={ 'evacuated', 'shelter1' }

THEN : true

ELSE : false

4.6.2 Effect on Actor's location of Actor moveTo Region01

Actor's location' \leftarrow Region01

4.6.3 Effect on Actor's resources of Actor moveTo Region01

IF Actor's alive

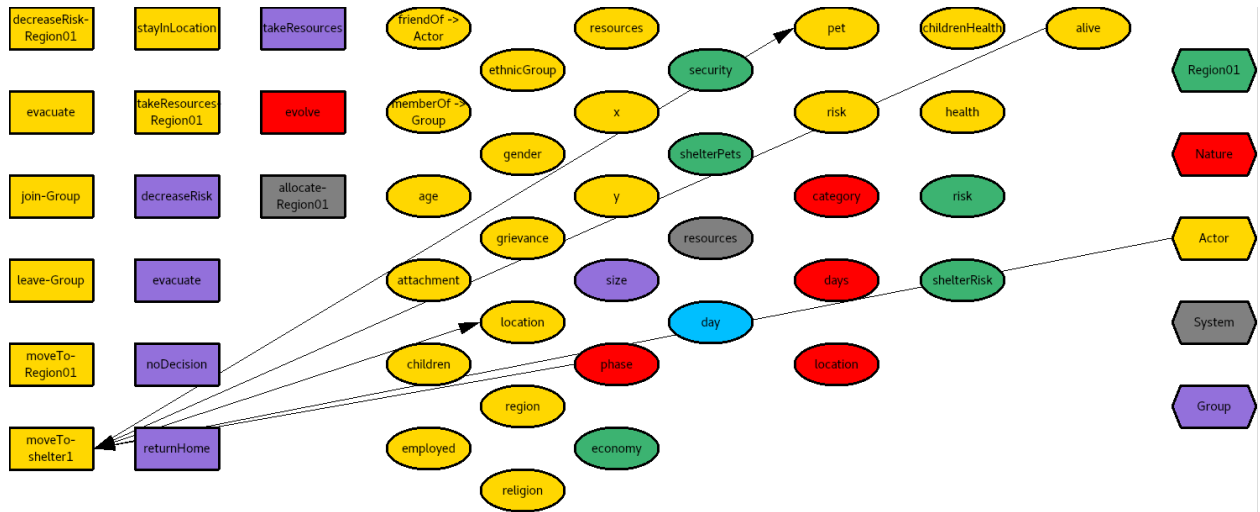
THEN : IF Actor's employed

THEN : Actor's resources' \leftarrow 80%·Actor's resources+0.20

ELSE : Actor's resources' \leftarrow Actor's resources

ELSE : Actor's resources' \leftarrow Actor's resources

4.7 Actor moveTo shelter1



4.7.1 Applicability of Actor moveTo shelter1

```

IF Nature's phase=none
  THEN : false
  ELSE : IF Actor's alive
    THEN : IF Actor's location=shelter1
      THEN : false
      ELSE : true
    ELSE : false
  
```

4.7.2 Effect on Actor's location of Actor moveTo shelter1

Actor's location' ← shelter1

4.7.3 Effect on Actor's pet of Actor moveTo shelter1

```

IF Actor's location'=shelter1
  THEN : IF Region01's shelterPets
    THEN : Actor's pet' ← Actor's pet
    ELSE : Actor's pet' ← false
  ELSE : Actor's pet' ← Actor's pet
  
```

[illegible]

ELSE : Actor's resources' \leftarrow Actor's resources

4.9.2 Effect on Actor's resources of Actor takeResources Region01

Actor's resources' $\leftarrow 80\% \cdot \text{Actor's resources} + 0.20$

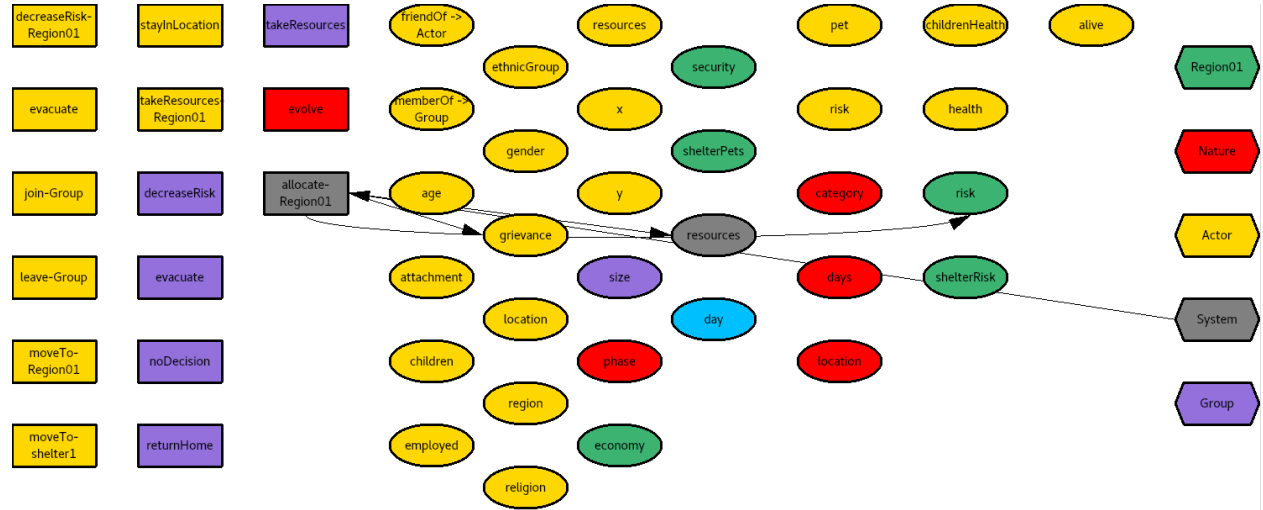
4.9.3 Effect on Actor's risk of Actor takeResources Region01

IF Nature's phase=none

THEN : Actor's risk' $\leftarrow 19\% \cdot \text{Actor's risk} + 0.80$

ELSE : Actor's risk' $\leftarrow 40\% \cdot \text{Actor's risk} + 0.60$

4.10 System allocate Region01



4.10.1 Effect on Actor's grievance of System allocate Region01

IF Actor's region=Region01

THEN : Actor's grievance' $\leftarrow 80\% \cdot \text{Actor's grievance}$

ELSE : Actor's grievance' $\leftarrow 80\% \cdot \text{Actor's grievance} + 0.20$

4.10.2 Effect on Region01's risk of System allocate Region01

Region01's risk' $\leftarrow 80\% \cdot \text{Region01's risk}$

4.10.3 Effect on System's resources of System allocate Region01

System's resources' $\leftarrow \text{System's resources}$

The diagram illustrates a complex network of relationships between various entities. On the left, a vertical list of actions (decreaseRisk-Region01, stayInLocation, takeResources, evacuate, join-Group, decreaseRisk, allocate-Region01, leave-Group, evacuate, moveTo-Region01, noDecision, moveTo-shelter1, returnHome) is connected to a central network of nodes. These nodes include roles (friendOf->Actor, memberOf->Group), resources (resources, pet, childrenHealth, alive, ethnicGroup, security, shelterPets, resources, grievance, size, day, location, children, region, employed, religion), and other concepts (x, y, risk, health, category, risk, days, shelterRisk, phase, economy). On the right, a vertical list of categories (Region01, Nature, Actor, System, Group) is shown. A line connects the 'allocate-Region01' node to the 'Group' category.

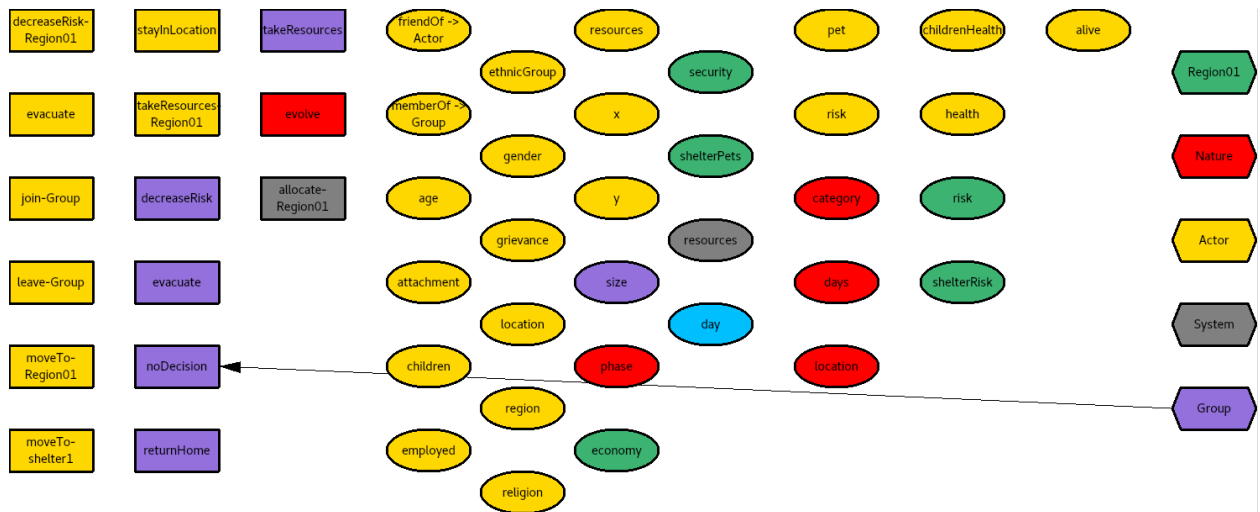
```
IF Group's size>0
  THEN : true
  ELSE : false
```

```

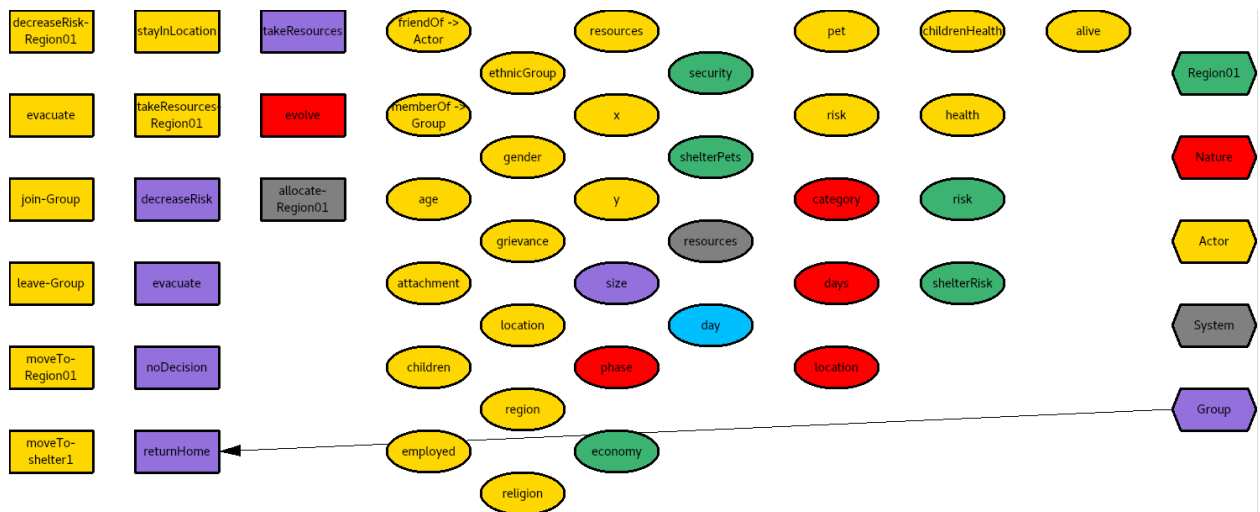
IF Nature's phase=none
  THEN : false
  ELSE : true

```

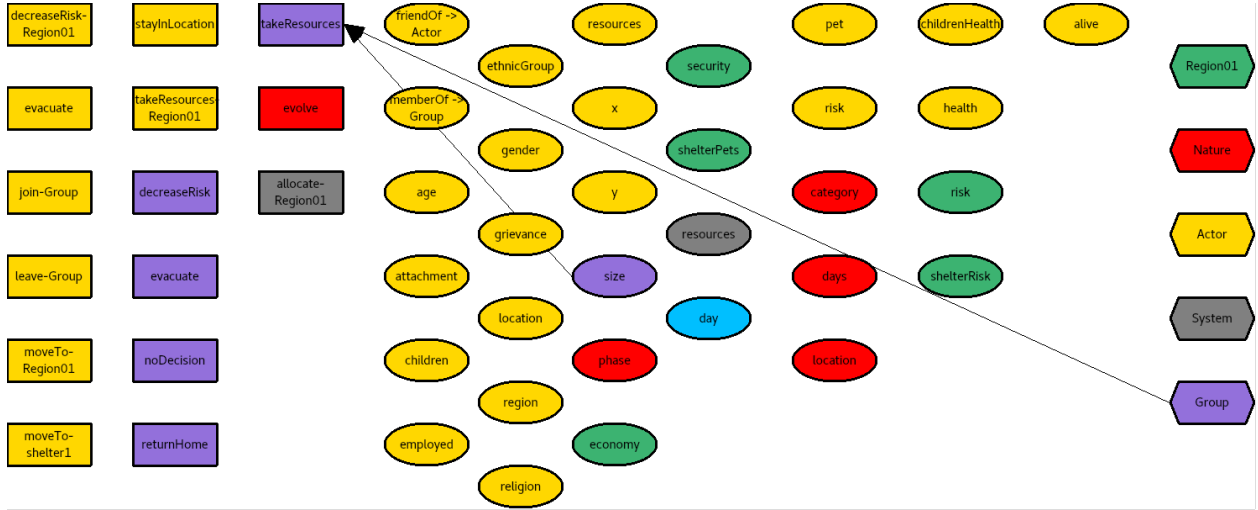

4.13 Group noDecision



4.14 Group returnHome



4.15 Group takeResources

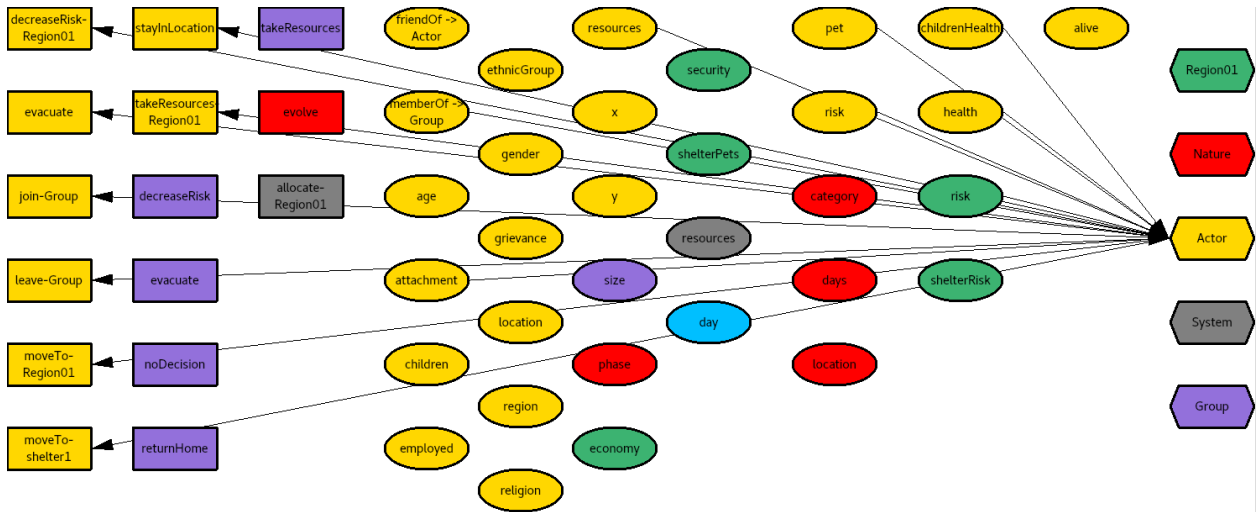


4.15.1 Applicability of Group takeResources

IF Group's size > 0
 THEN : true
 ELSE : false

5 Expected Reward

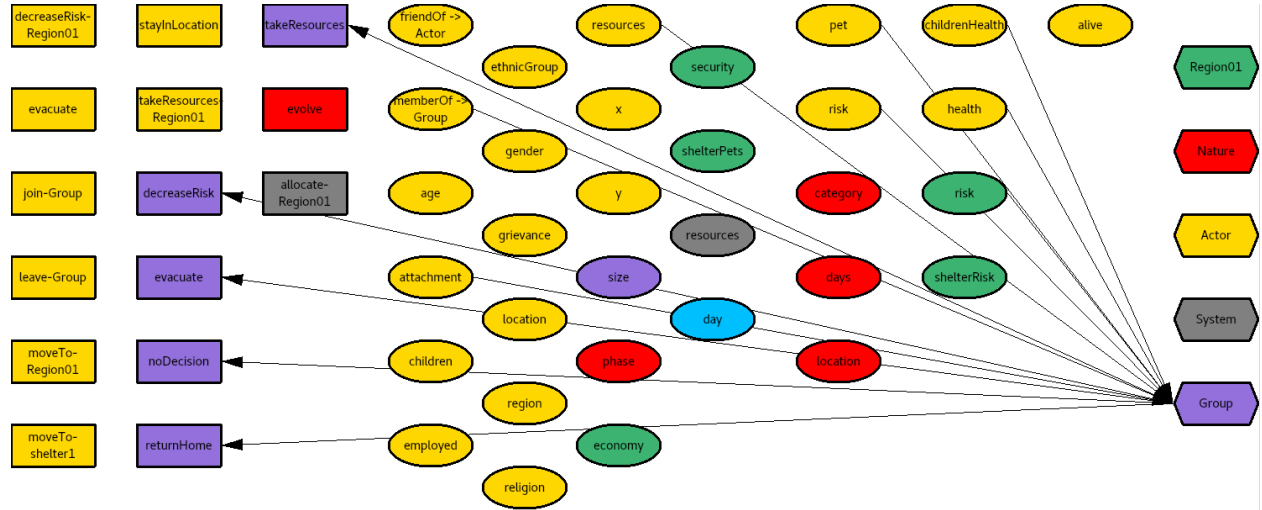
5.1 Actor's Reward



IF Actor's risk > 0.60
 THEN : IF Actor's attachment = anxious
 THEN : $R \leftarrow 20\% \cdot \text{Actor memberOf Group} + 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$
 ELSE : IF Actor's attachment = avoidant
 THEN : $R \leftarrow -20\% \cdot \text{Actor memberOf Group} + 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$
 ELSE : $R \leftarrow 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$

ELSE : $R \leftarrow 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$

5.2 Group's Reward



IF Actor's risk > 0.60

THEN : IF Actor's attachment = anxious

THEN : $R \leftarrow 20\% \cdot \text{Actor memberOf Group} + 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$

ELSE : IF Actor's attachment = avoidant

THEN : $R \leftarrow -20\% \cdot \text{Actor memberOf Group} + 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$

ELSE : $R \leftarrow 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$

ELSE : $R \leftarrow 40\% \cdot \text{Actor's childrenHealth} + 60\% \cdot \text{Actor's health} + 40\% \cdot \text{Actor's pet} + 20\% \cdot \text{Actor's resources} + -60\% \cdot \text{Region01's risk}$