USC Ground Truth Documentation

October 8, 2018

Contents

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:

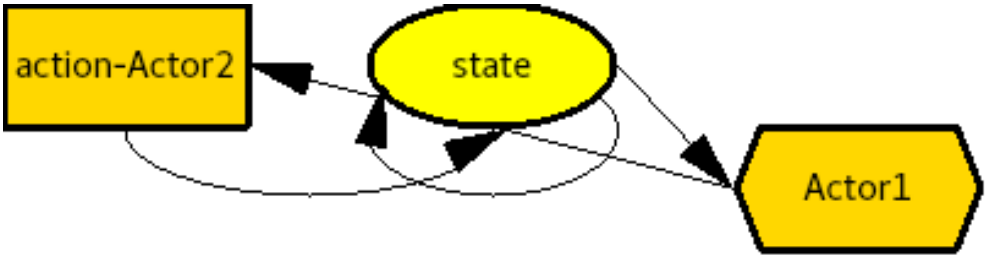

Figure 1: Simple influence diagram

- 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

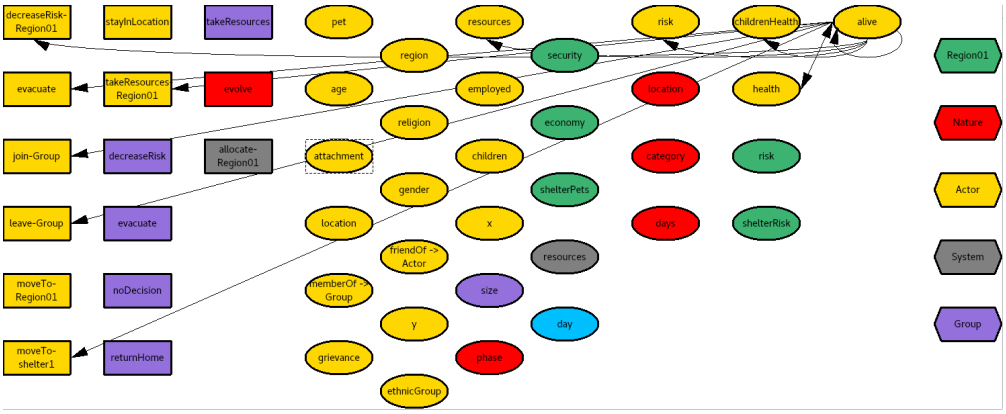

Figure 2: Ground Truth subgraph for Actor's alive

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

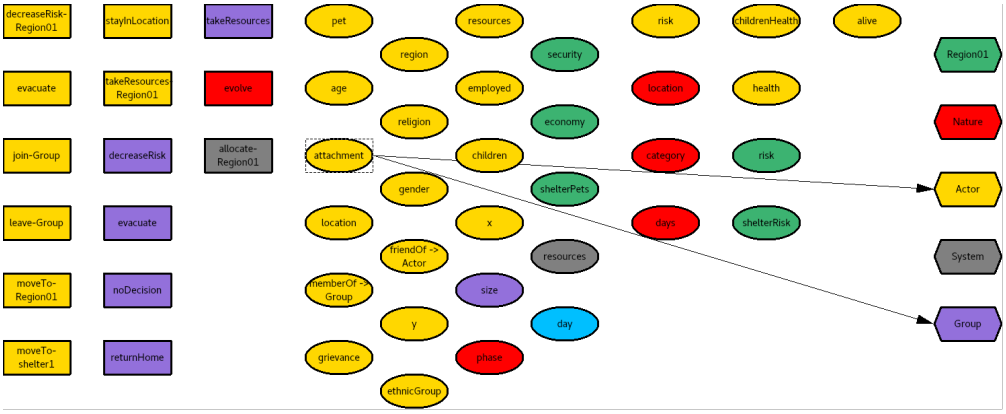

Figure 3: Ground Truth subgraph for Actor's attachment

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

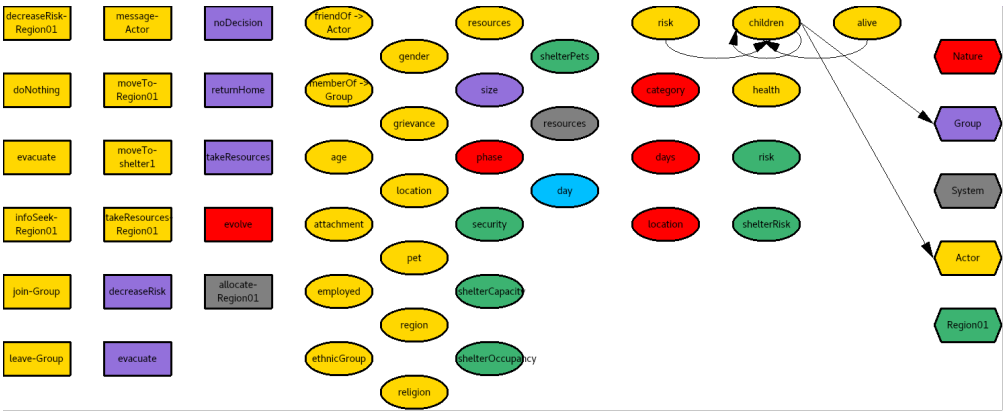

Figure 4: Ground Truth subgraph for Actor's children

`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`

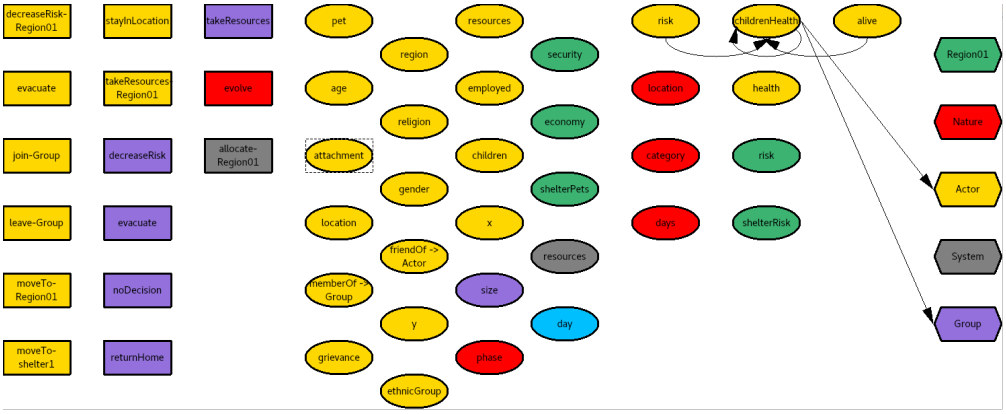

Figure 5: Ground Truth subgraph for Actor's childrenHealth

2.7.1 Default change in Actor's childrenHealth

`psychsim/domains/groundtruth/actor.py:455`

IF **Actor's alive**

THEN : IF **Actor's risk**$'\in$

[0,0.2]: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

(0.2,0.4]:

20%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**

80%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

(0.4,0.6]:

40%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**

60%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

(0.6,0.8]:

60%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**

40%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

(0.8,1.0]:

80%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**

19%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

(1.0,1]:

100%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**

0%: **Actor's childrenHealth**$'\leftarrow$60%·**Actor's childrenHealth**+0.24

ELSE : **Actor's childrenHealth**$'\leftarrow$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`

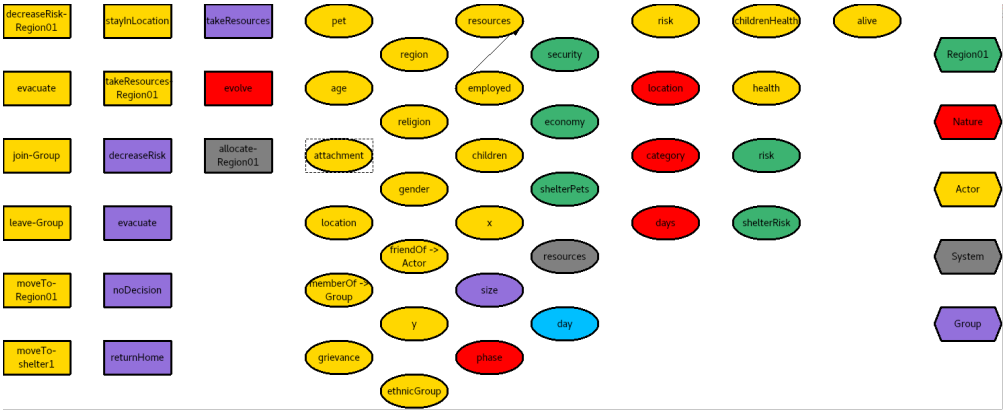

Figure 6: Ground Truth subgraph for Actor's employed

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`

2.13 Actor's health

Current level of physical wellbeing

Type: Real

`psychsim/domains/groundtruth/actor.py:194`

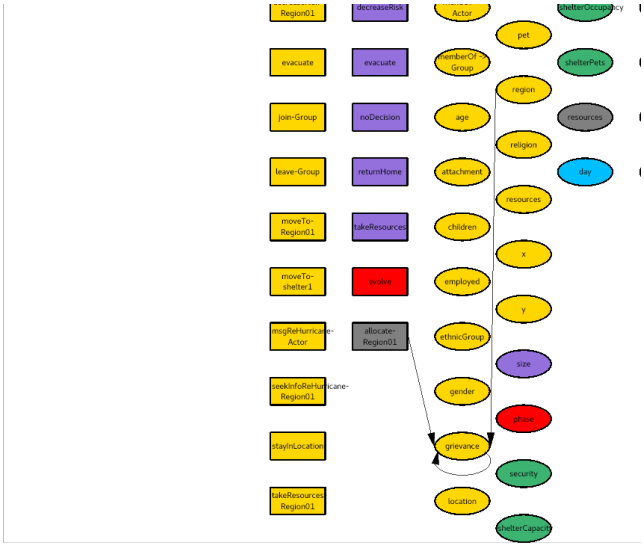

Figure 7: Ground Truth subgraph for Actor's grievance

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

2.14 Actor's location

Current location

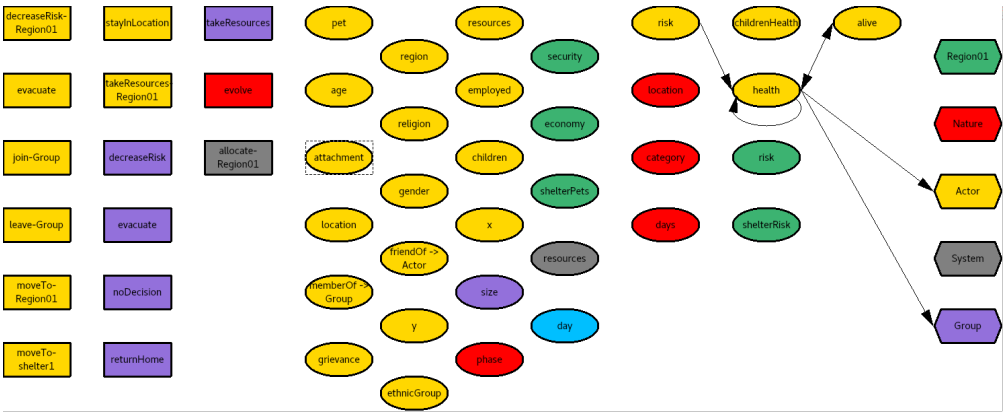

Figure 8: Ground Truth subgraph for Actor's health

Type: String

Values: **Region01**, **evacuated**, **shelter1**

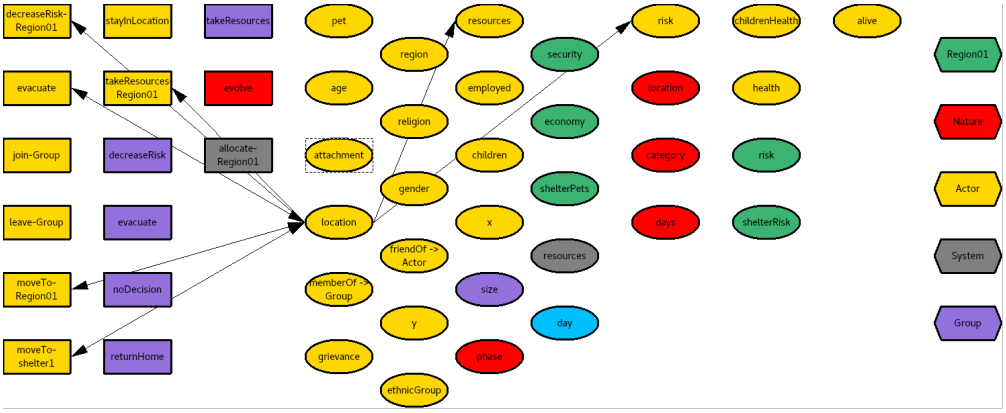

Figure 9: Ground Truth subgraph for Actor's location

`psychsim/domains/groundtruth/actor.py:187`

2.14.1 Effect of Actor-evacuate on Actor's location

`psychsim/domains/groundtruth/actor.py:399`
Actor's location′←evacuated

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

`psychsim/domains/groundtruth/actor.py:406`
Actor's location′←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

2.18 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

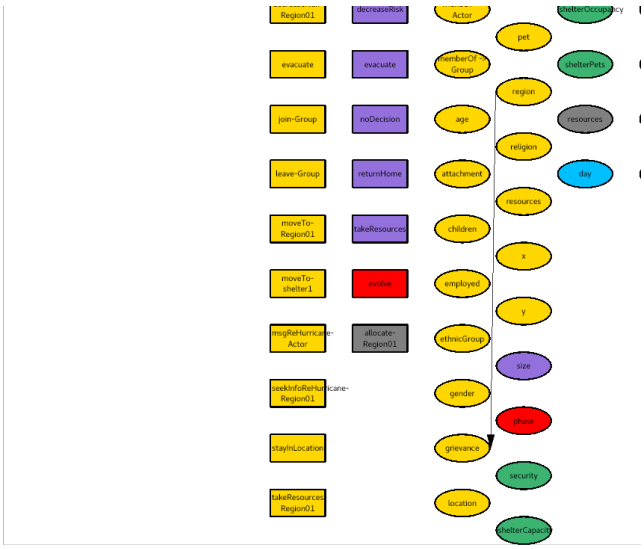

Figure 10: Ground Truth subgraph for Actor's region

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**$'\leftarrow 80\%\cdot$**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**$'\leftarrow 80\%\cdot$**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**

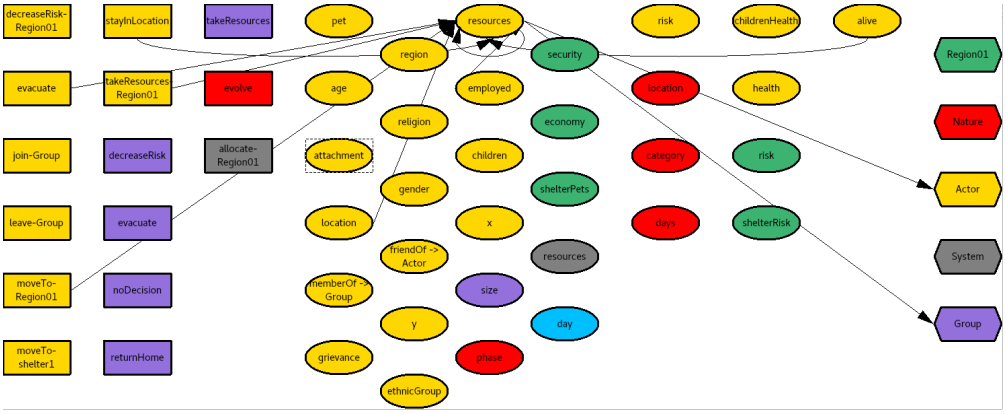

Figure 11: Ground Truth subgraph for Actor's resources

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

psychsim/domains/groundtruth/actor.py:544
Actor's resources′←80%·**Actor's resources**+0.20

2.22 Actor's risk

Current level of risk from hurricane

Type: Real

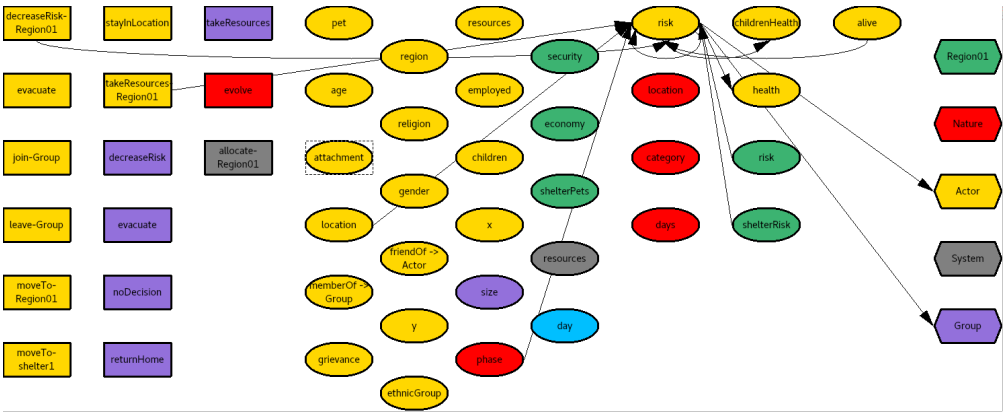

Figure 12: Ground Truth subgraph for Actor's risk

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′←80%·**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**′←19%·**Actor's risk**+0.80
ELSE : **Actor's risk**′←40%·**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**′←**Region01's shelterRisk**
ELSE : IF **Actor's location**′=**evacuated**
THEN : **Actor's risk**′←9%·**Actor's risk**
ELSE : **Actor's risk**′←**Region01's risk**
ELSE : **Actor's risk**′←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

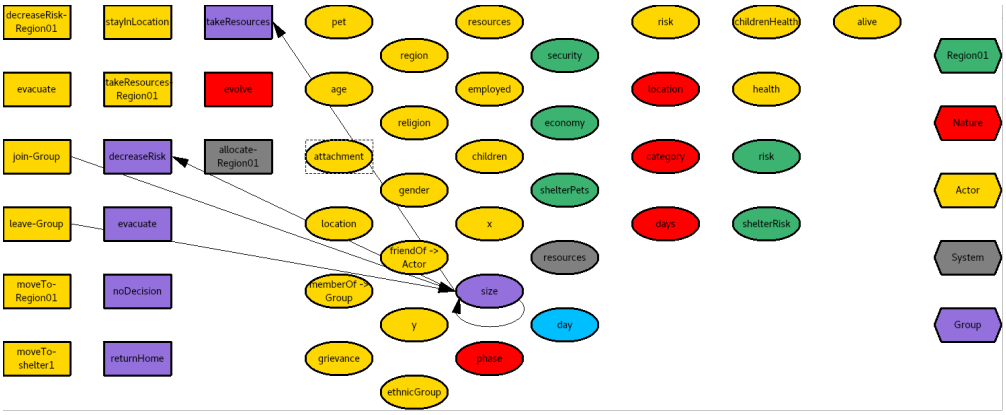

Figure 13: Ground Truth subgraph for Group's size

`psychsim/domains/groundtruth/group.py:24`

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

`psychsim/domains/groundtruth/group.py:113`
Group's size′←**Group's size**+1

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

`psychsim/domains/groundtruth/group.py:124`
Group's size′←**Group's size**−1

2.26 Nature's category

Type: Integer

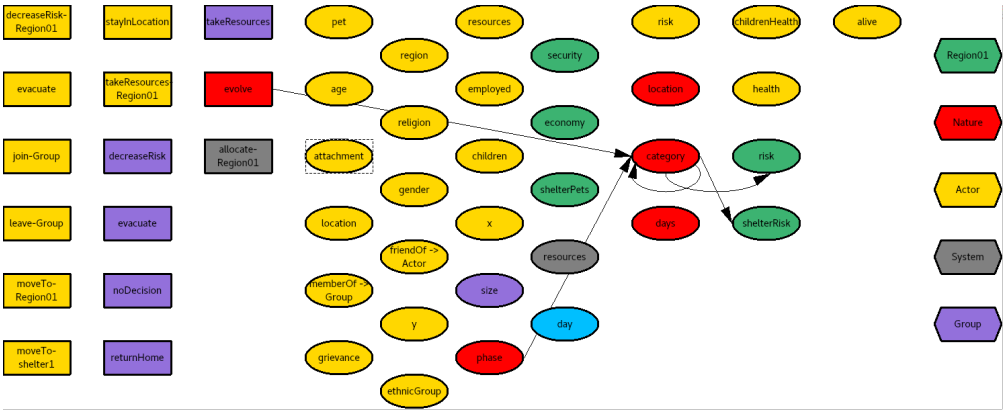

Figure 14: Ground Truth subgraph for Nature's category

`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

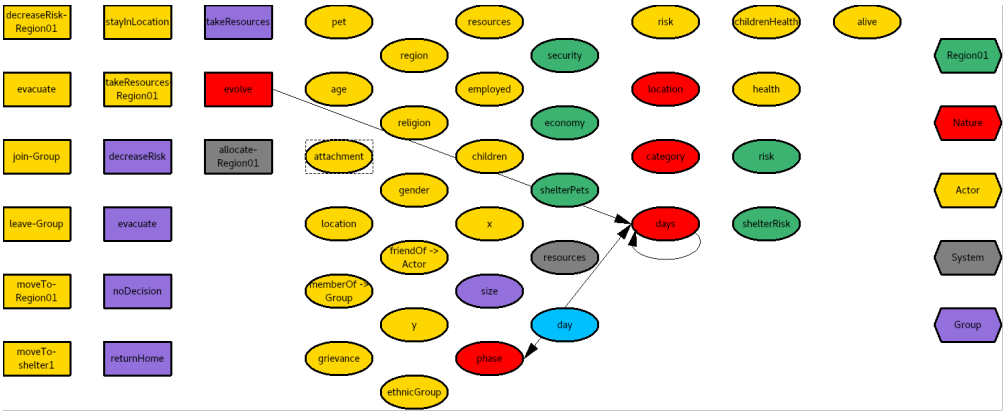

Figure 15: Ground Truth subgraph for Nature's days

`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**

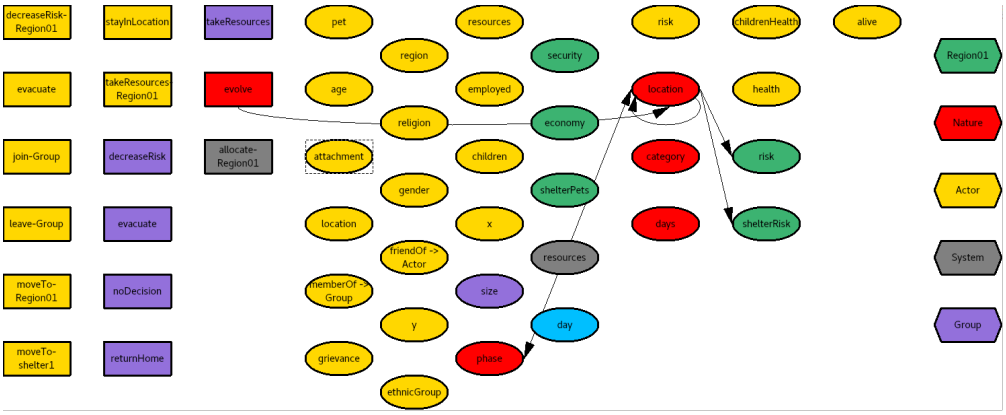

Figure 16: Ground Truth subgraph for Nature's location

`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**

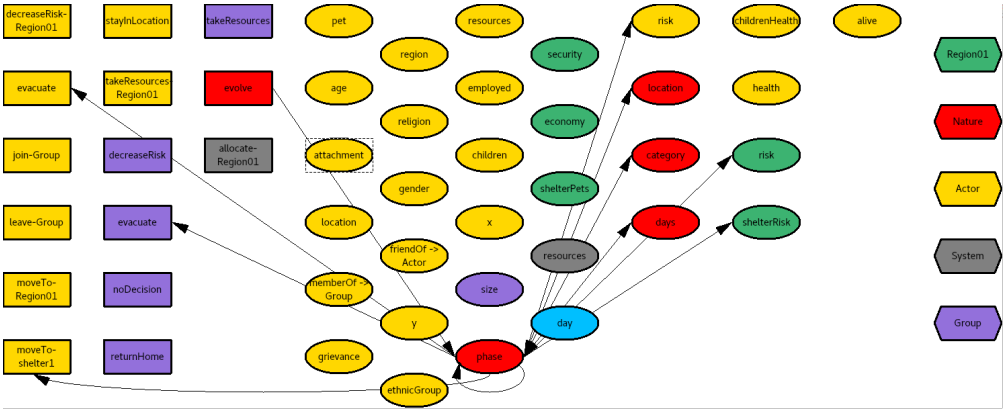

Figure 17: Ground Truth subgraph for Nature's phase

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

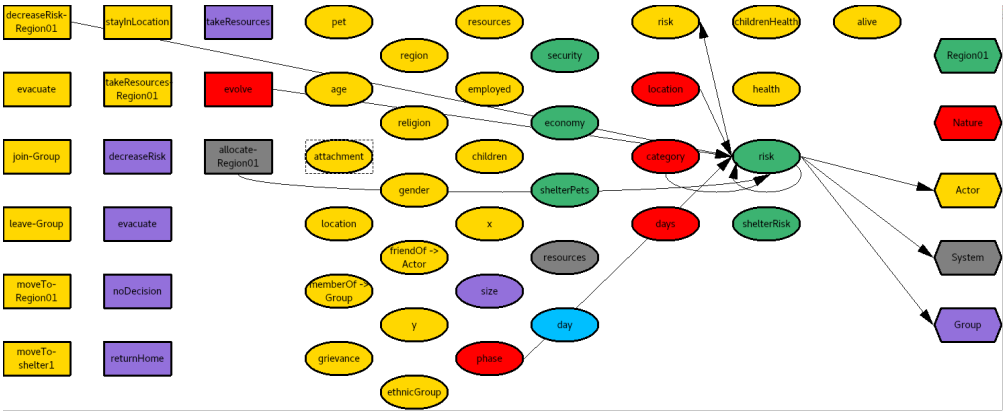

Figure 18: Ground Truth subgraph for Region01's risk

`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**′←80%·**Region01's risk**
= **Region01**: IF **Nature's category**
= **1**: **Region01's risk**′←80%·**Region01's risk**+0.20
= **2**: **Region01's risk**′←60%·**Region01's risk**+0.40
= **3**: **Region01's risk**′←39%·**Region01's risk**+0.60
= **4**: **Region01's risk**′←19%·**Region01's risk**+0.80
= **5**: **Region01's risk**′←0%·**Region01's risk**+1.00
ELSE : **Region01's risk**′←80%·**Region01's risk**

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

`psychsim/domains/groundtruth/system.py:43`
Region01's risk′←80%·**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

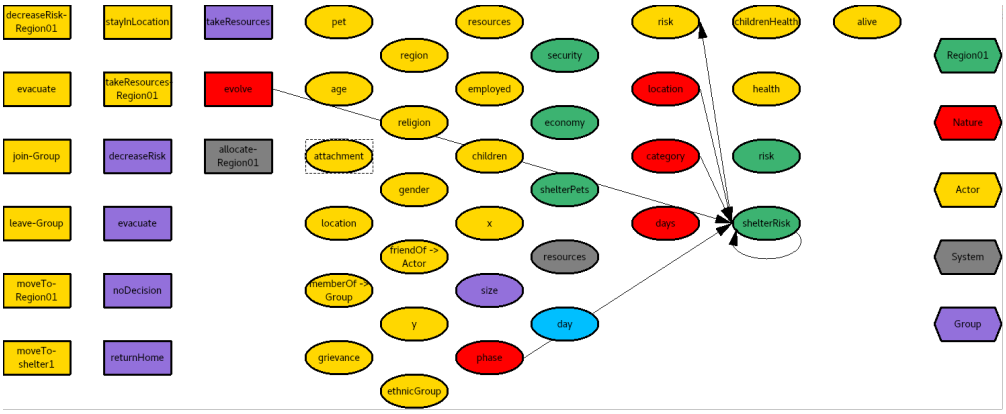

Figure 19: Ground Truth subgraph for Region01's shelterRisk

`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`

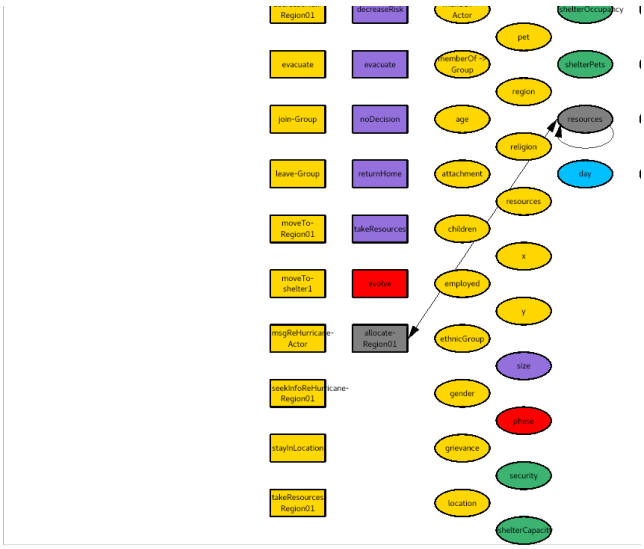

Figure 20: Ground Truth subgraph for System's resources

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

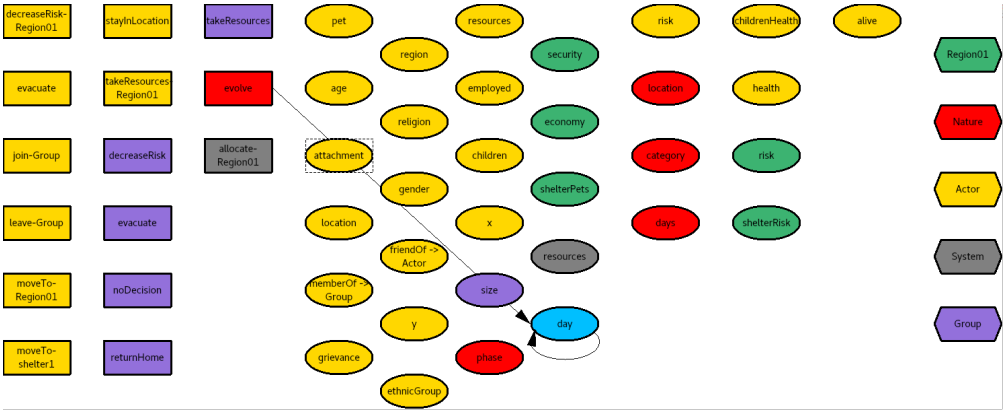

Figure 21: Ground Truth subgraph for day

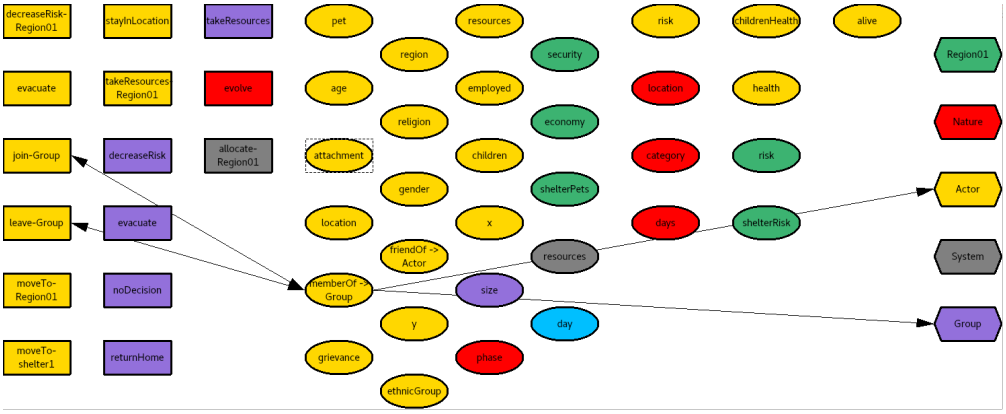

Figure 22: Ground Truth subgraph for Actor memberOf -> Group

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**$=1$

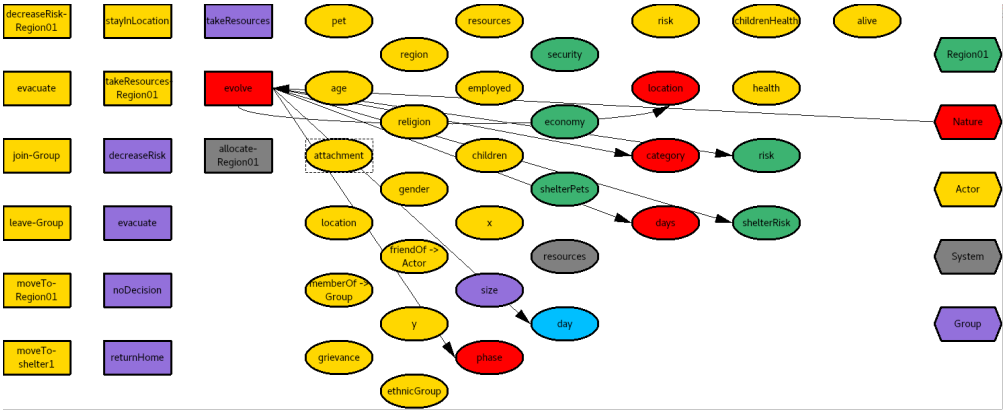

Figure 23: Ground Truth subgraph for Nature-evolve

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

4.1.2 Effect on Nature's days of Nature evolve

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

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**$'$←**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**

4.1.5 Effect on Region01's risk of Nature evolve

IF **Nature's phase**′=**active**
THEN : IF **Nature's location**′
OTHERWISE : **Region01's risk**′←80%·**Region01's risk**
= **Region01**: IF **Nature's category**
= **1**: **Region01's risk**′←80%·**Region01's risk**+0.20
= **2**: **Region01's risk**′←60%·**Region01's risk**+0.40
= **3**: **Region01's risk**′←39%·**Region01's risk**+0.60
= **4**: **Region01's risk**′←19%·**Region01's risk**+0.80
= **5**: **Region01's risk**′←0%·**Region01's risk**+1.00
ELSE : **Region01's risk**′←80%·**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**: **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**

4.1.7 Effect on day of Nature evolve

day′←**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**

4.2.2 Effect on Actor's risk of Actor decreaseRisk Region01

Actor's risk′←80%·**Actor's risk**+0.20

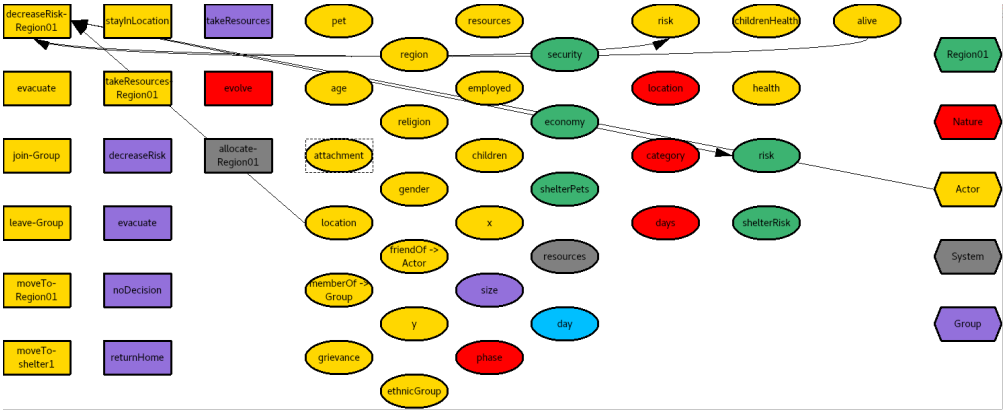

Figure 24: Ground Truth subgraph for Actor-decreaseRisk-Region01

4.2.3 Effect on Region01's risk of Actor decreaseRisk Region01

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

4.3 Actor evacuate

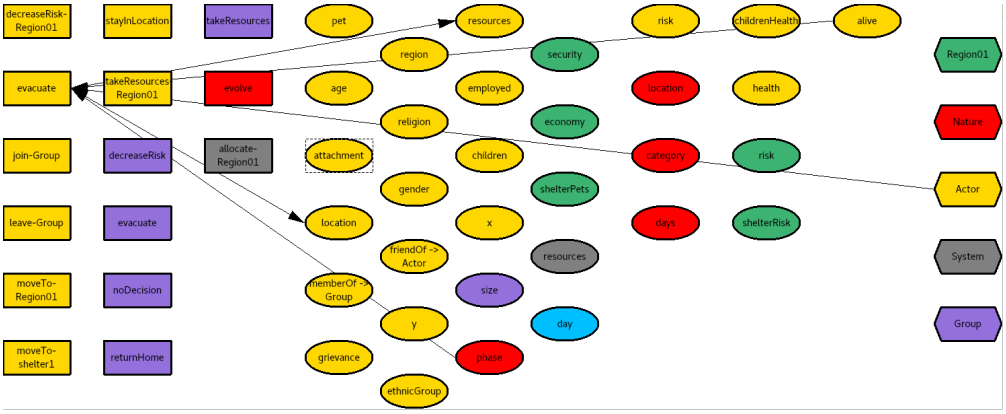

Figure 25: Ground Truth subgraph for Actor-evacuate

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**$'\leftarrow$**Actor's resources**-0.20
ELSE : **Actor's resources**$'\leftarrow 0.00$

4.4 Actor join Group

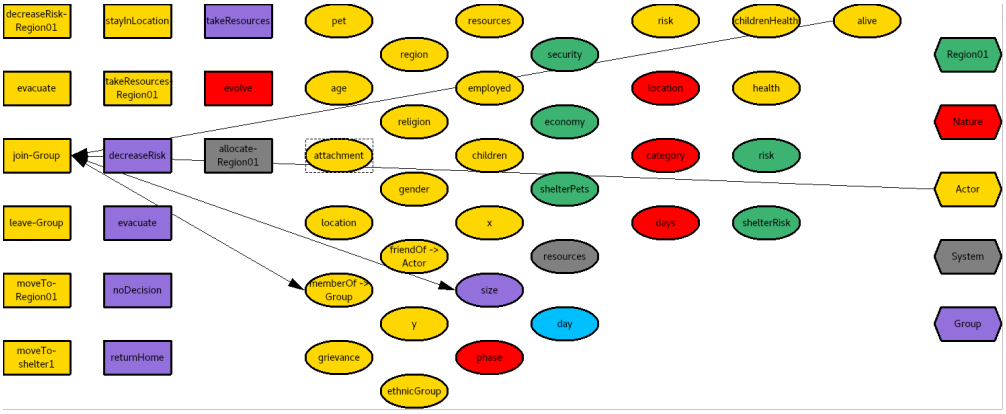

Figure 26: Ground Truth subgraph for Actor-join-Group

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**

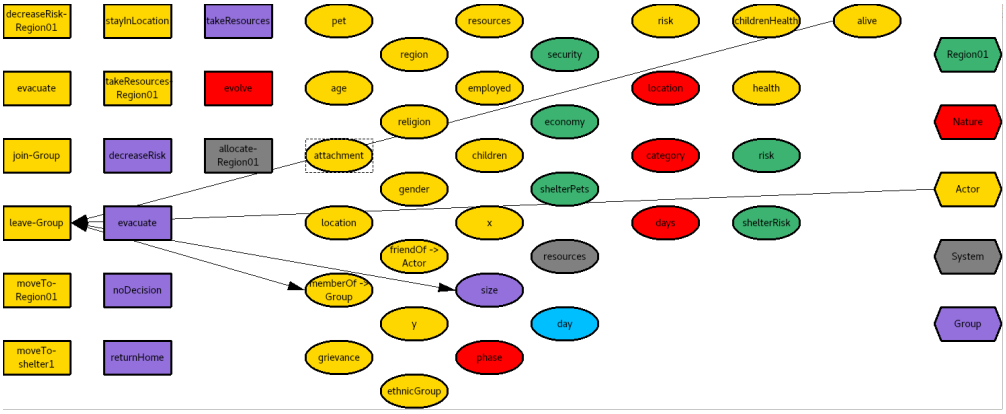

Figure 27: Ground Truth subgraph for Actor-leave-Group

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

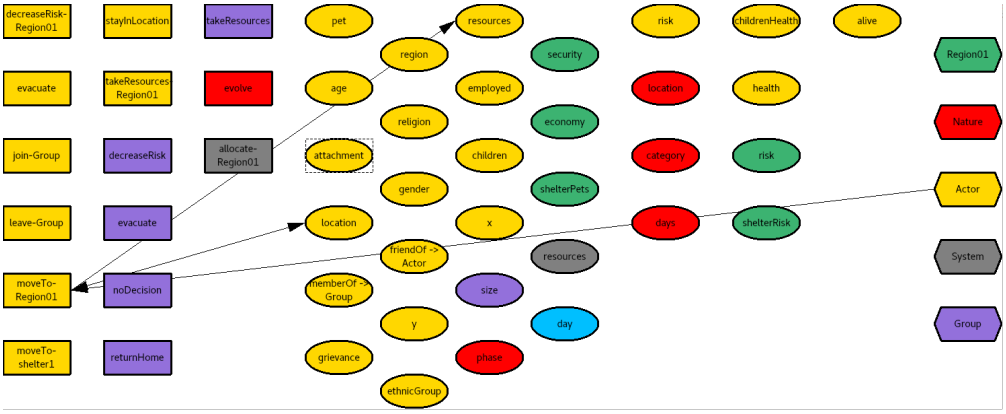

Figure 28: Ground Truth subgraph for Actor-moveTo-Region01

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**$'\leftarrow 80\% \cdot$**Actor's resources**$+0.20$

ELSE : **Actor's resources′←Actor's resources**
ELSE : **Actor's resources′←Actor's resources**

4.7 Actor moveTo shelter1

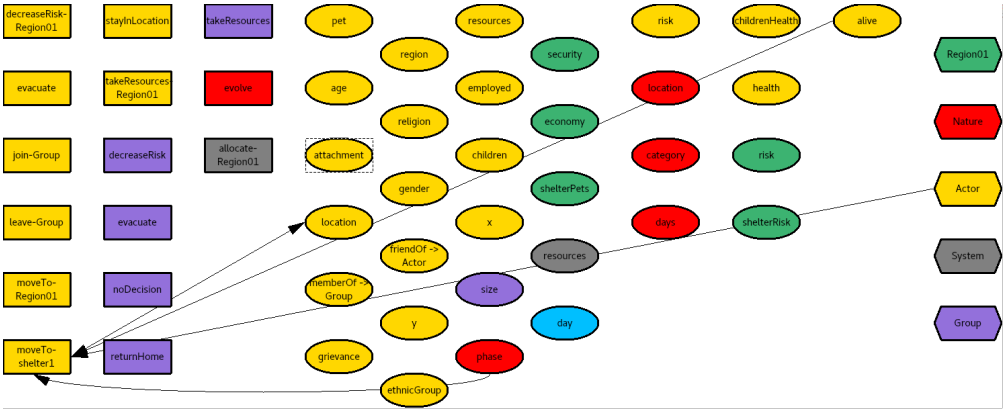

Figure 29: Ground Truth subgraph for Actor-moveTo-shelter1

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

4.8 Actor stayInLocation

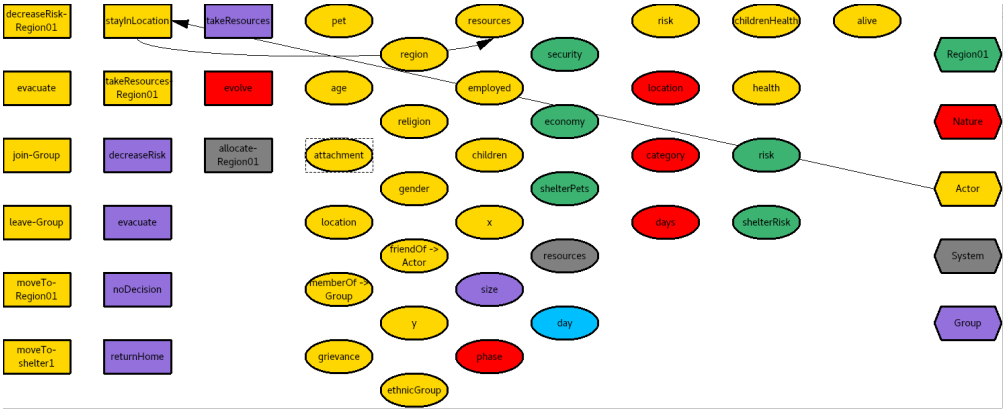

Figure 30: Ground Truth subgraph for Actor-stayInLocation

4.8.1 Effect on Actor's resources of Actor stayInLocation

IF **Actor's alive**
THEN : IF **Actor's employed**
THEN : IF **Actor's location**={**'evacuated', 'Region01'**}
THEN : **Actor's resources**′←80%·**Actor's resources**+0.20
ELSE : **Actor's resources**′←**Actor's resources**
ELSE : **Actor's resources**′←**Actor's resources**
ELSE : **Actor's resources**′←**Actor's resources**

4.9 Actor takeResources Region01

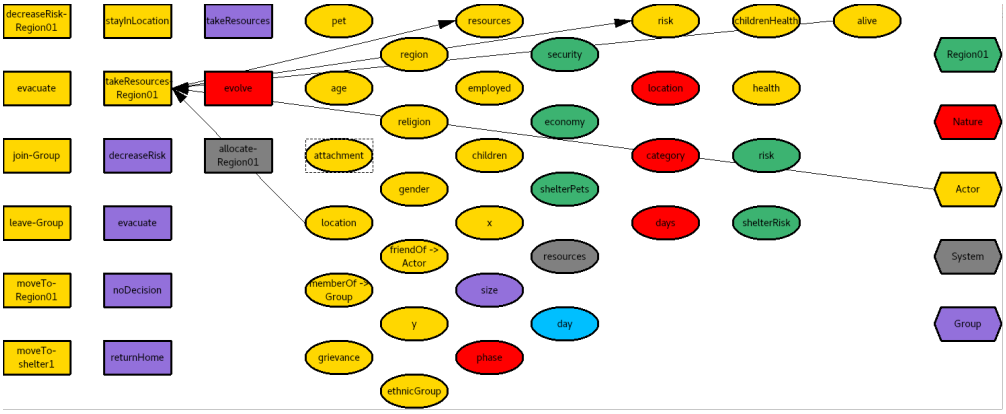

Figure 31: Ground Truth subgraph for Actor-takeResources-Region01

4.9.1 Applicability of Actor takeResources Region01

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

4.9.2 Effect on Actor's resources of Actor takeResources Region01

Actor's resources′←80%·**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**′←19%·**Actor's risk**+0.80
ELSE : **Actor's risk**′←40%·**Actor's risk**+0.60

4.10 System allocate Region01

4.10.1 Effect on Region01's risk of System allocate Region01

Region01's risk′←80%·**Region01's risk**

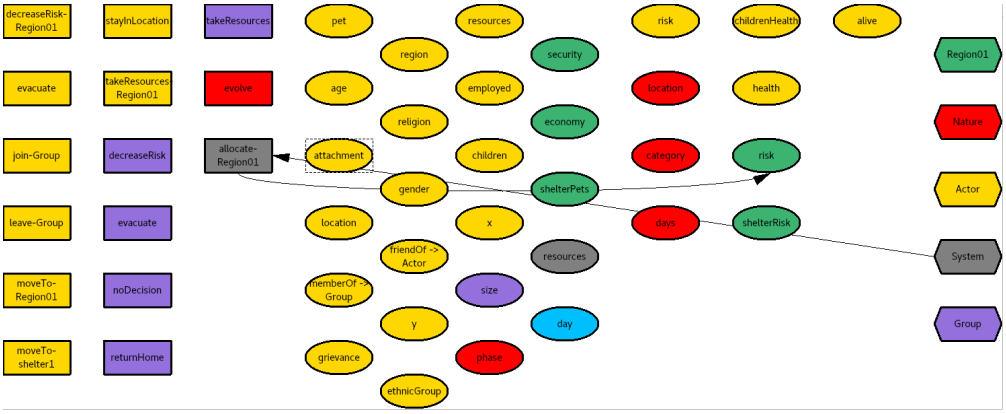

Figure 32: Ground Truth subgraph for System-allocate-Region01

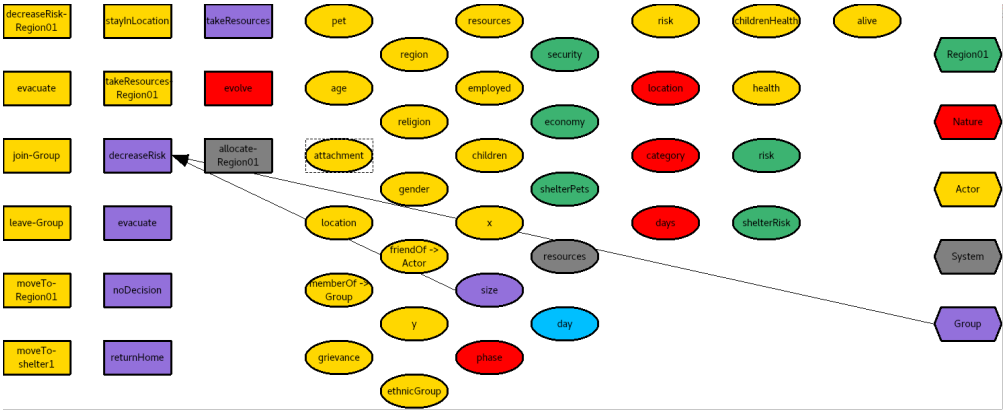

Figure 33: Ground Truth subgraph for Group-decreaseRisk

4.11 Group decreaseRisk

4.11.1 Applicability of Group decreaseRisk

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

4.12 Group evacuate

4.12.1 Applicability of Group evacuate

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

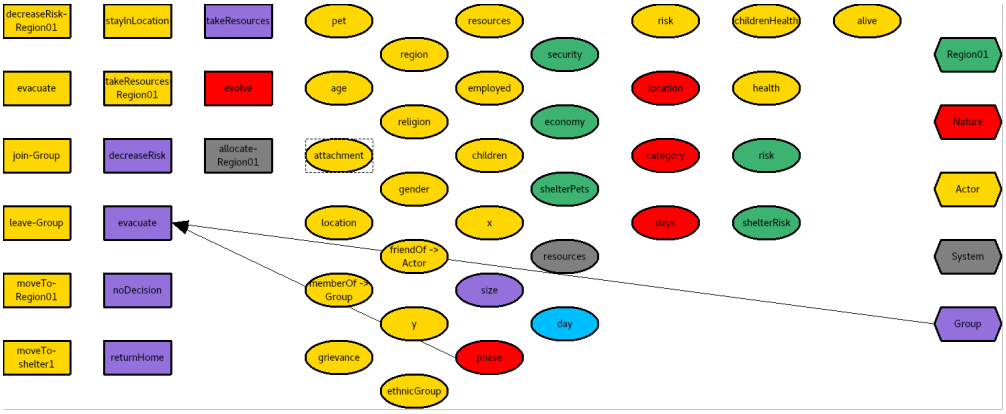

Figure 34: Ground Truth subgraph for Group-evacuate

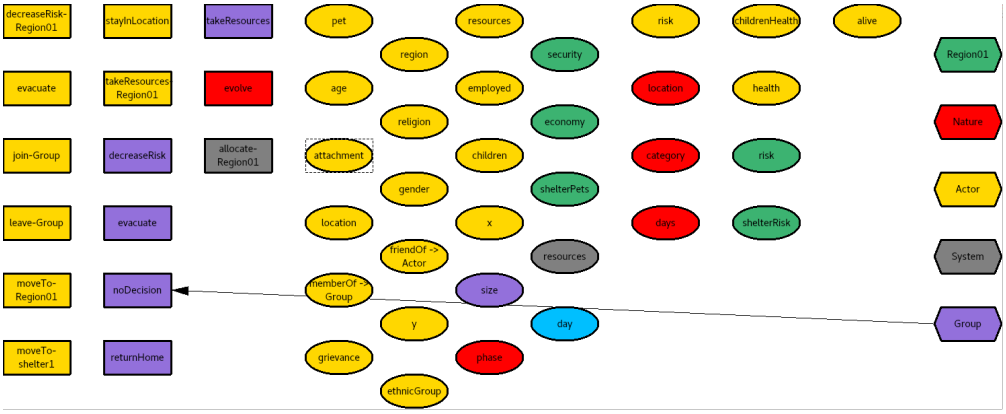

Figure 35: Ground Truth subgraph for Group-noDecision

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←20%·**Actor memberOf Group**+40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**
ELSE : IF **Actor's attachment**=**avoidant**
THEN : R←-20%·**Actor memberOf Group**+40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

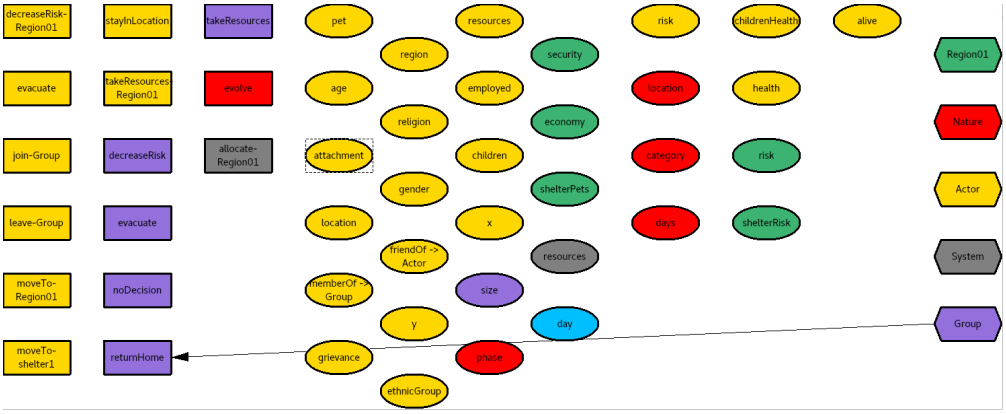

Figure 36: Ground Truth subgraph for Group-returnHome

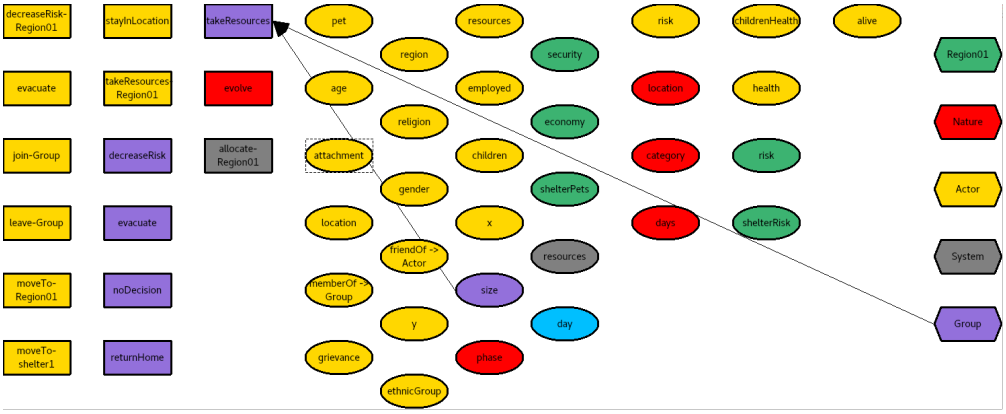

Figure 37: Ground Truth subgraph for Group-takeResources

ELSE : R←40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

ELSE : R←40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

5.2 Group's Reward

IF **Actor's risk**>0.60

THEN : IF **Actor's attachment**=**anxious**

THEN : R←20%·**Actor memberOf Group**+40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

ELSE : IF **Actor's attachment**=**avoidant**

THEN : R←-20%·**Actor memberOf Group**+40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

ELSE : R←40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

ELSE : R←40%·**Actor's childrenHealth**+60%·**Actor's health**+20%·**Actor's resources**+-60%·**Region01's risk**

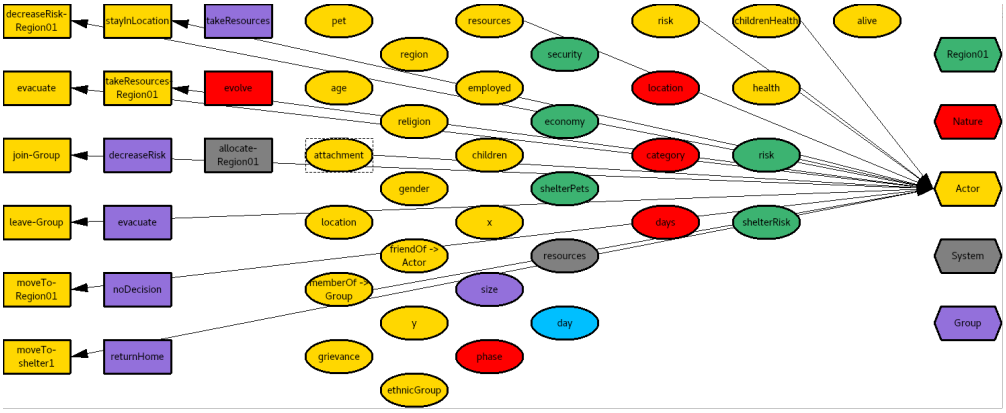

Figure 38: Ground Truth subgraph for Actor

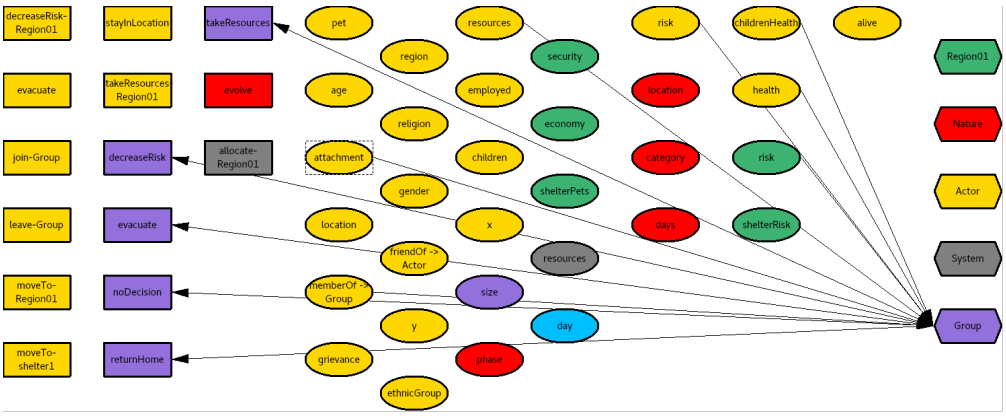

Figure 39: Ground Truth subgraph for Group