USC Ground Truth

October 25, 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:

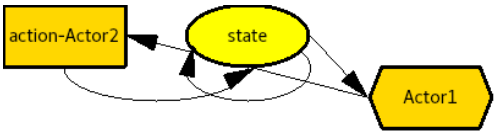


Figure 1: Simple influence diagram

- 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

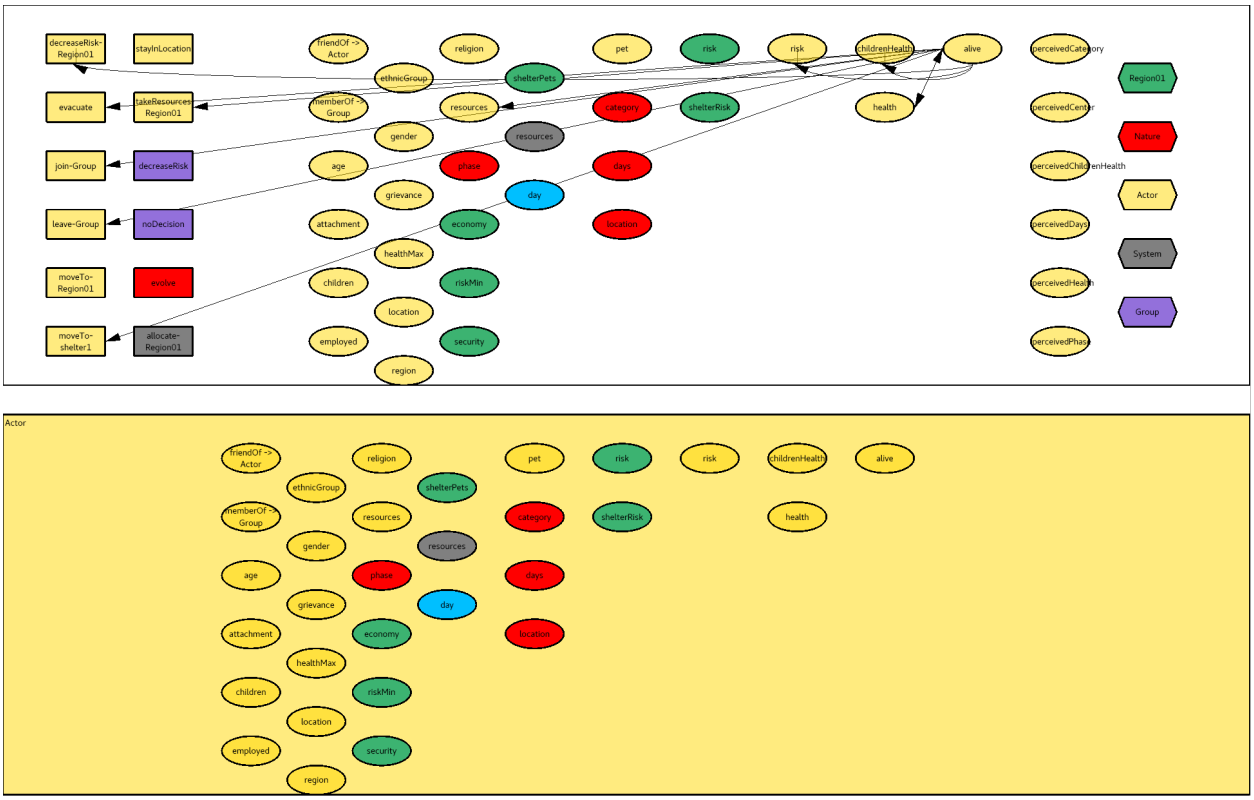
2.1 Actor's age

Type: Integer

`psychsim/domains/groundtruth/simulation/actor.py:80`

2.2 Actor's alive

Type: Boolean



psychsim/domains/groundtruth/simulation/actor.py:205

2.2.1 Default change in Actor's alive

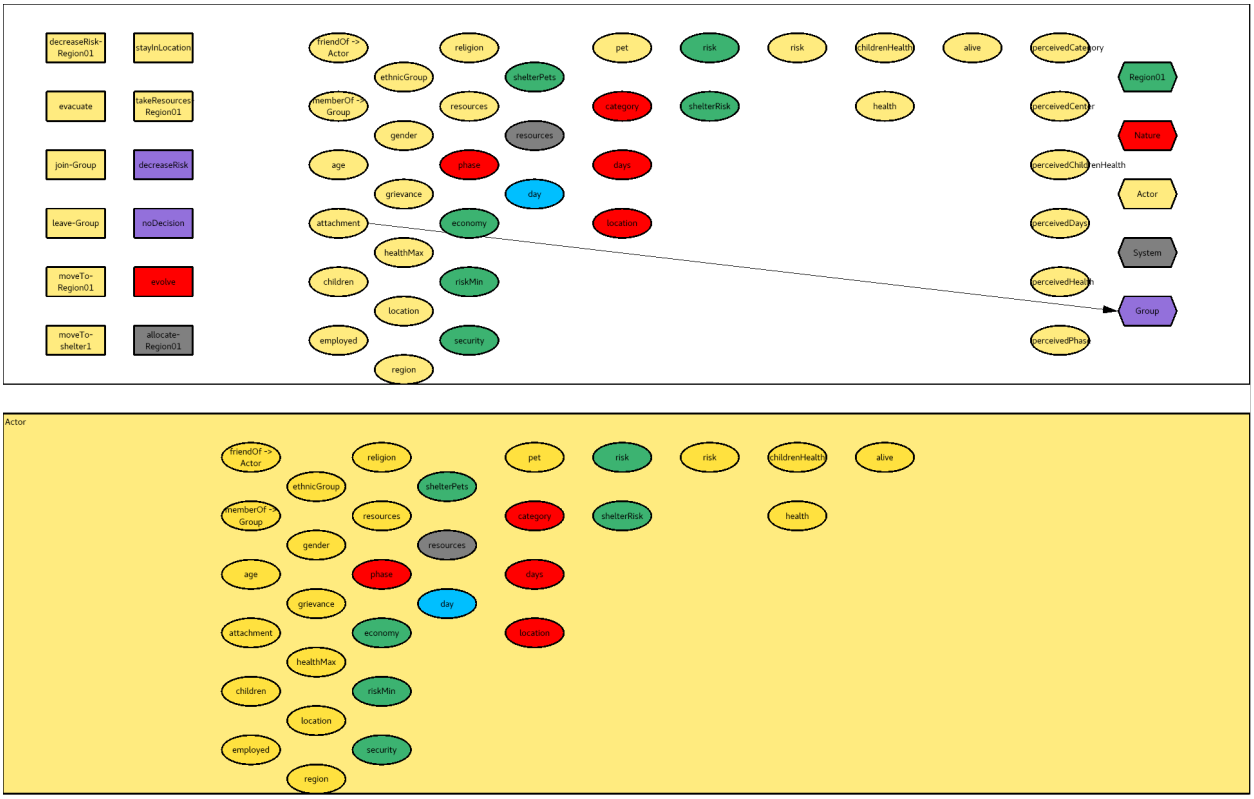
psychsim/domains/groundtruth/simulation/actor.py:491
IF **Actor's alive**
THEN : IF **Actor's health**$'$>0.01
THEN : **Actor's alive**$'$←**true**
ELSE : **Actor's alive**$'$←**false**
ELSE : **Actor's alive**$'$←**Actor's alive**

2.3 Actor's attachment

Attachment style

Type: String

Values: **anxious**, **avoidant**, **secure**

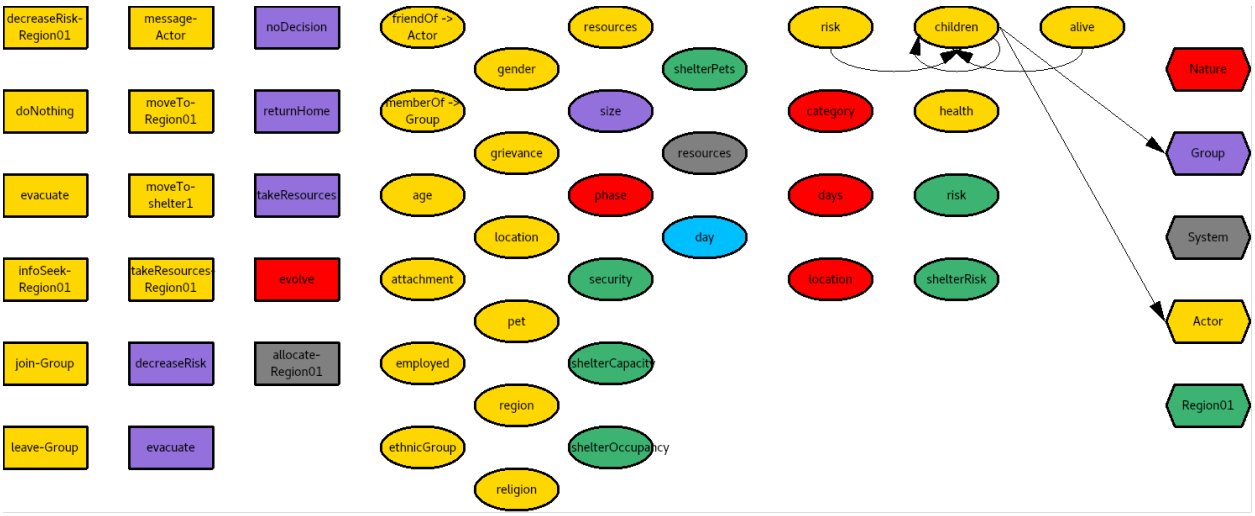


psychsim/domains/groundtruth/simulation/actor.py:115

2.4 Actor's children

Number of children

Type: Real

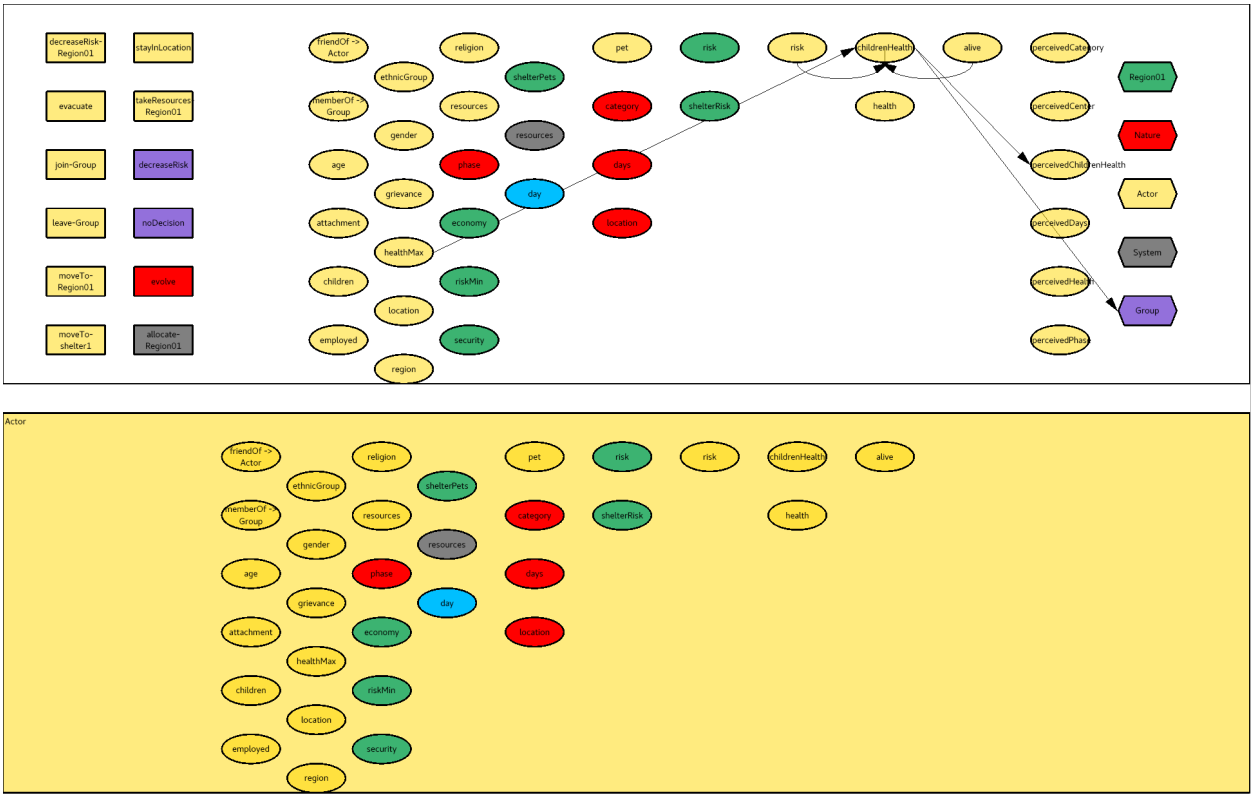


psychsim/domains/groundtruth/simulation/actor.py:89

2.5 Actor's childrenHealth

Current level of children's physical wellbeing

Type: Real



psychsim/domains/groundtruth/simulation/actor.py:230

2.5.1 Effect of Actor on Actor's childrenHealth

psychsim/domains/groundtruth/simulation/actor.py:480

IF **Actor's alive**

THEN : IF **Actor's risk**′∈

[0,0.2]: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**

(0.2,0.4]:

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

80%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**

(0.4,0.6]:

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

60%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**

(0.6,0.8]:

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

40%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**

(0.8,1.0]:

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

19%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**

(1.0,1]:

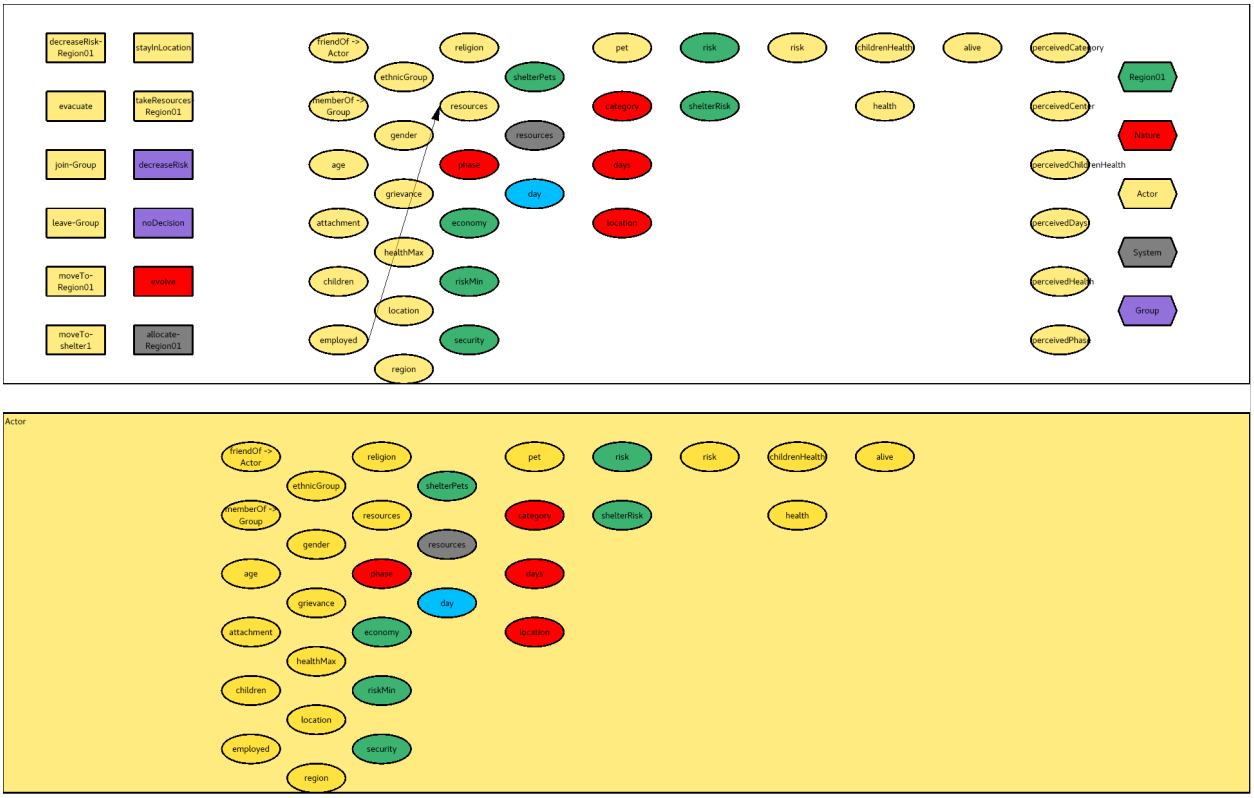
100%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**

0%: **Actor's childrenHealth**′←60%·**Actor's childrenHealth**+40%·**Actor's healthMax**
ELSE : **Actor's childrenHealth**′←0.00

2.6 Actor's employed

Has a full-time job

Type: Boolean



psychsim/domains/groundtruth/simulation/actor.py:97

2.7 Actor's ethnicGroup

Ethnicity of actor

Type: String

Values: **majority**, **minority**

psychsim/domains/groundtruth/simulation/actor.py:53

2.8 Actor's gender

Type: String

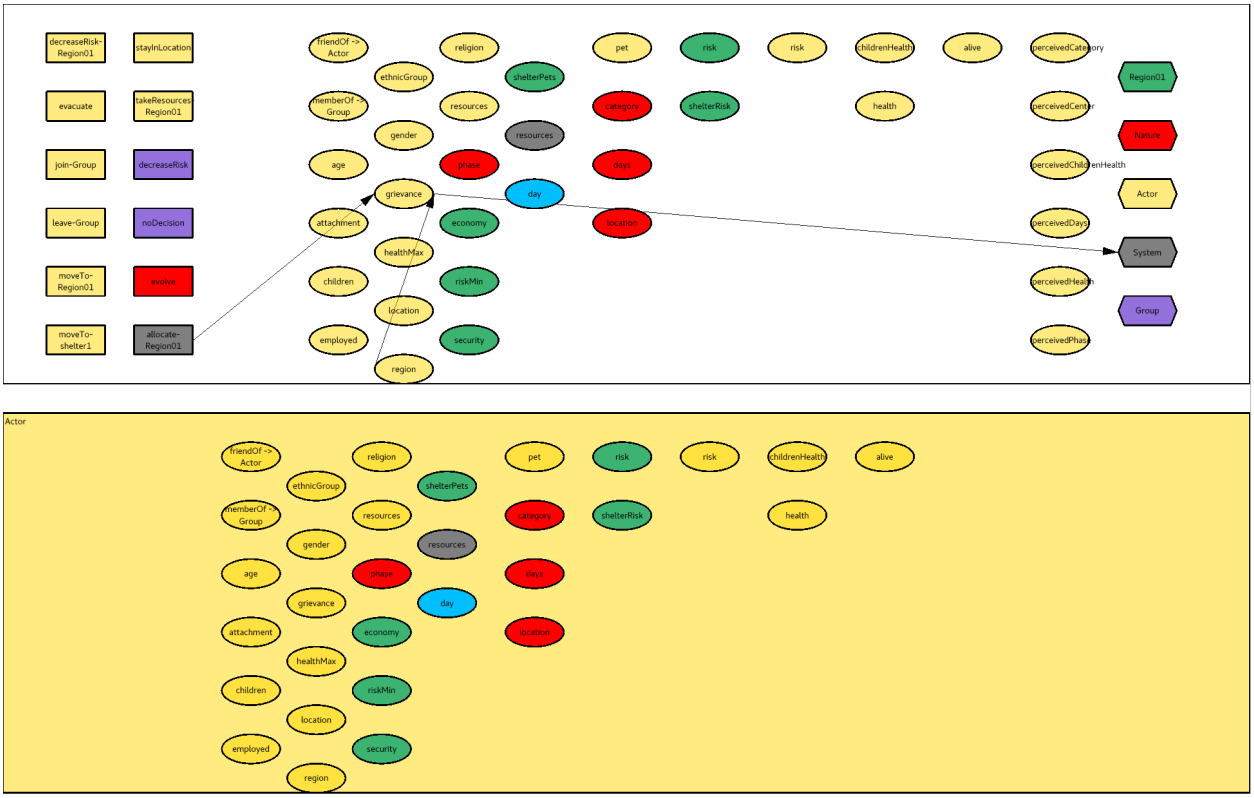
Values: **female**, **male**

psychsim/domains/groundtruth/simulation/actor.py:72

2.9 Actor's grievance

Current level of grievance felt toward system

Type: Real



`psychsim/domains/groundtruth/simulation/actor.py:266`

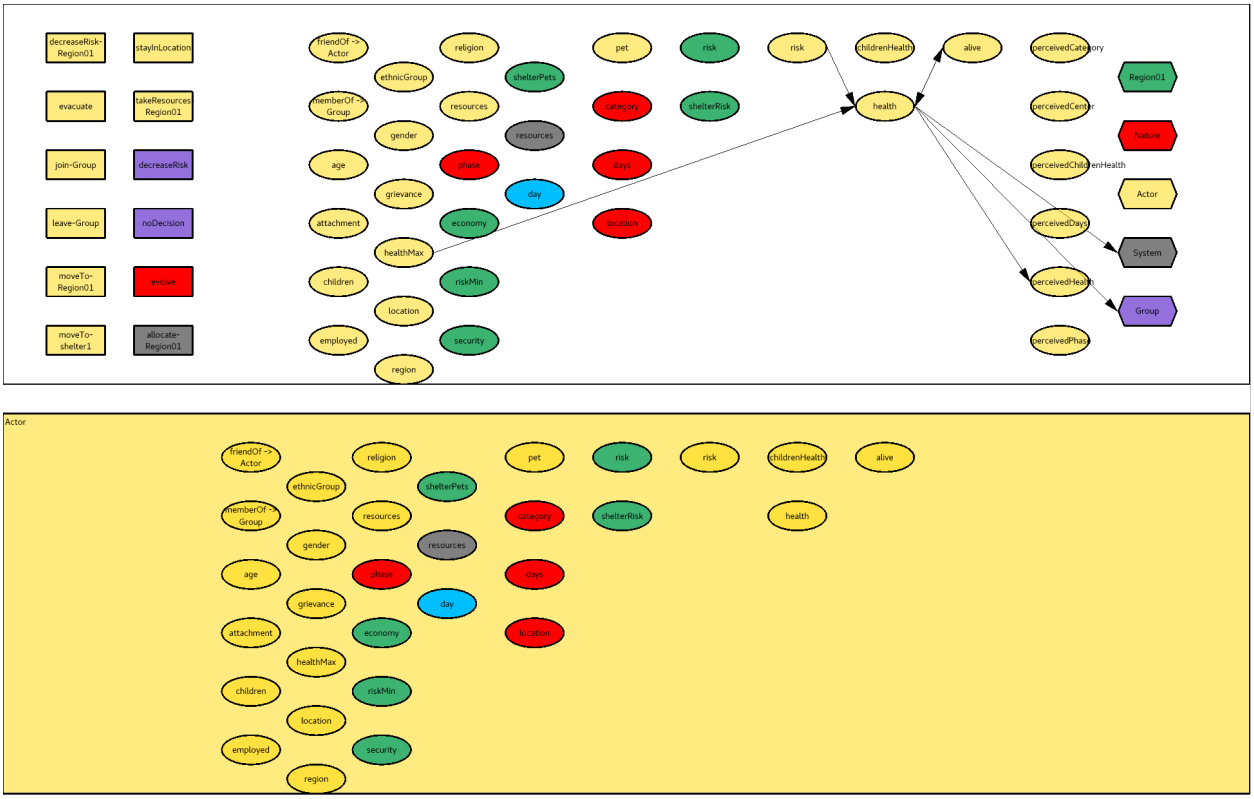
2.9.1 Effect of System-allocate-Region01 on Actor's grievance

`psychsim/domains/groundtruth/simulation/system.py:53`
IF **Actor's region**=**Region01**
THEN : **Actor's grievance**′←80%·**Actor's grievance**
ELSE : **Actor's grievance**′←80%·**Actor's grievance**+0.20

2.10 Actor's health

Current level of physical wellbeing

Type: Real



`psychsim/domains/groundtruth/simulation/actor.py:209`

2.10.1 Effect of Actor on Actor's health

`psychsim/domains/groundtruth/simulation/actor.py:464`

IF **Actor's alive**

THEN : IF **Actor's risk**′∈

[0,0.2]: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

(0.2,0.4]:

20%: **Actor's health**′←60%·**Actor's health**

80%: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

(0.4,0.6]:

40%: **Actor's health**′←60%·**Actor's health**

60%: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

(0.6,0.8]:

60%: **Actor's health**′←60%·**Actor's health**

40%: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

(0.8,1.0]:

80%: **Actor's health**′←60%·**Actor's health**

19%: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

(1.0,1]:

100%: **Actor's health**′←60%·**Actor's health**

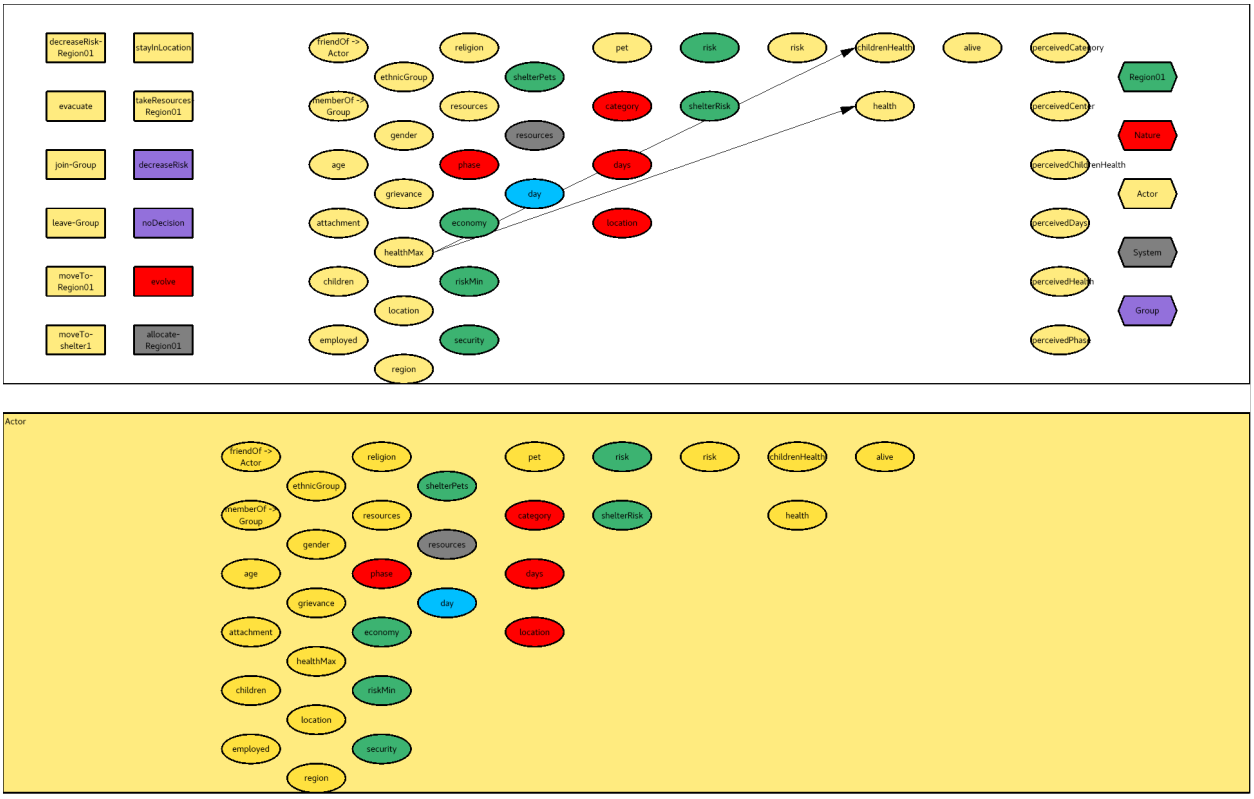
0%: **Actor's health**′←60%·**Actor's health**+40%·**Actor's healthMax**

ELSE : **Actor's health**′←0.00

2.11 Actor's healthMax

Maximum level of physical wellbeing

Type: Real



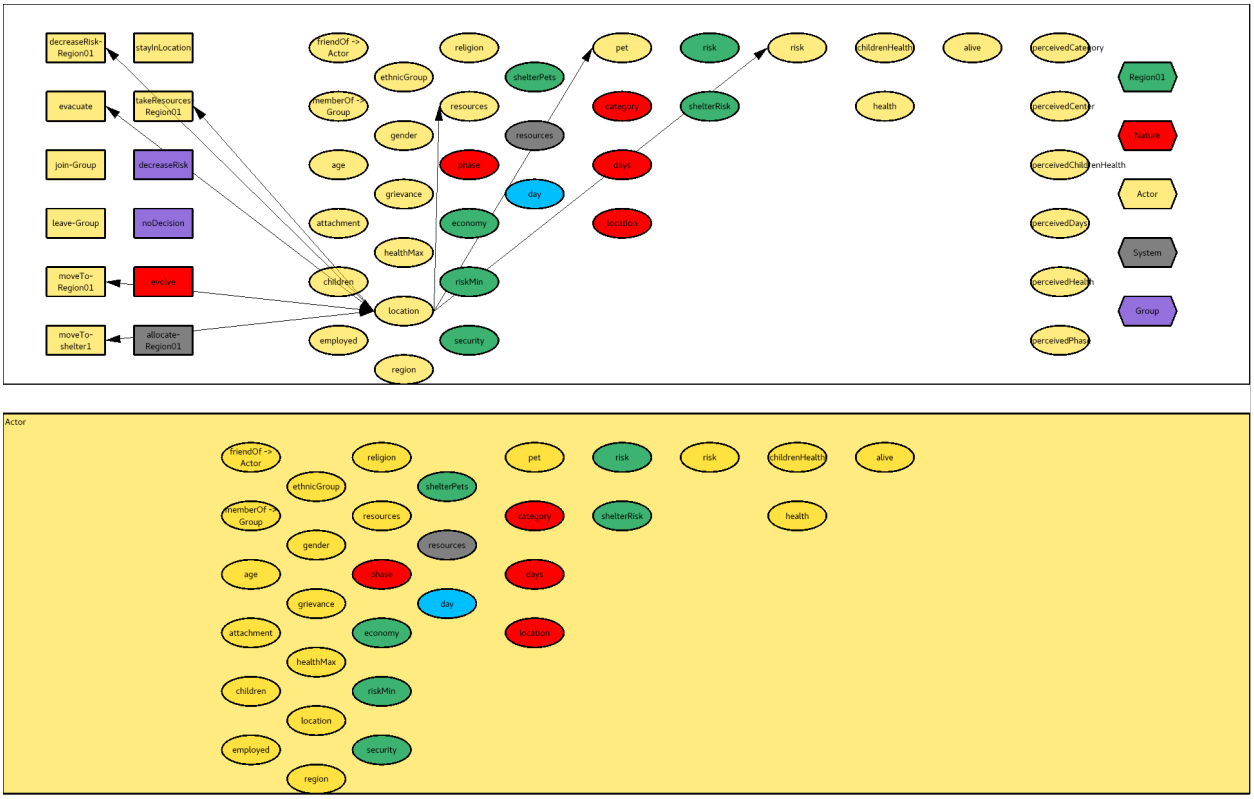
`psychsim/domains/groundtruth/simulation/actor.py:224`

2.12 Actor's location

Current location

Type: String

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



psychsim/domains/groundtruth/simulation/actor.py:202

2.12.1 Effect of Actor-evacuate on Actor's location

psychsim/domains/groundtruth/simulation/actor.py:420
Actor's location′←evacuated

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

psychsim/domains/groundtruth/simulation/actor.py:427
Actor's location′←Region01

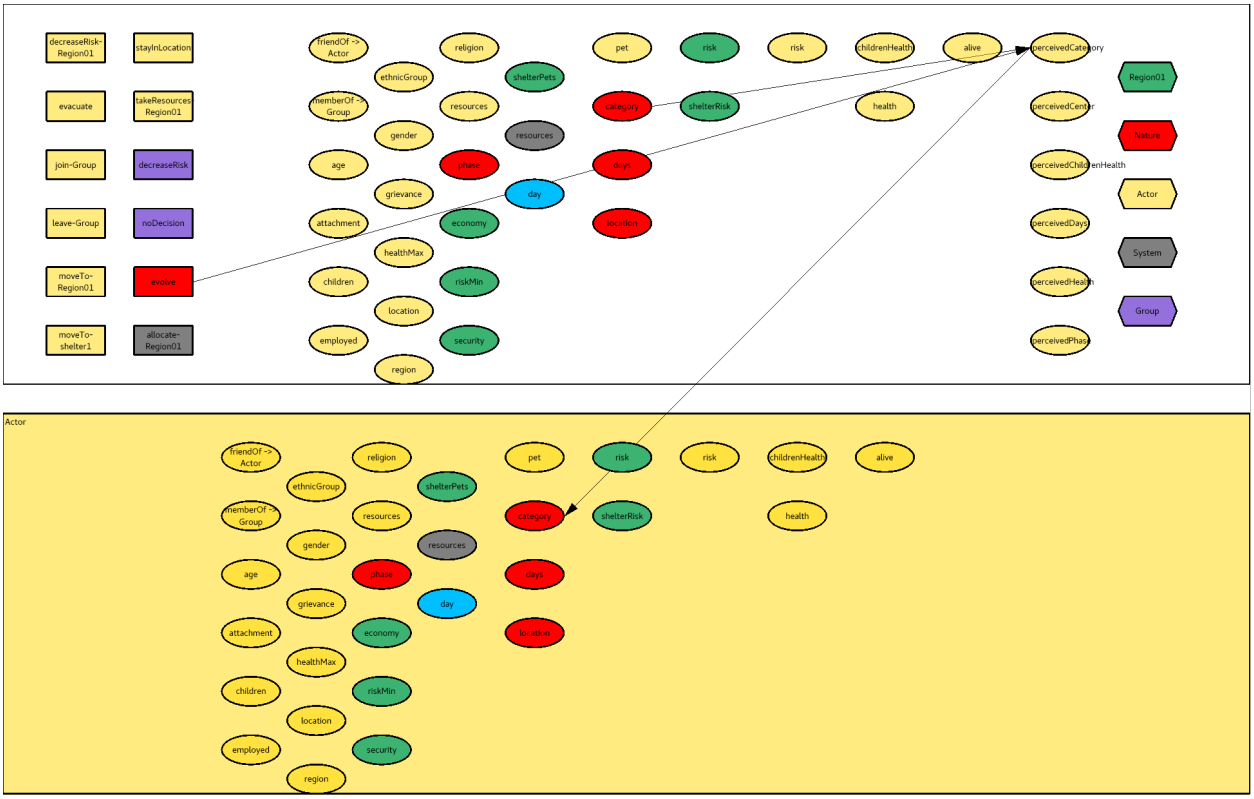
2.12.3 Effect of Actor-moveTo-shelter1 on Actor's location

psychsim/domains/groundtruth/simulation/actor.py:417
Actor's location′←shelter1

2.13 Actor's perceivedCategory

Perception of Nature's category

Type: Integer



psychsim/domains/groundtruth/simulation/actor.py:683

2.13.1 Observation function of Actor's perceivedCategory when Nature-evolve

Actor's perceivedCategory$'$←Nature's category

2.13.2 Default observation of Actor's perceivedCategory

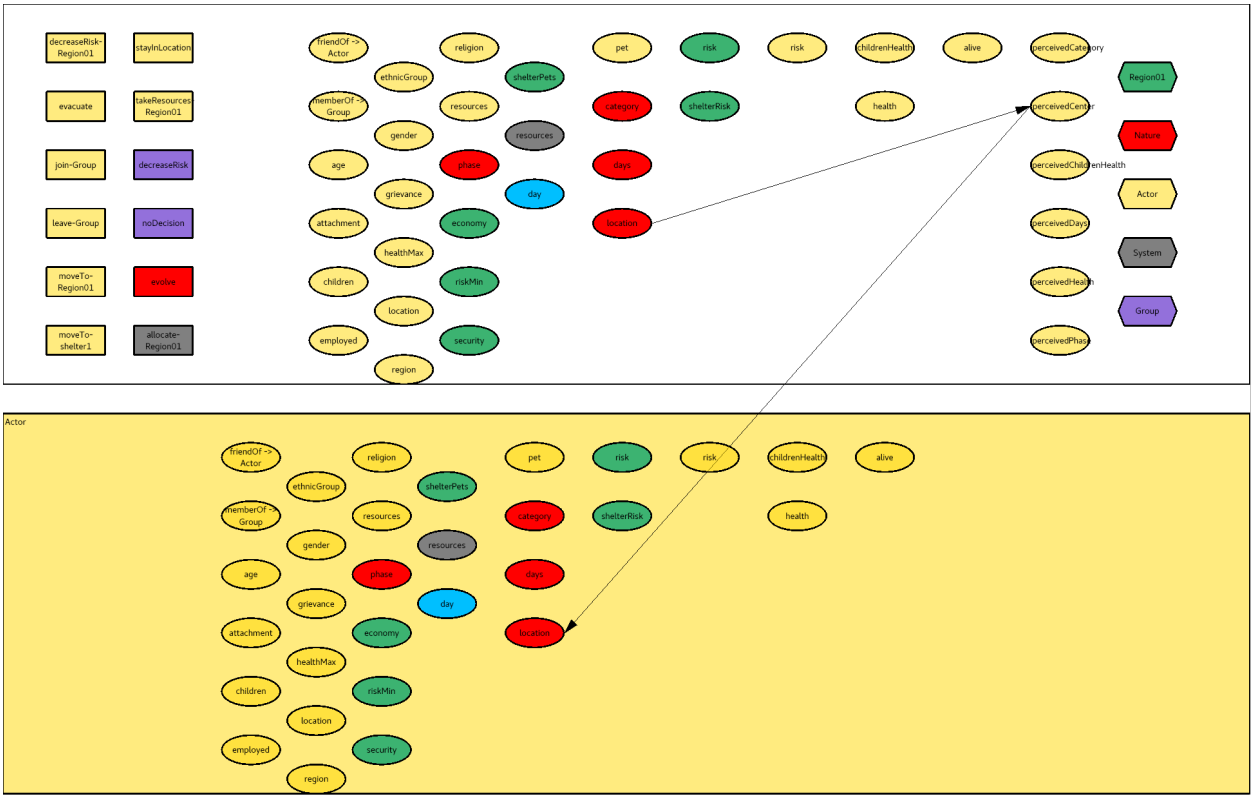
Actor's perceivedCategory$'$←0

2.14 Actor's perceivedCenter

Perception of Nature's location

Type: String

Values: Region01, none



`psychsim/domains/groundtruth/simulation/actor.py:677`

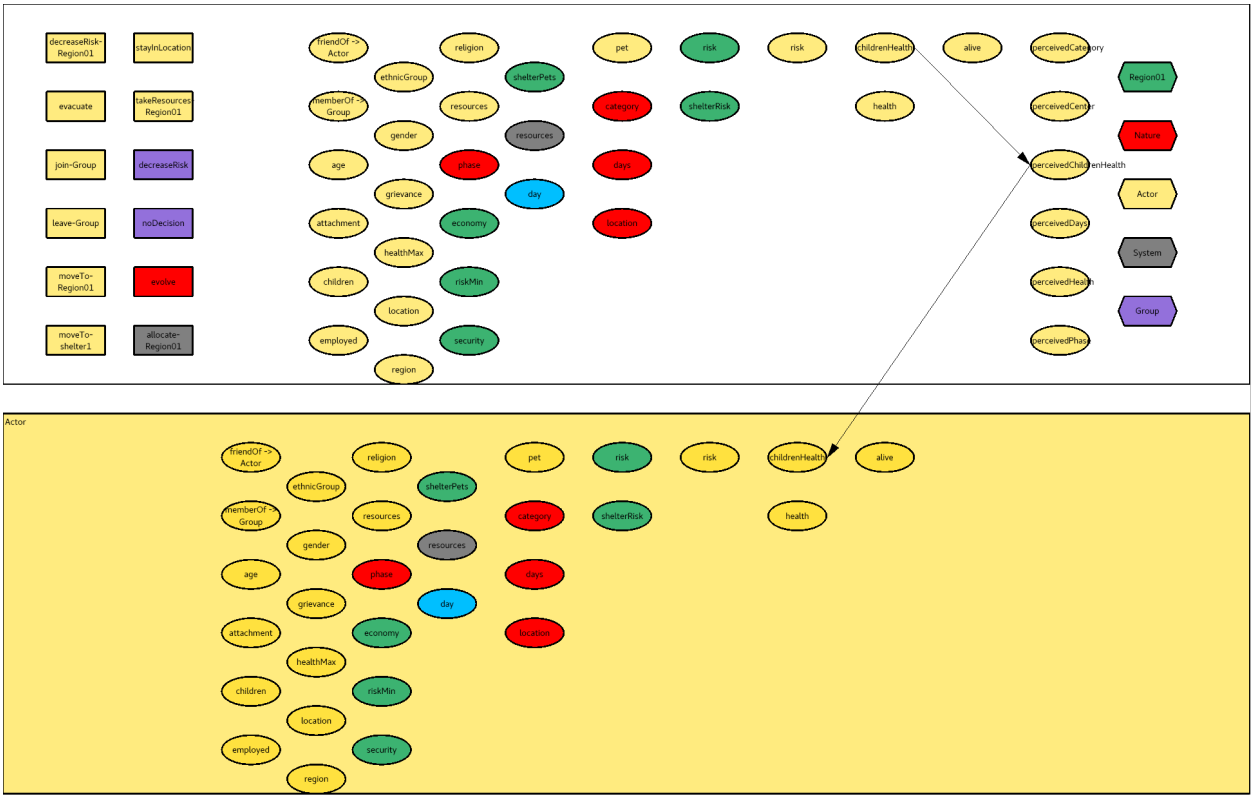
2.14.1 Default observation of Actor's perceivedCenter

Actor's perceivedCenter′←Nature's location

2.15 Actor's perceivedChildrenHealth

Perception of Actor's childrenHealth

Type: Real



psychsim/domains/groundtruth/simulation/actor.py:716

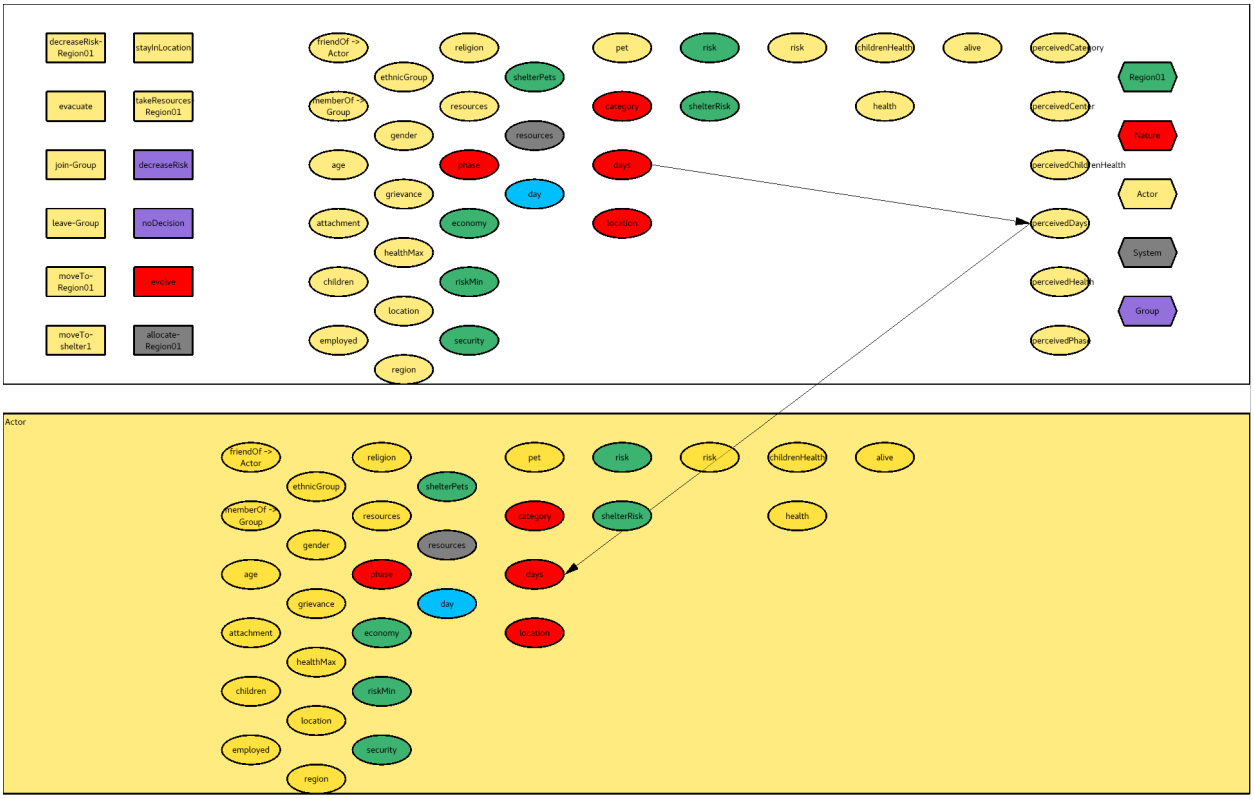
2.15.1 Default observation of Actor's perceivedChildrenHealth

Actor's perceivedChildrenHealth′←Actor's childrenHealth

2.16 Actor's perceivedDays

Perception of Nature's days

Type: Integer



psychsim/domains/groundtruth/simulation/actor.py:671

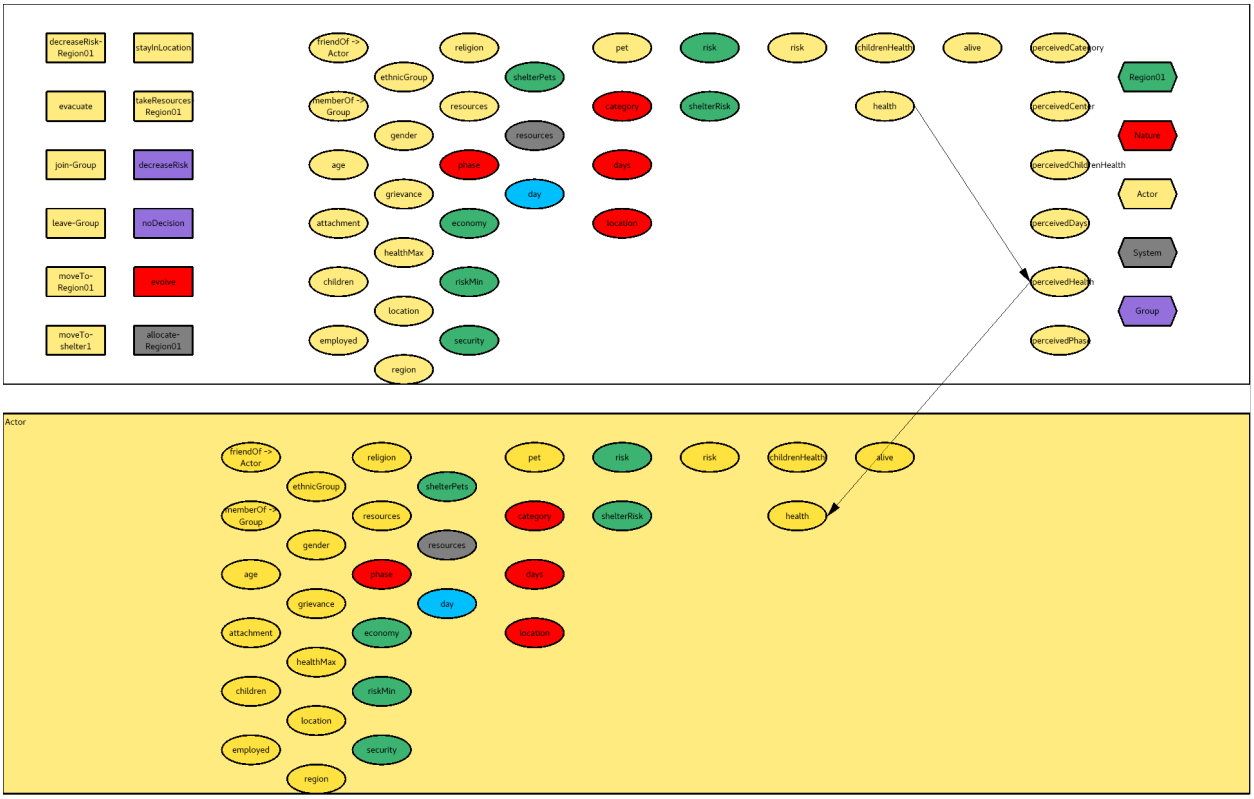
2.16.1 Default observation of Actor's perceivedDays

Actor's perceivedDays′←Nature's days

2.17 Actor's perceivedHealth

Perception of Actor's health

Type: Real



psychsim/domains/groundtruth/simulation/actor.py:710

2.17.1 Default observation of Actor's perceivedHealth

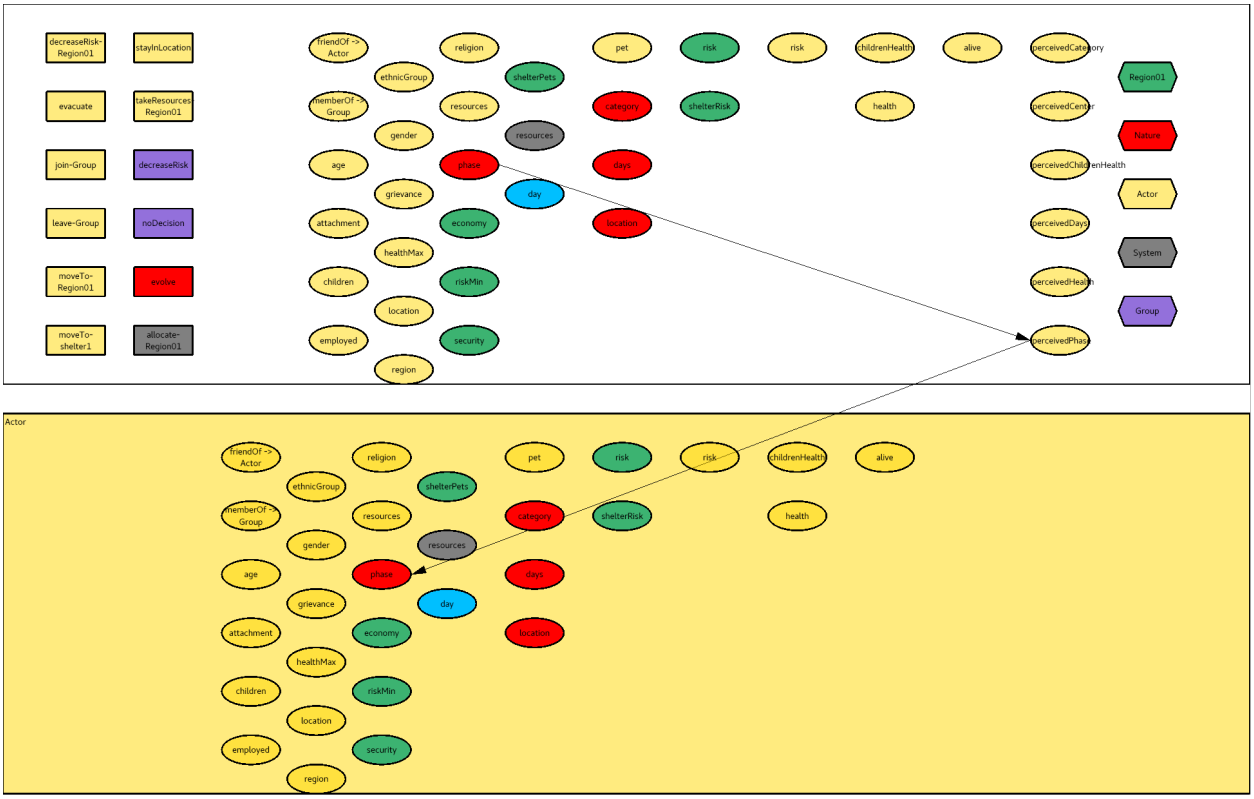
Actor's perceivedHealth′←Actor's health

2.18 Actor's perceivedPhase

Perception of Nature's phase

Type: String

Values: active, **approaching**, **none**



psychsim/domains/groundtruth/simulation/actor.py:666

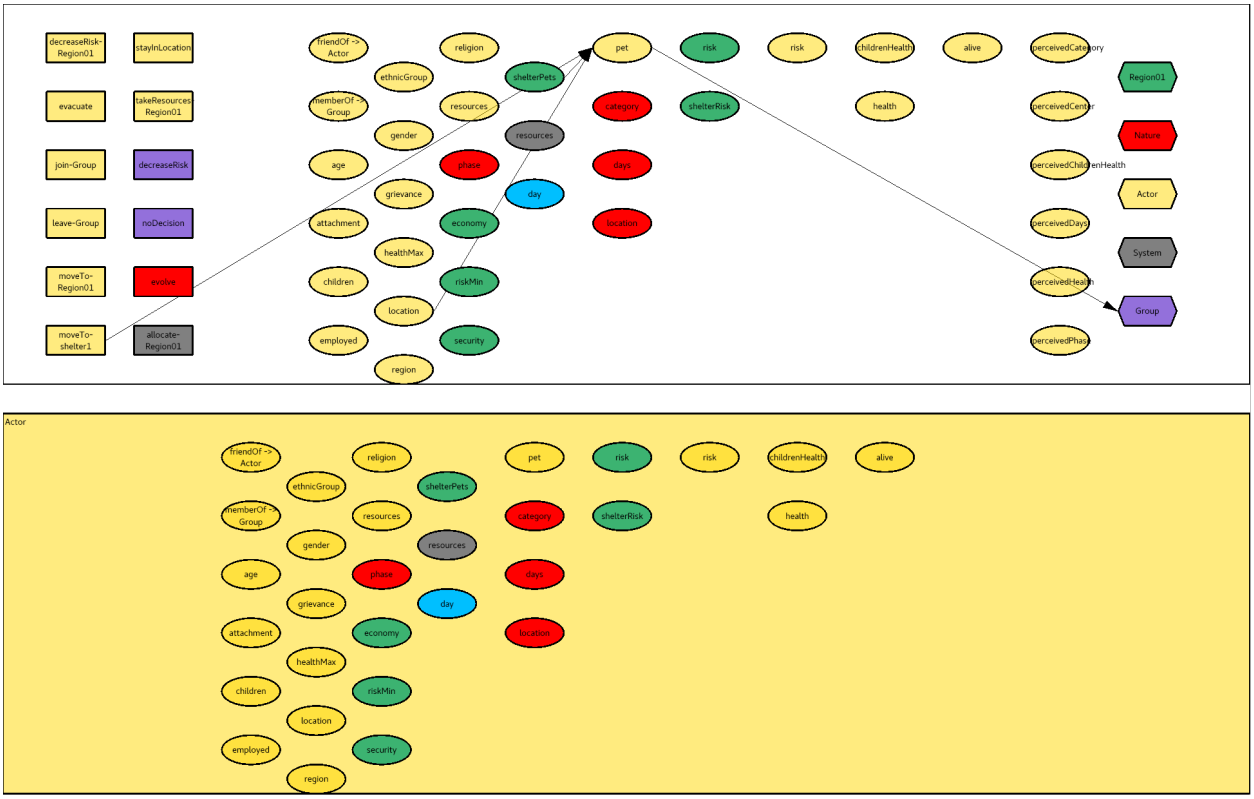
2.18.1 Default observation of Actor's perceivedPhase

Actor's perceivedPhase′←Nature's phase

2.19 Actor's pet

Owns a pet

Type: Boolean



psychsim/domains/groundtruth/simulation/actor.py:102

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

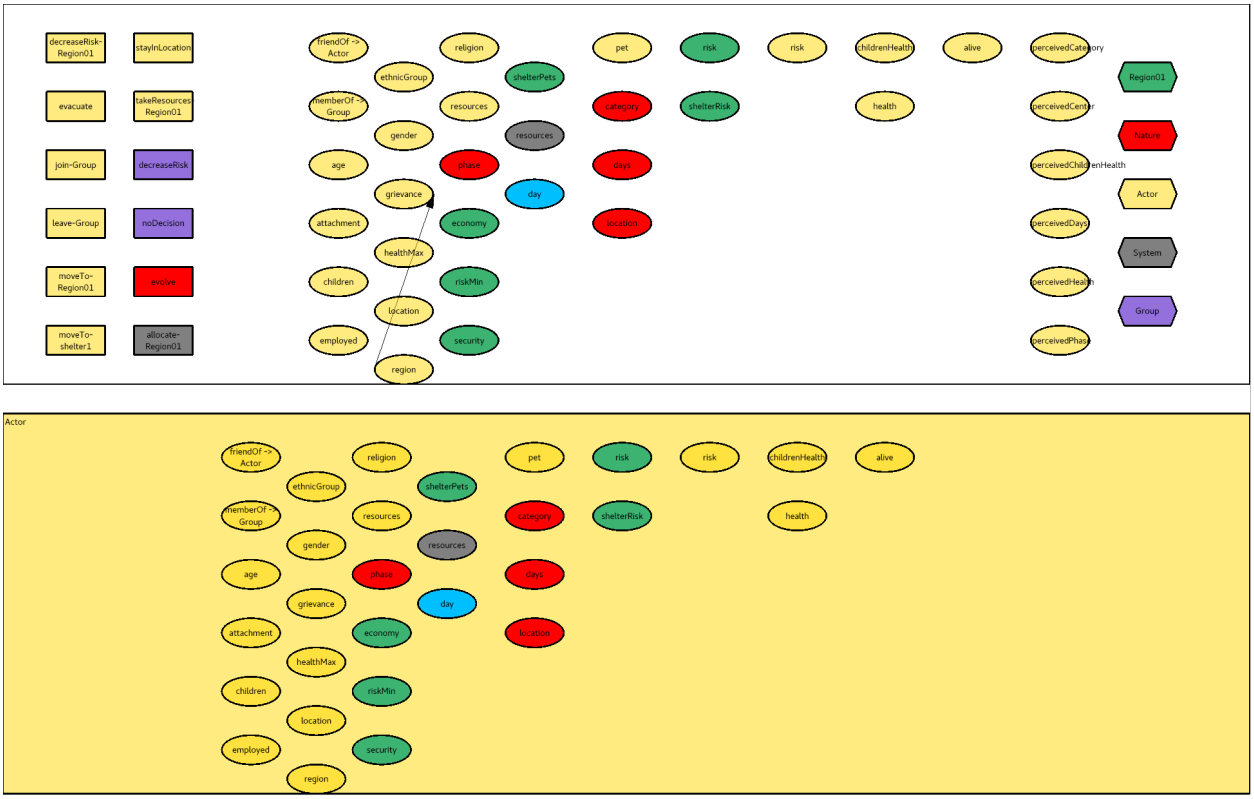
psychsim/domains/groundtruth/simulation/actor.py:608
IF **Actor's location′=shelter1**
THEN : IF **Region01's shelterPets**
THEN : **Actor's pet′←Actor's pet**
ELSE : **Actor's pet′←false**
ELSE : **Actor's pet′←Actor's pet**

2.20 Actor's region

Region of residence

Type: String

Values: Region01



psychsim/domains/groundtruth/simulation/actor.py:164

2.21 Actor's religion

Religious affiliation of actor

Type: String

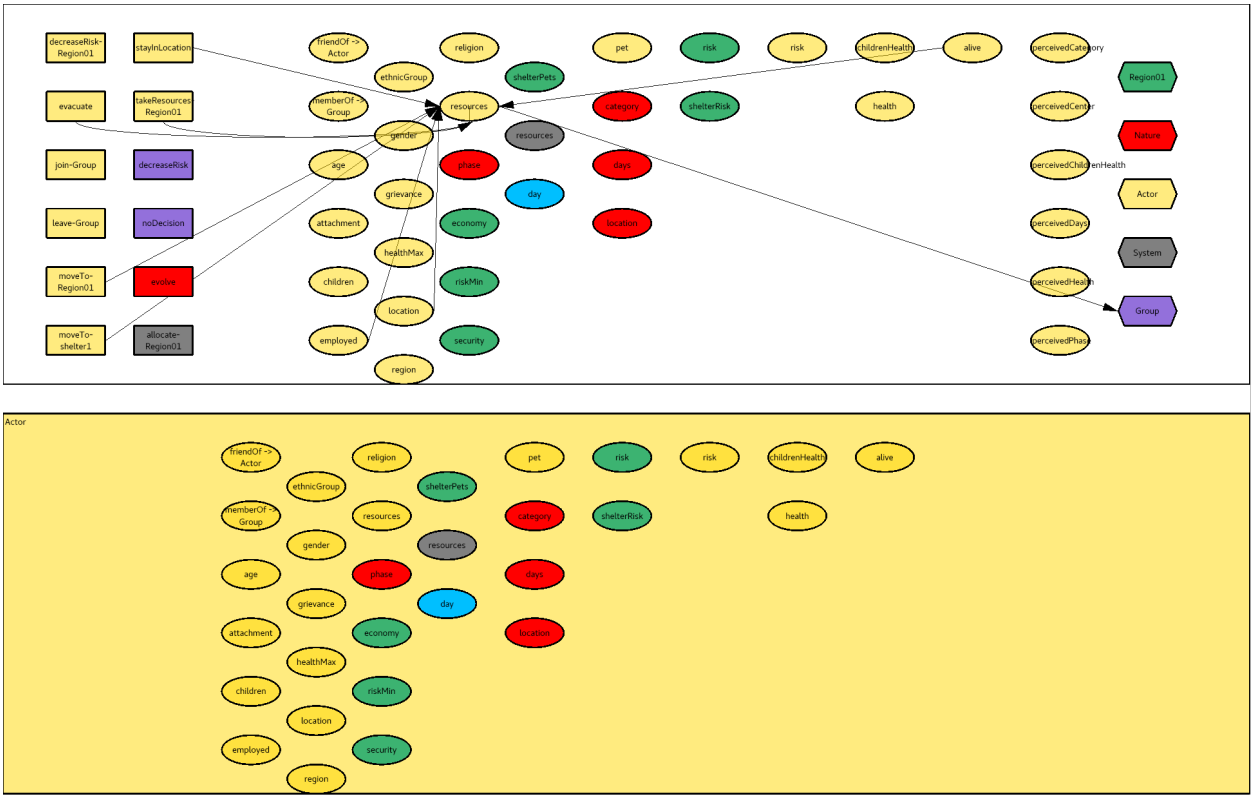
Values: **majority**, **minority**, **none**

psychsim/domains/groundtruth/simulation/actor.py:61

2.22 Actor's resources

Material resources (wealth) currently owned

Type: Real



psychsim/domains/groundtruth/simulation/actor.py:234

2.22.1 Effect of Actor-evacuate on Actor's resources

psychsim/domains/groundtruth/simulation/actor.py:532
IF **Actor's resources**>0.40
THEN : **Actor's resources**$'\leftarrow$**Actor's resources**-0.40
ELSE : **Actor's resources**$'\leftarrow 0.00$

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

psychsim/domains/groundtruth/simulation/actor.py:520
IF **Actor's alive**
THEN : IF **Actor's employed**
THEN : **Actor's resources**$'\leftarrow 60\%\cdot$**Actor's resources**$+0.40$
ELSE : **Actor's resources**$'\leftarrow$**Actor's resources**
ELSE : **Actor's resources**$'\leftarrow$**Actor's resources**

2.22.3 Effect of Actor-moveTo-shelter1 on Actor's resources

psychsim/domains/groundtruth/simulation/actor.py:524
Actor's resources$'\leftarrow 0\%\cdot$**Actor's resources**

2.22.4 Effect of Actor-stayInLocation on Actor's resources

psychsim/domains/groundtruth/simulation/actor.py:509
IF **Actor's alive**
THEN : IF **Actor's employed**

THEN : IF **Actor's location**={**'Region01', 'evacuated'**}
THEN : **Actor's resources**′←60%·**Actor's resources**+0.40
ELSE : **Actor's resources**′←**Actor's resources**
ELSE : **Actor's resources**′←**Actor's resources**
ELSE : **Actor's resources**′←**Actor's resources**

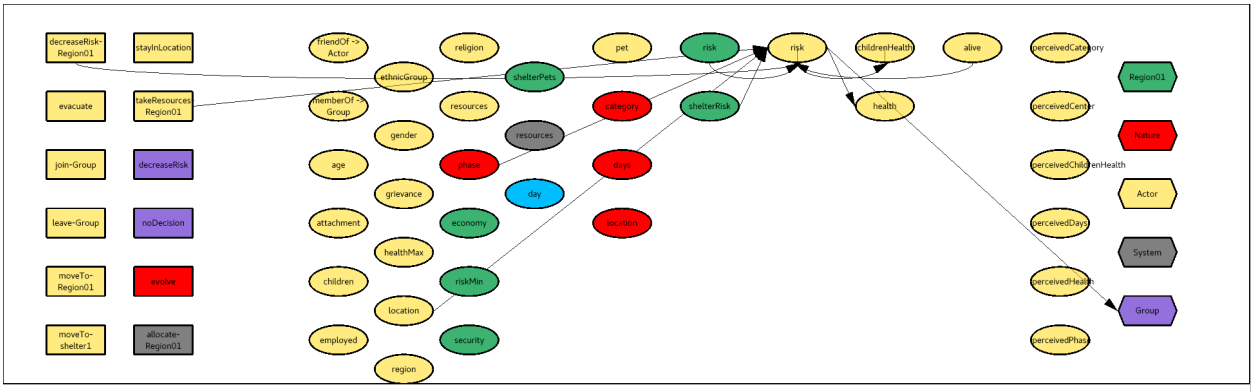
2.22.5 Effect of Actor-takeResources-Region01 on Actor's resources

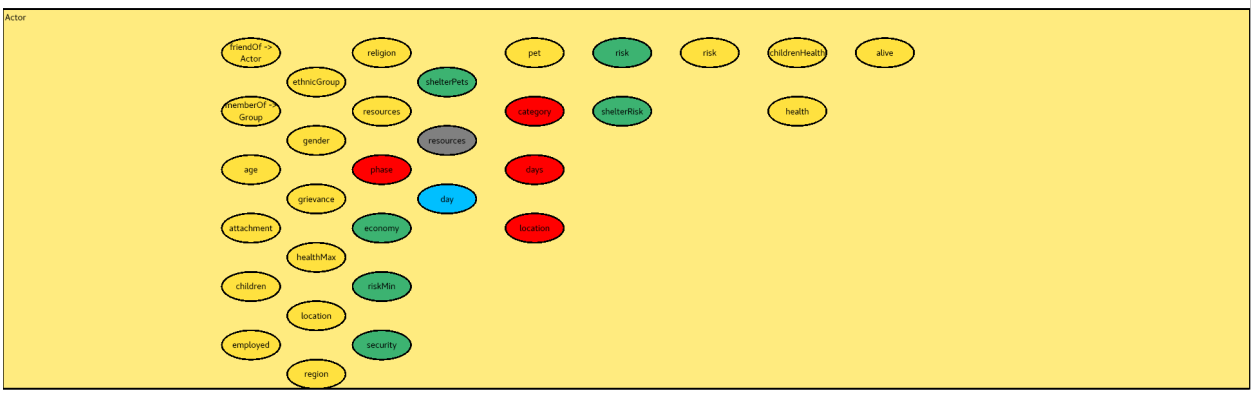
`psychsim/domains/groundtruth/simulation/actor.py:575`
Actor's resources′←80%·**Actor's resources**+0.20

2.23 Actor's risk

Current level of risk from hurricane

Type: Real





`psychsim/domains/groundtruth/simulation/actor.py:254`

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

`psychsim/domains/groundtruth/simulation/actor.py:557`
IF **Actor memberOf Group**
THEN : IF **Group's __ACTION__**=**Group-decreaseRisk**
THEN : **Actor's risk**′←92%·**Actor's risk**+0.08
ELSE : **Actor's risk**′←80%·**Actor's risk**+0.20
ELSE : **Actor's risk**′←80%·**Actor's risk**+0.20

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

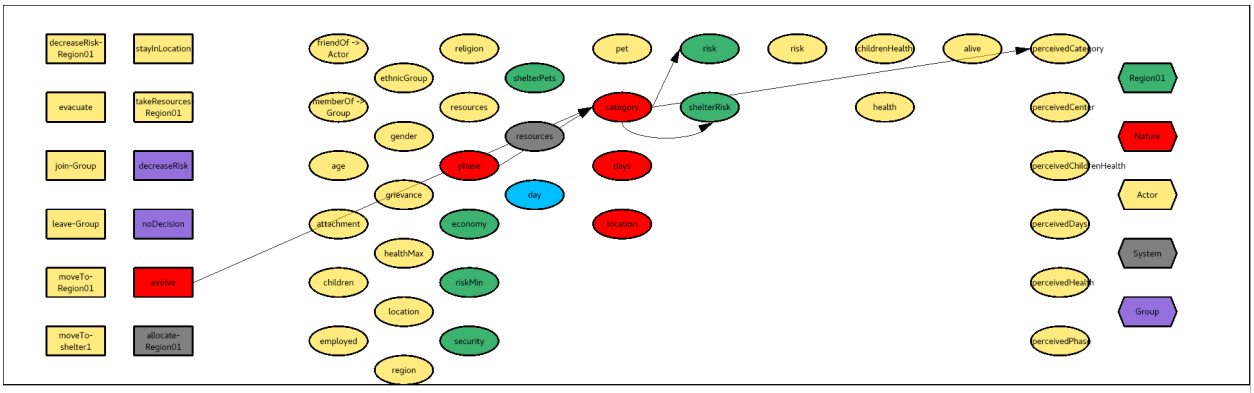
psychsim/domains/groundtruth/simulation/actor.py:582
IF **Nature's phase**=**none**
THEN : **Actor's risk**′←19%·**Actor's risk**+0.80
ELSE : **Actor's risk**′←40%·**Actor's risk**+0.60

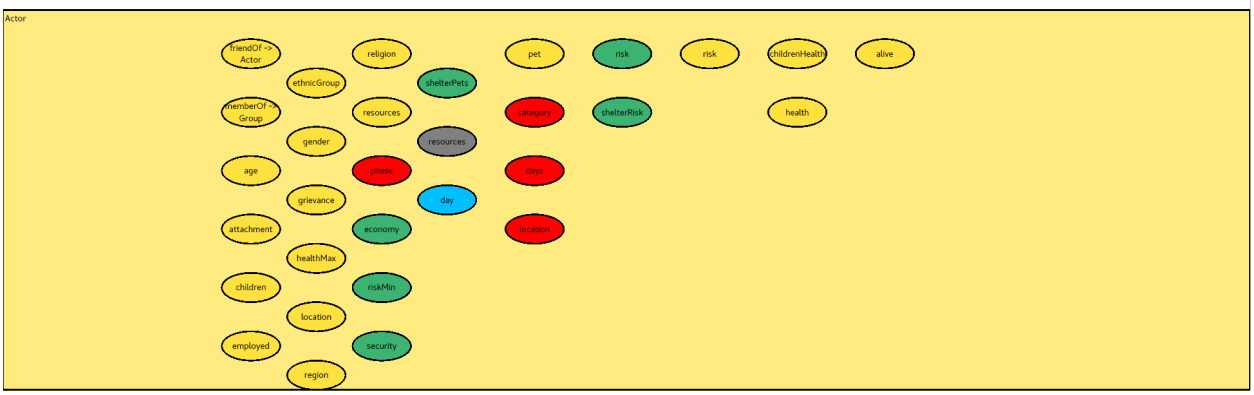
2.23.3 Default change in Actor's risk

psychsim/domains/groundtruth/simulation/actor.py:450
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

2.24 Nature's category

Type: Integer





psychsim/domains/groundtruth/simulation/nature.py:26

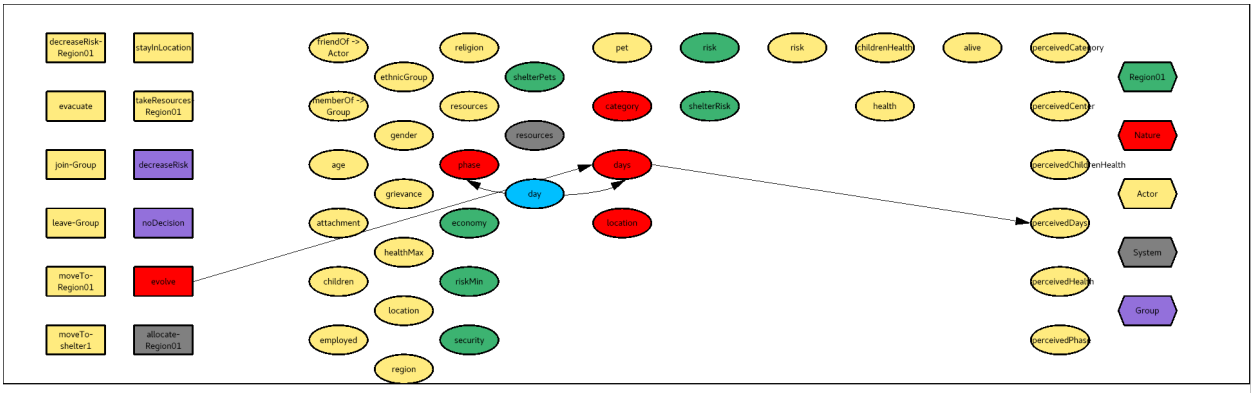
2.24.1 Effect of Nature-evolve on Nature's category

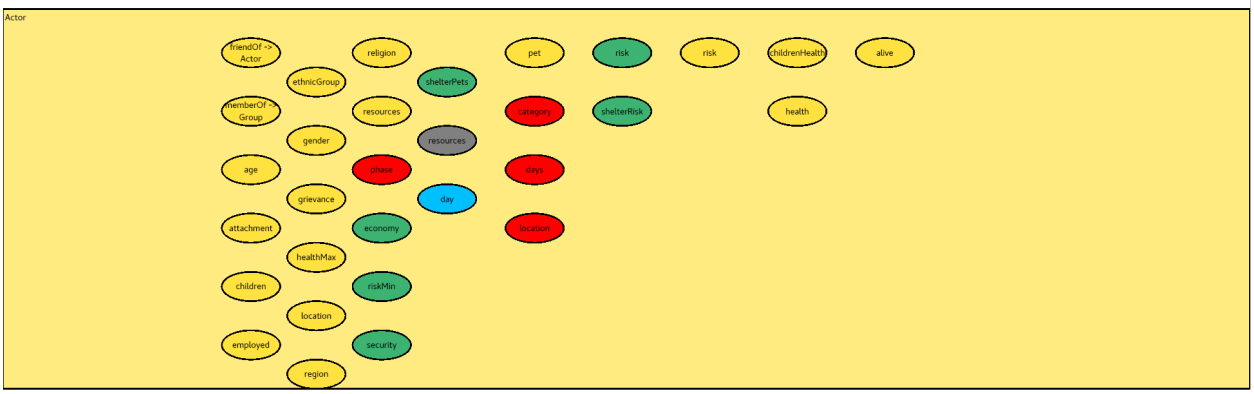
psychsim/domains/groundtruth/simulation/nature.py:80
IF **Nature's phase**′

= **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

2.25 Nature's days

Type: Integer





psychsim/domains/groundtruth/simulation/nature.py:18

2.25.1 Effect of Nature-evolve on Nature's days

psychsim/domains/groundtruth/simulation/nature.py:54

IF **Nature's phase**=**Nature's phase**′

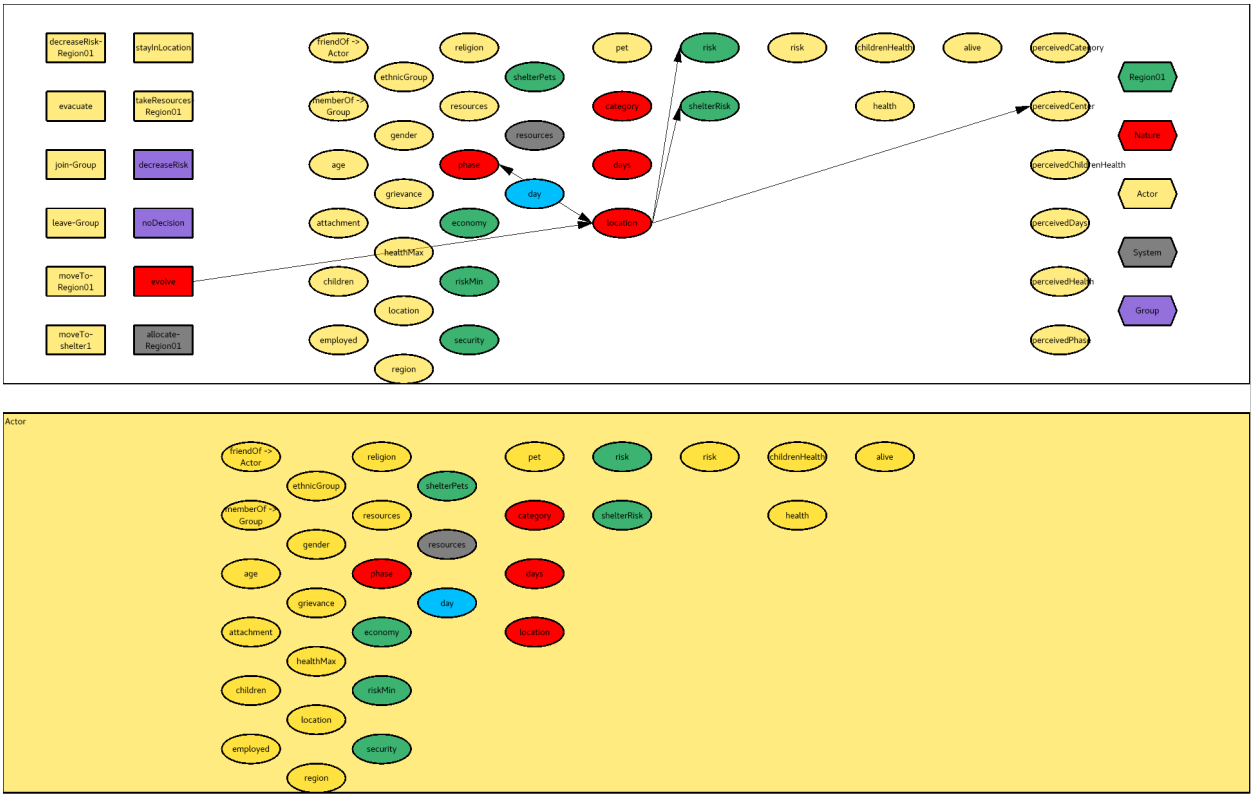
THEN : **Nature's days**′←**Nature's days**+1

ELSE : **Nature's days**′←0

2.26 Nature's location

Type: String

Values: Region01, **none**



psychsim/domains/groundtruth/simulation/nature.py:23

2.26.1 Effect of Nature-evolve on Nature's location

psychsim/domains/groundtruth/simulation/nature.py:113

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 phase**=**approaching**

THEN : **Nature's location**′←**Nature's location**

ELSE : IF **Nature's location**

OTHERWISE : **Nature's location**′←**Nature's location**

= **Region01**:

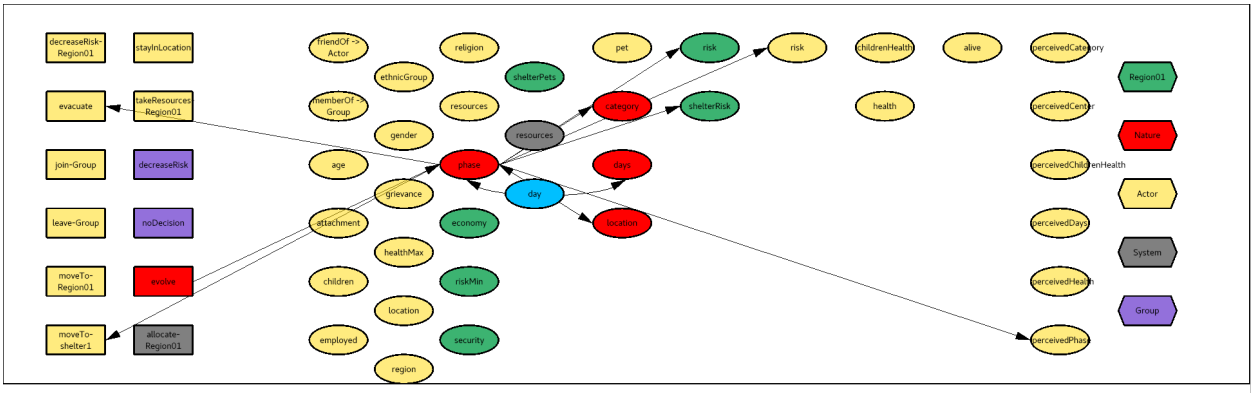
20%: **Nature's location**′←**Region01**

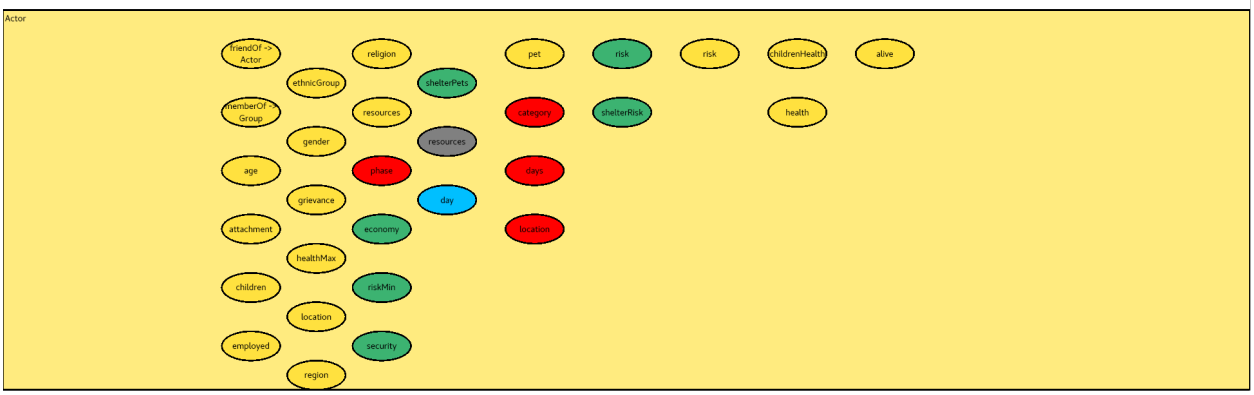
48%: **Nature's location′←none**
= **none**: **Nature's location′←none**

2.27 Nature's phase

Type: String

Values: **active**, **approaching**, **none**





psychsim/domains/groundtruth/simulation/nature.py:16

2.27.1 Effect of Nature-evolve on Nature's phase

psychsim/domains/groundtruth/simulation/nature.py:49
IF **Nature's phase**
= **none**: IF **Nature's days**>2
THEN :
60%: **Nature's phase′←approaching**
40%: **Nature's phase′←none**
ELSE : **Nature's phase′←none**
= **approaching**: IF **Nature's days**>2
THEN :
60%: **Nature's phase′←active**
40%: **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**

2.28 Region01's economy

Current economic level of region

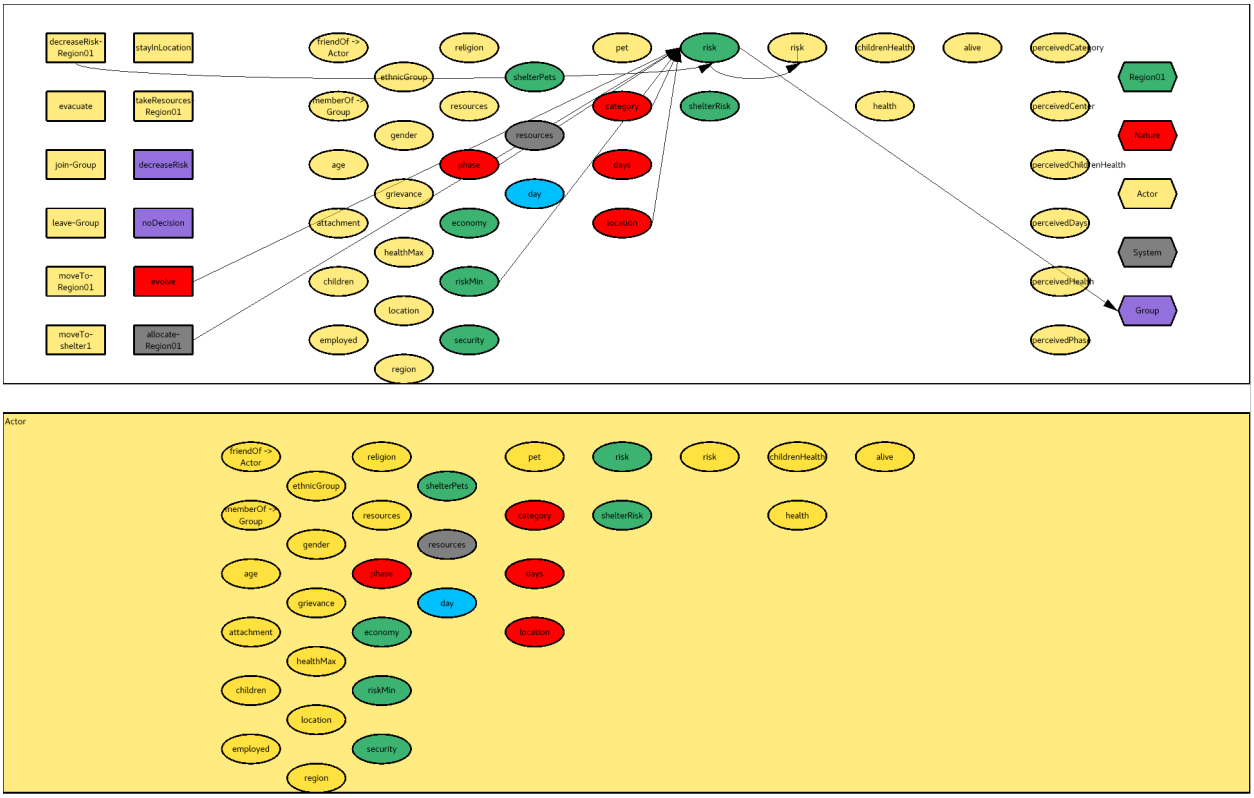
Type: Real

psychsim/domains/groundtruth/simulation/region.py:83

2.29 Region01's risk

Level of risk from hurricane

Type: Real



psychsim/domains/groundtruth/simulation/region.py:51

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

psychsim/domains/groundtruth/simulation/actor.py:552
IF **Group's __ACTION__=Group-decreaseRisk**
THEN : **Region01's risk**$'$←68%·**Region01's risk**+31%·**Region01's riskMin**
ELSE : **Region01's risk**$'$←80%·**Region01's risk**+20%·**Region01's riskMin**

2.29.2 Effect of Nature-evolve on Region01's risk

psychsim/domains/groundtruth/simulation/nature.py:132
IF **Nature's phase**$'$=**active**
THEN : IF **Nature's location**$'$
OTHERWISE : **Region01's risk**$'$←80%·**Region01's risk**+20%·**Region01's riskMin**

= **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**+20%·**Region01's riskMin**

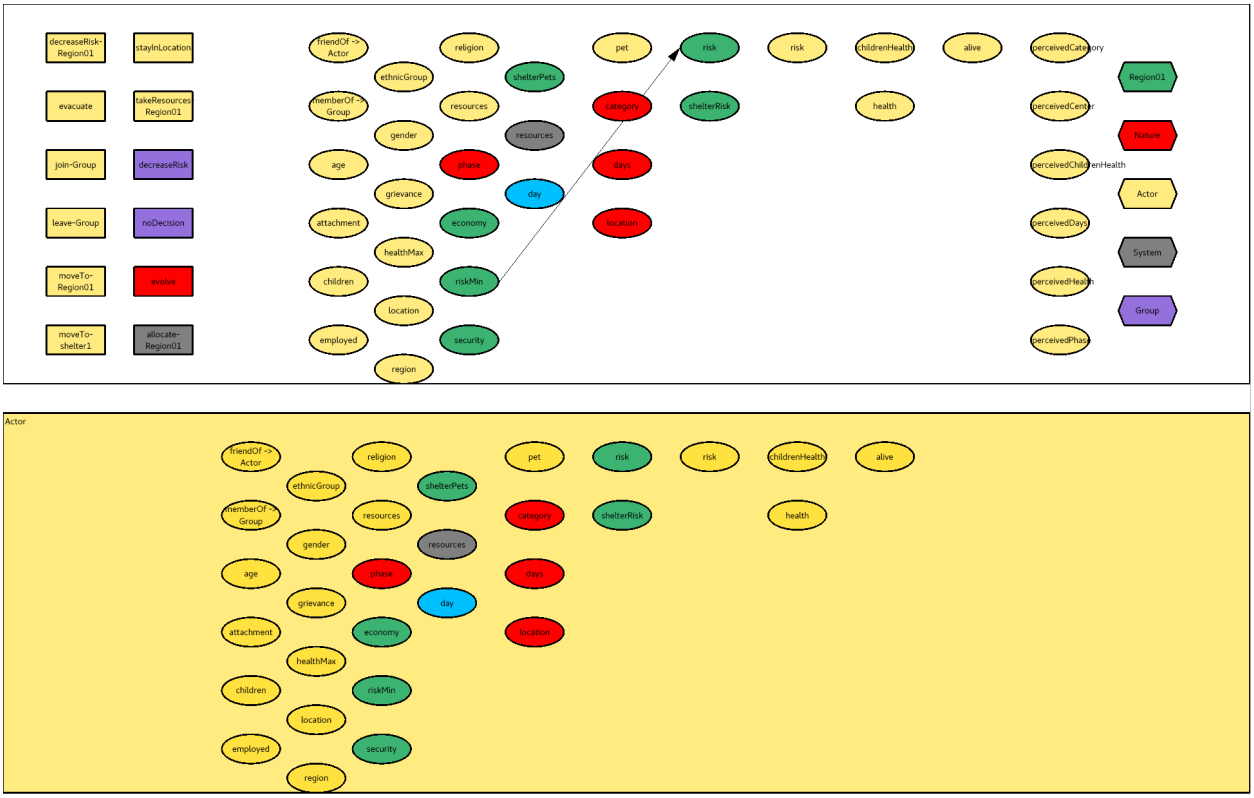
2.29.3 Effect of System-allocate-Region01 on Region01's risk

`psychsim/domains/groundtruth/simulation/system.py:41`
Region01's risk′←80%·**Region01's risk**

2.30 Region01's riskMin

Minimum level of risk in this region

Type: Real



`psychsim/domains/groundtruth/simulation/region.py:66`

2.31 Region01's security

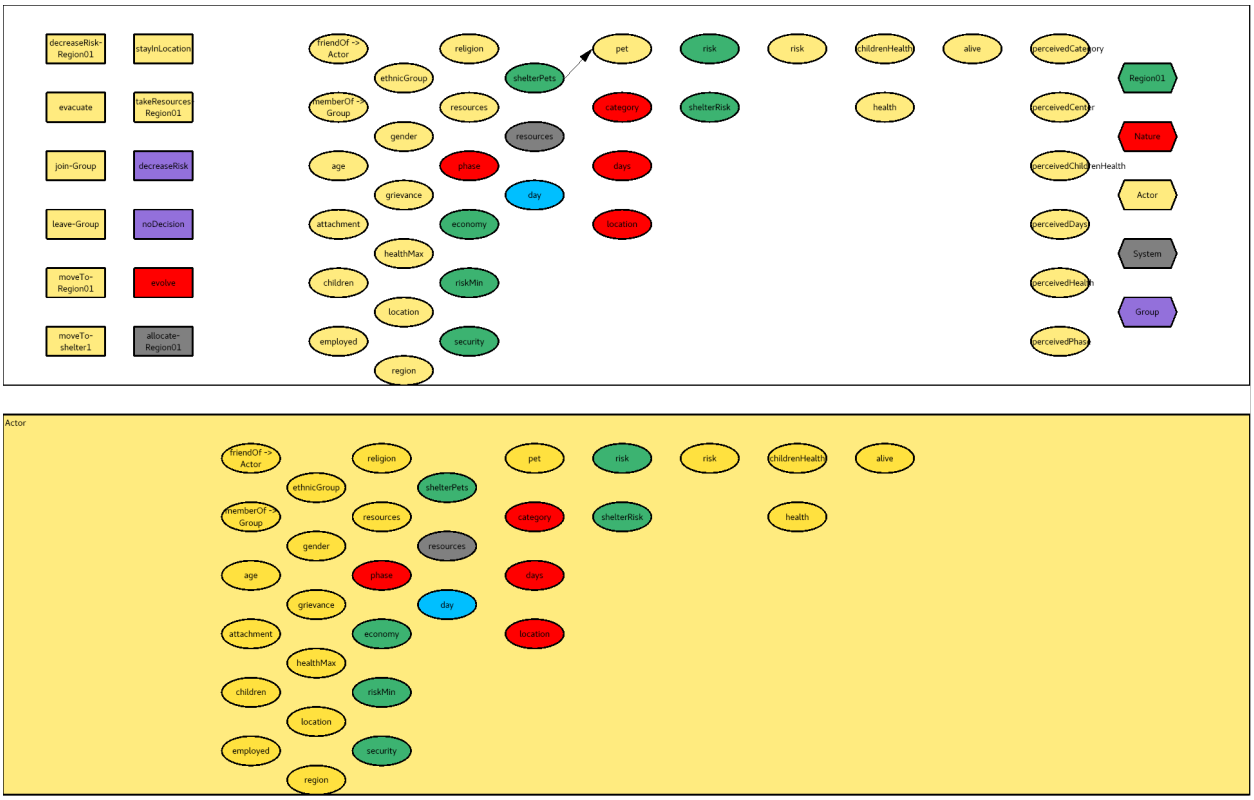
Level of law enforcement in region

Type: Real

`psychsim/domains/groundtruth/simulation/region.py:70`

2.32 Region01's shelterPets

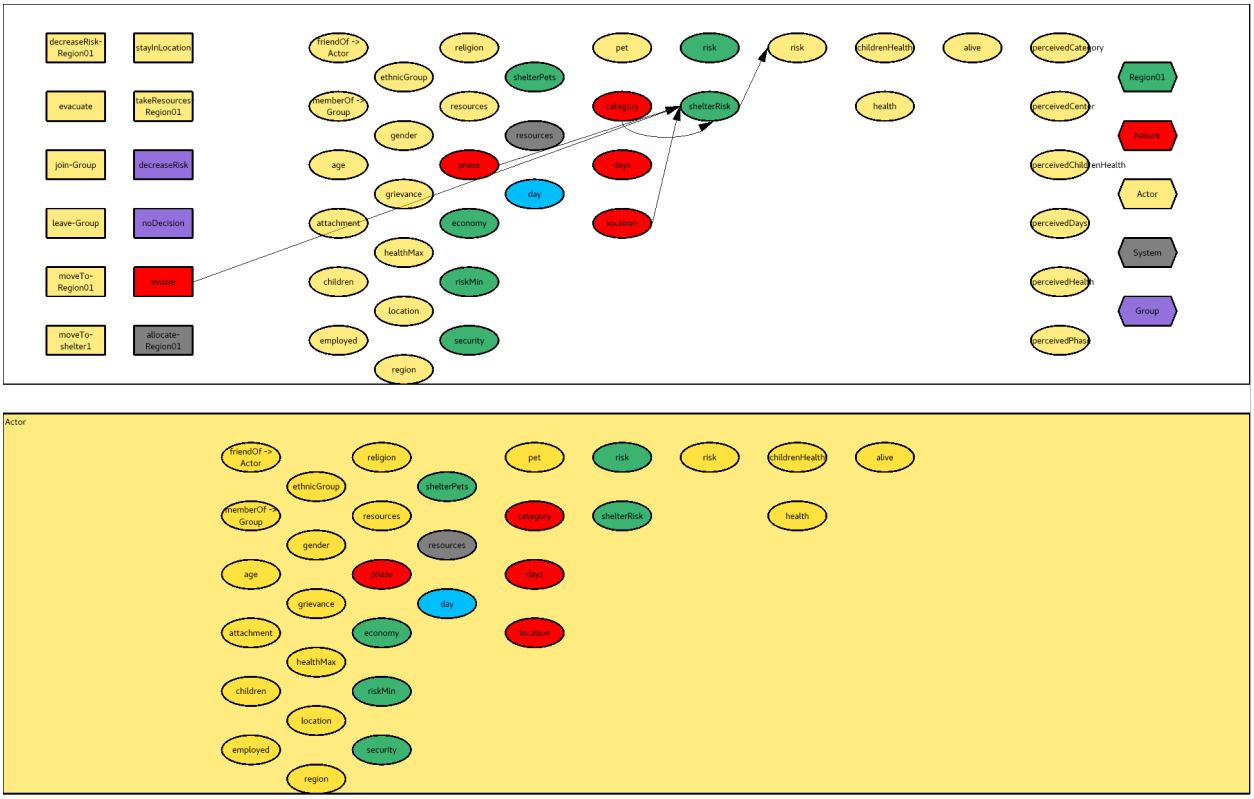
Type: Boolean



`psychsim/domains/groundtruth/simulation/region.py:94`

2.33 Region01's shelterRisk

Type: Real



psychsim/domains/groundtruth/simulation/region.py:88

2.33.1 Effect of Nature-evolve on Region01's shelterRisk

psychsim/domains/groundtruth/simulation/nature.py:147

IF **Nature's phase**$'$=**active**

THEN : IF **Nature's location**$'$=**Region01**

THEN : IF **Nature's category**

= **1**: **Region01's shelterRisk**$'$←80%·**Region01's shelterRisk**+0.20

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

= **3**: **Region01's shelterRisk**$'$←80%·**Region01's shelterRisk**+0.20

= **4**: **Region01's shelterRisk**$'$←80%·**Region01's shelterRisk**+0.20

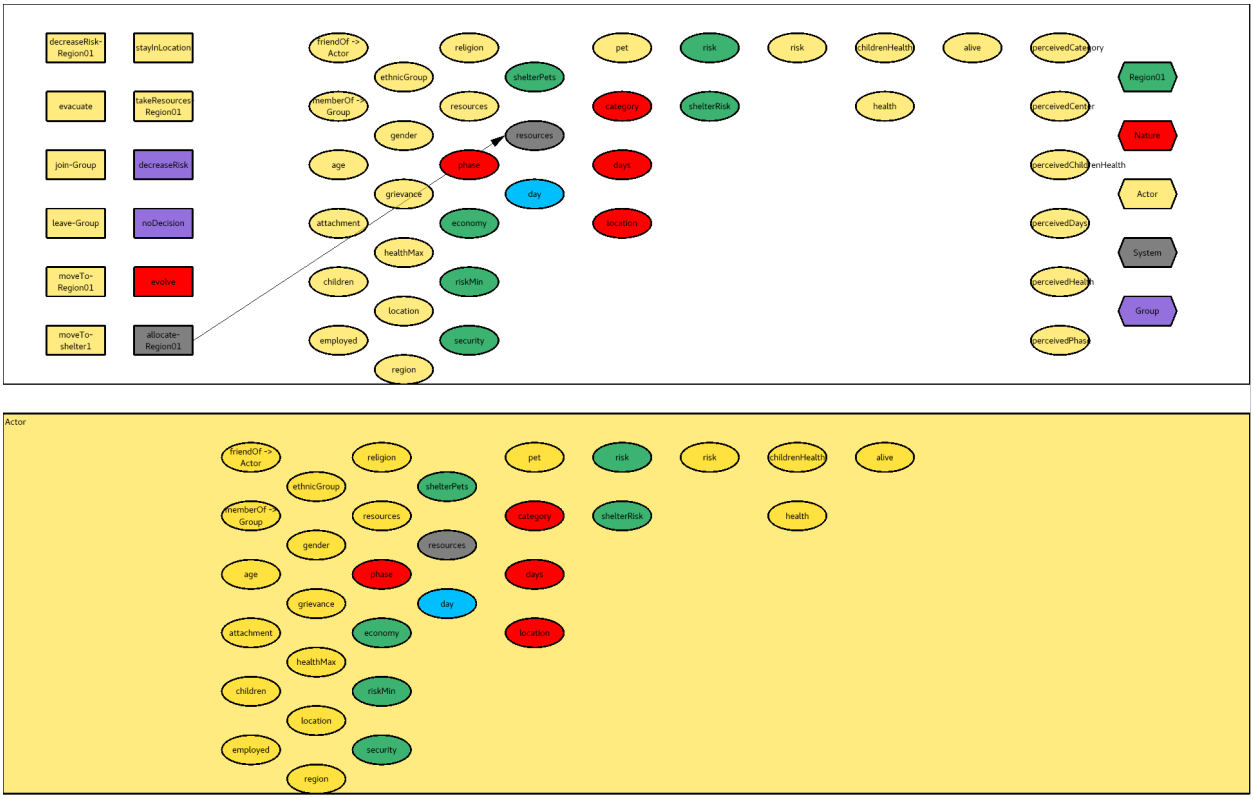
= **5**: **Region01's shelterRisk**$'$←80%·**Region01's shelterRisk**+0.20

ELSE : **Region01's shelterRisk**$'$←**Region01's shelterRisk**

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

2.34 System's resources

Type: Integer



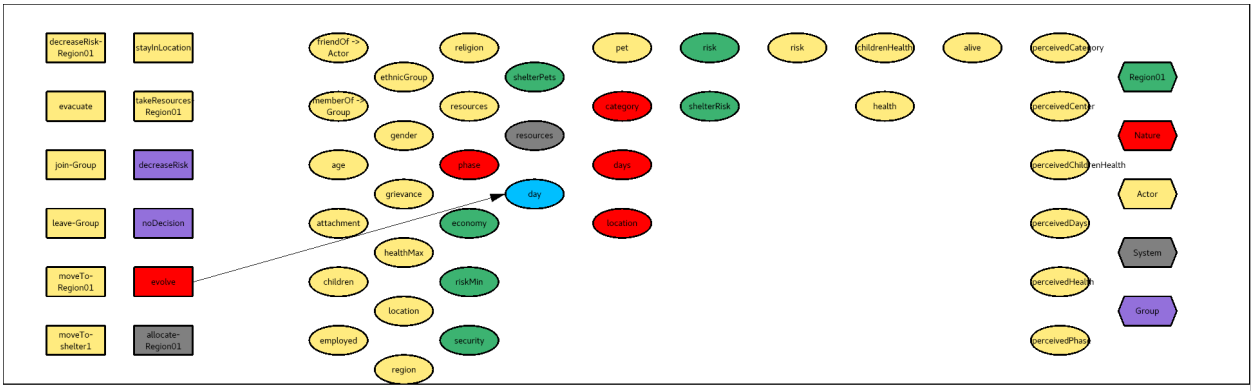
psychsim/domains/groundtruth/simulation/system.py:20

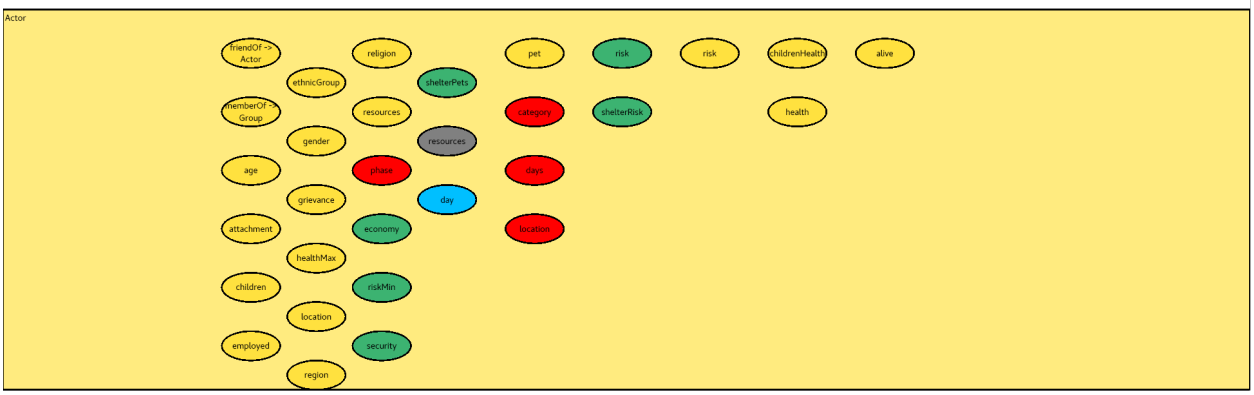
2.34.1 Effect of System-allocate-Region01 on System's resources

psychsim/domains/groundtruth/simulation/system.py:43
System's resources′←System's resources

2.35 day

Type: Integer





psychsim/domains/groundtruth/simulation/create.py:45

2.35.1 Effect of Nature-evolve on day

psychsim/domains/groundtruth/simulation/nature.py:152
day′←**day**+1

3 Relations

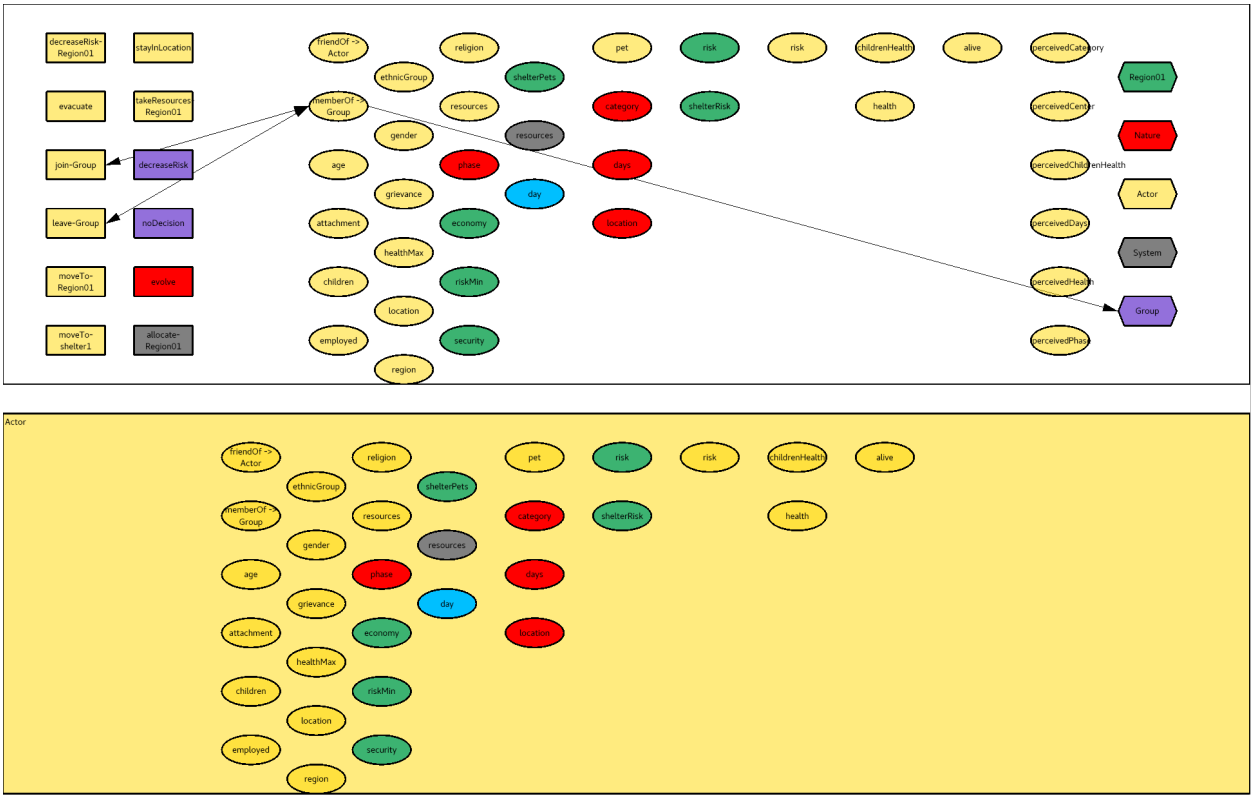
3.1 Actor friendOf Actor

Type: Boolean

psychsim/domains/groundtruth/simulation/actor.py:748

3.2 Actor memberOf Group

Type: Boolean



psychsim/domains/groundtruth/simulation/group.py:88

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

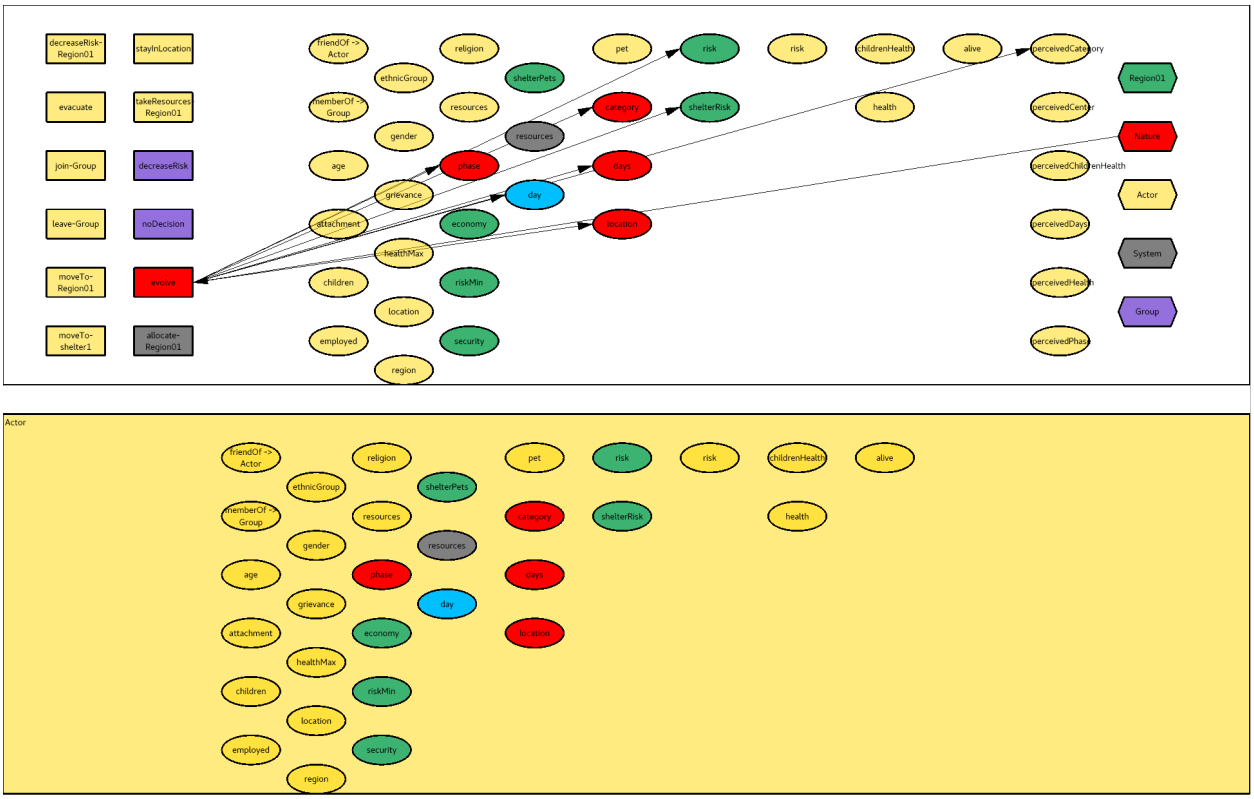
Actor memberOf Group′←true

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

Actor memberOf Group′←false

4 Actions

4.1 Nature evolve



psychsim/domains/groundtruth/simulation/nature.py:14

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**′←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

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 phase**=**approaching**
THEN : **Nature's location**′←**Nature's location**
ELSE : IF **Nature's location**
OTHERWISE : **Nature's location**′←**Nature's location**
= **Region01**:
20%: **Nature's location**′←**Region01**
48%: **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**>2
THEN :
60%: **Nature's phase**′←**approaching**
40%: **Nature's phase**′←**none**
ELSE : **Nature's phase**′←**none**
= **approaching**: IF **Nature's days**>2
THEN :
60%: **Nature's phase**′←**active**
40%: **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**+20%·**Region01's riskMin**
= **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**+20%·**Region01's riskMin**

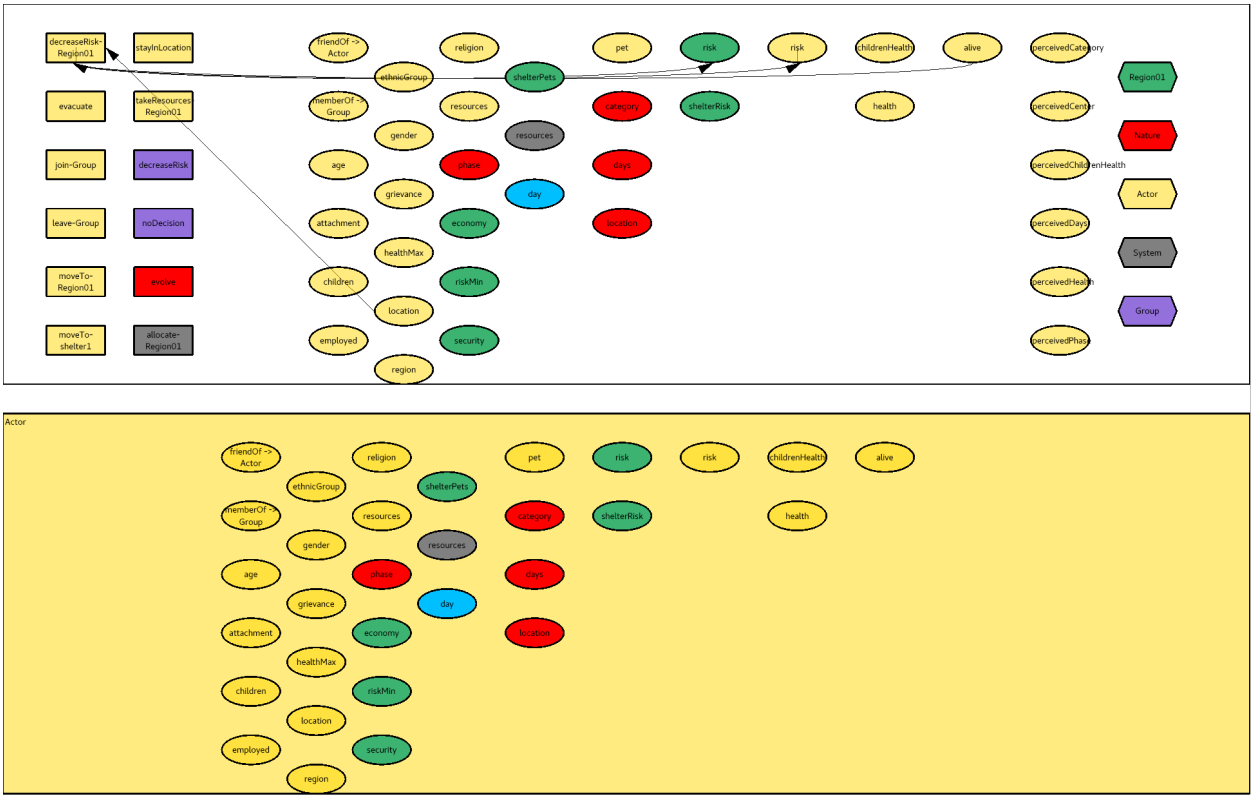
4.1.6 Effect on Region01's shelterRisk of Nature evolve

IF **Nature's phase′=active**
THEN : IF **Nature's location′=Region01**
THEN : IF **Nature's category**
= **1**: **Region01's shelterRisk′**←80%·**Region01's shelterRisk**+0.20
= **2**: **Region01's shelterRisk′**←80%·**Region01's shelterRisk**+0.20
= **3**: **Region01's shelterRisk′**←80%·**Region01's shelterRisk**+0.20
= **4**: **Region01's shelterRisk′**←80%·**Region01's shelterRisk**+0.20
= **5**: **Region01's shelterRisk′**←80%·**Region01's shelterRisk**+0.20
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



psychsim/domains/groundtruth/simulation/actor.py:345

4.2.1 Applicability of Actor decreaseRisk Region01

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

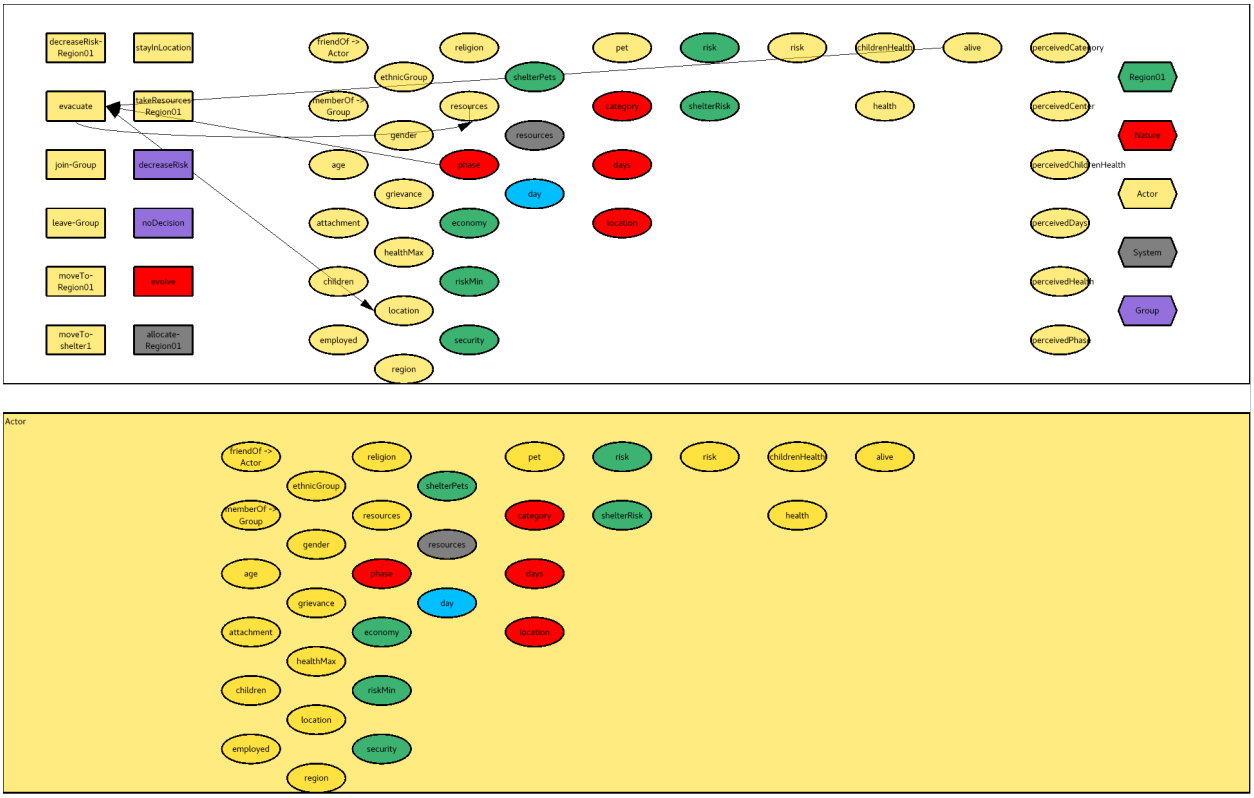
4.2.2 Effect on Actor's risk of Actor decreaseRisk Region01

IF **Actor memberOf Group**
THEN : IF **Group's __ACTION__=Group-decreaseRisk**
THEN : **Actor's risk**′←92%·**Actor's risk**+0.08
ELSE : **Actor's risk**′←80%·**Actor's risk**+0.20
ELSE : **Actor's risk**′←80%·**Actor's risk**+0.20

4.2.3 Effect on Region01's risk of Actor decreaseRisk Region01

IF **Group's __ACTION__=Group-decreaseRisk**
THEN : **Region01's risk**′←68%·**Region01's risk**+31%·**Region01's riskMin**
ELSE : **Region01's risk**′←80%·**Region01's risk**+20%·**Region01's riskMin**

4.3 Actor evacuate



psychsim/domains/groundtruth/simulation/actor.py:327

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**

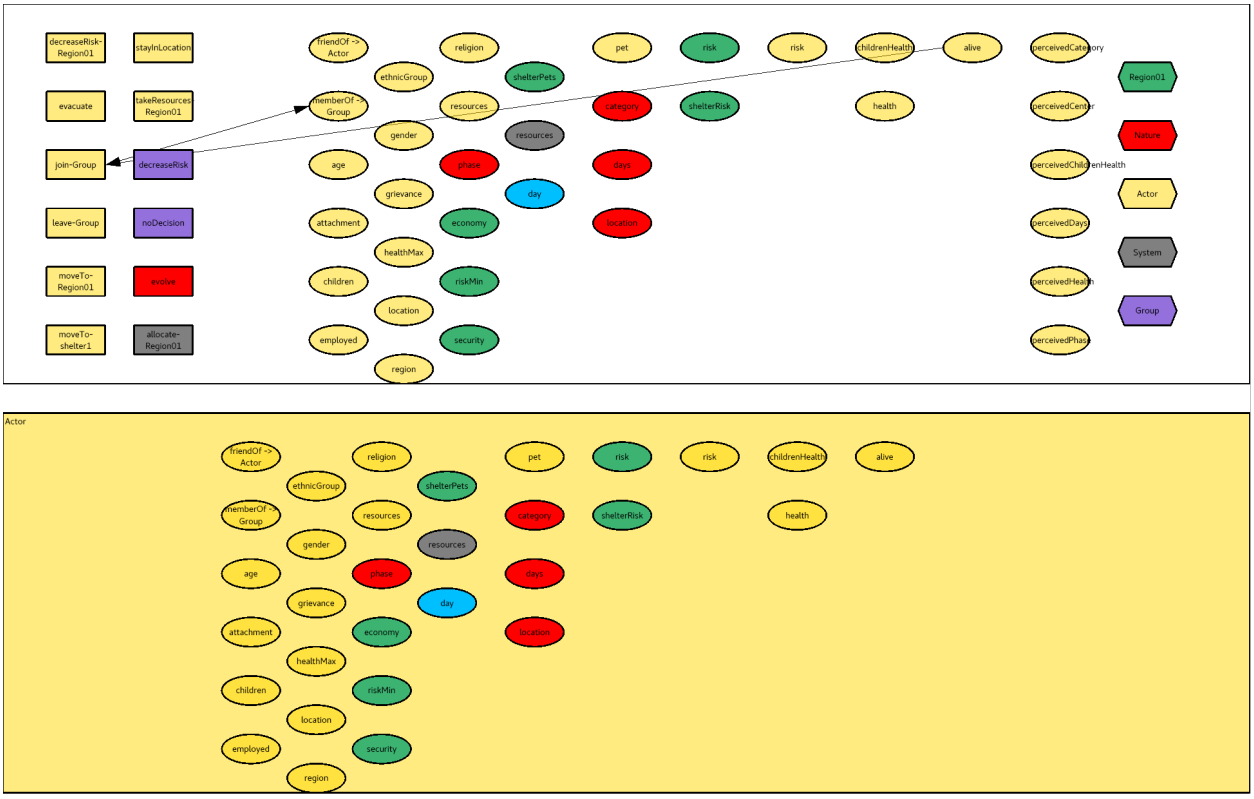
4.3.2 Effect on Actor's location of Actor evacuate

Actor's location$'\leftarrow$**evacuated**

4.3.3 Effect on Actor's resources of Actor evacuate

IF **Actor's resources**>0.40
THEN : **Actor's resources**$'\leftarrow$**Actor's resources**-0.40
ELSE : **Actor's resources**$'\leftarrow 0.00$

4.4 Actor join Group



`psychsim/domains/groundtruth/simulation/group.py:103`

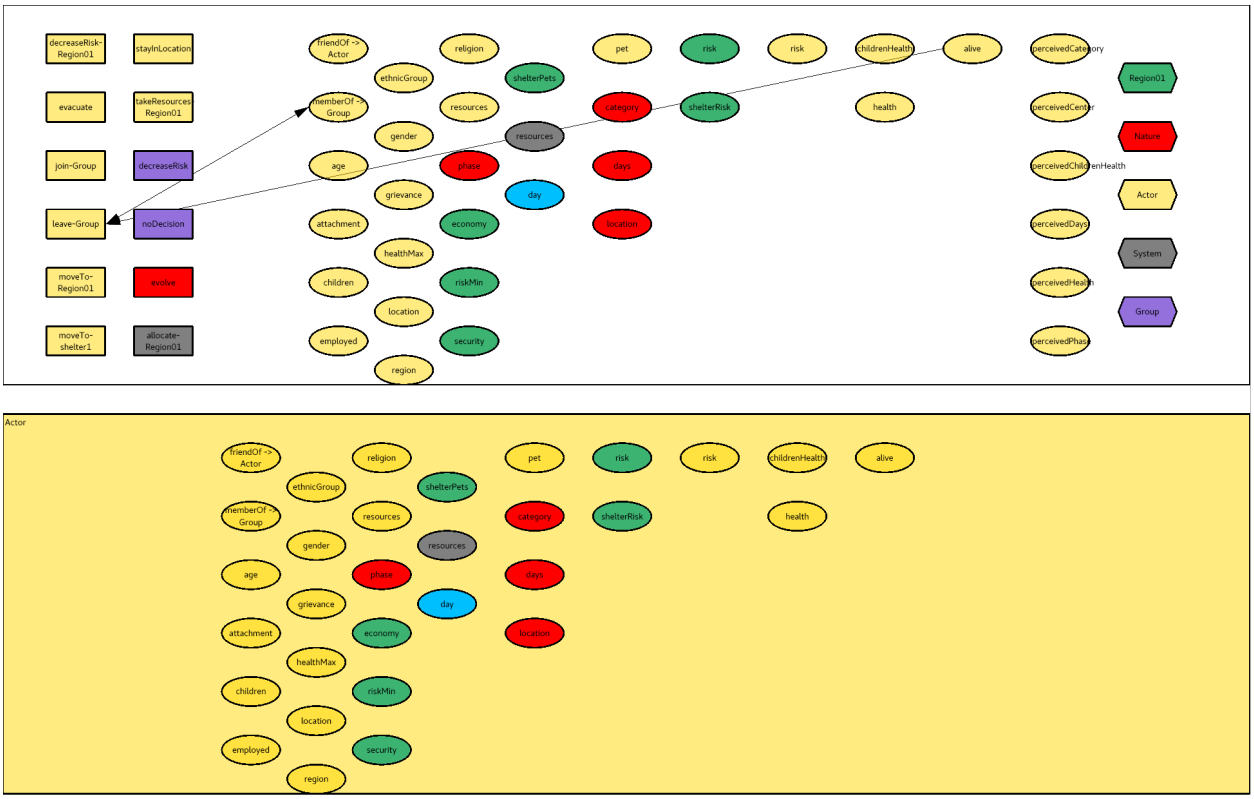
4.4.1 Applicability of Actor join Group

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**

4.5 Actor leave Group



psychsim/domains/groundtruth/simulation/group.py:114

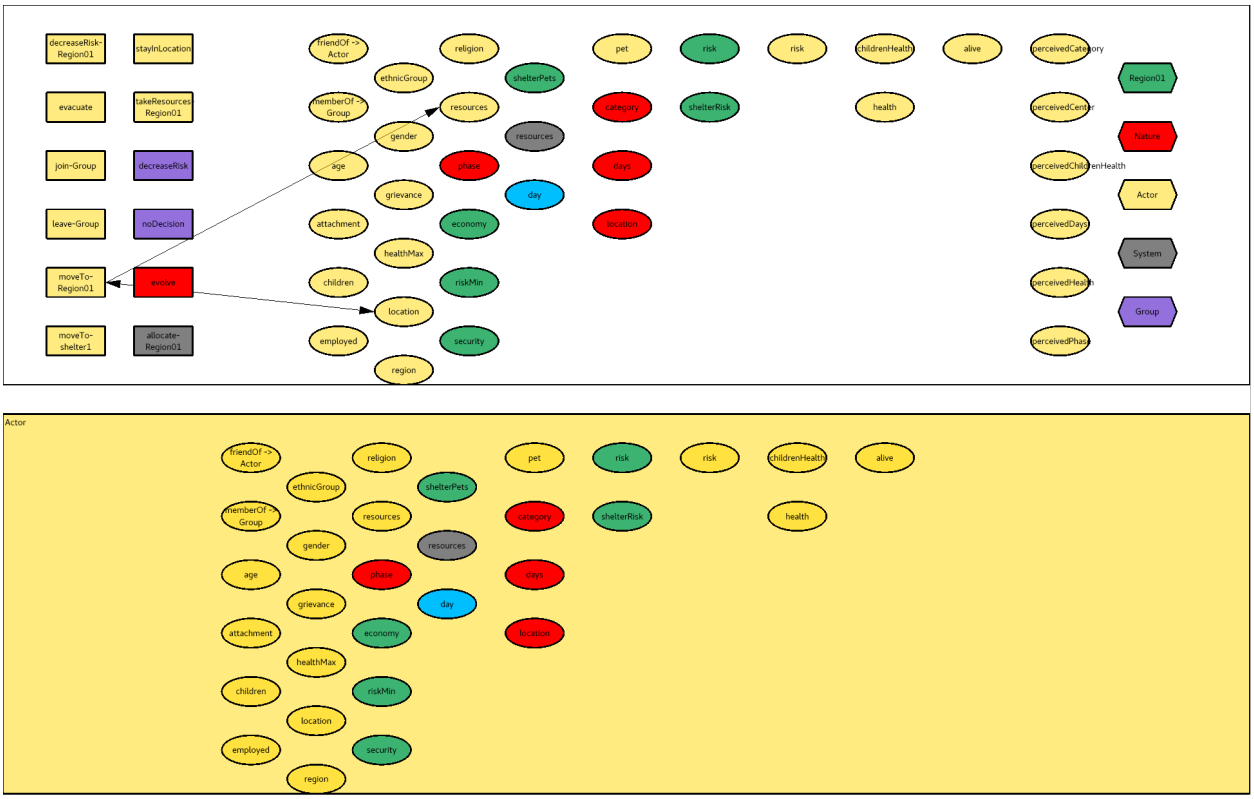
4.5.1 Applicability of Actor leave Group

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′←false

4.6 Actor moveTo Region01



psychsim/domains/groundtruth/simulation/actor.py:334

4.6.1 Applicability of Actor moveTo Region01

IF **Actor's location**={**'evacuated', 'shelter1'**}
THEN : **true**
ELSE : **false**

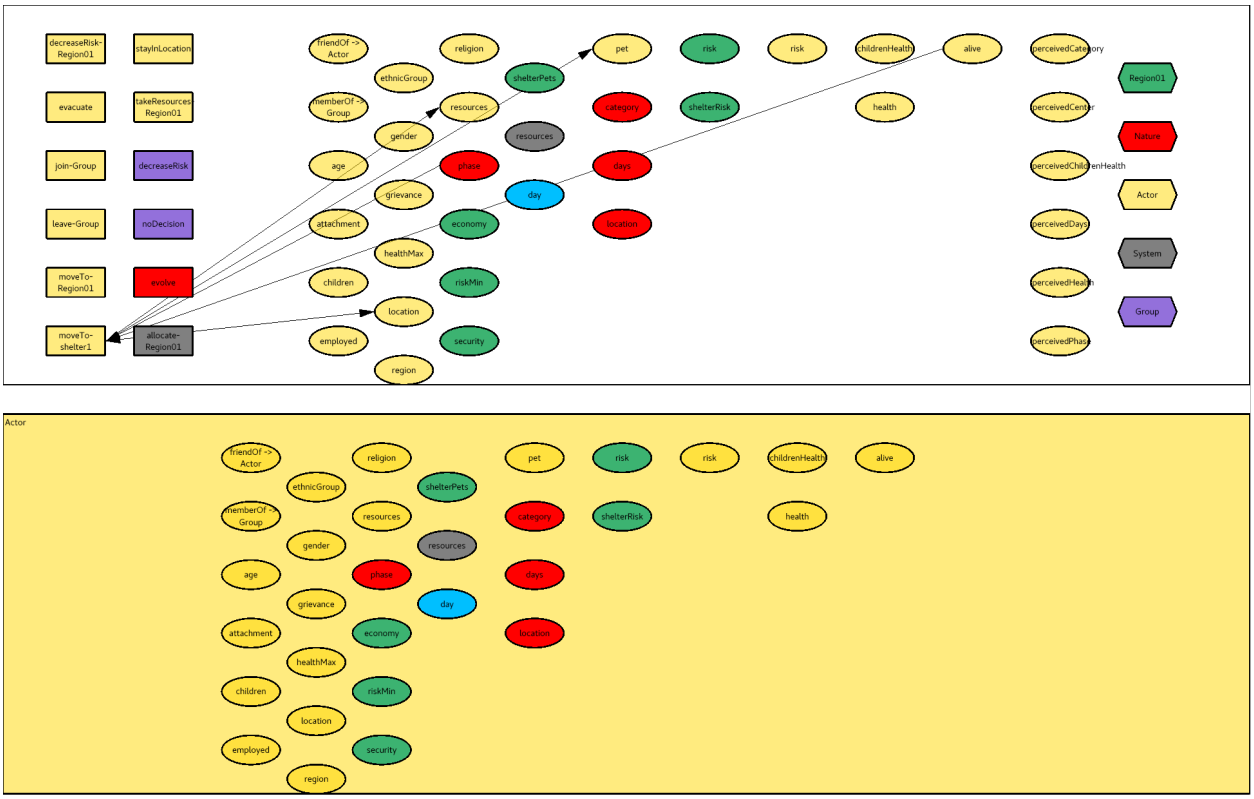
4.6.2 Effect on Actor's location of Actor moveTo Region01

Actor's location$'$←**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**$'$←60%·**Actor's resources**+0.40
ELSE : **Actor's resources**$'$←**Actor's resources**
ELSE : **Actor's resources**$'$←**Actor's resources**

4.7 Actor moveTo shelter1



psychsim/domains/groundtruth/simulation/actor.py:317

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

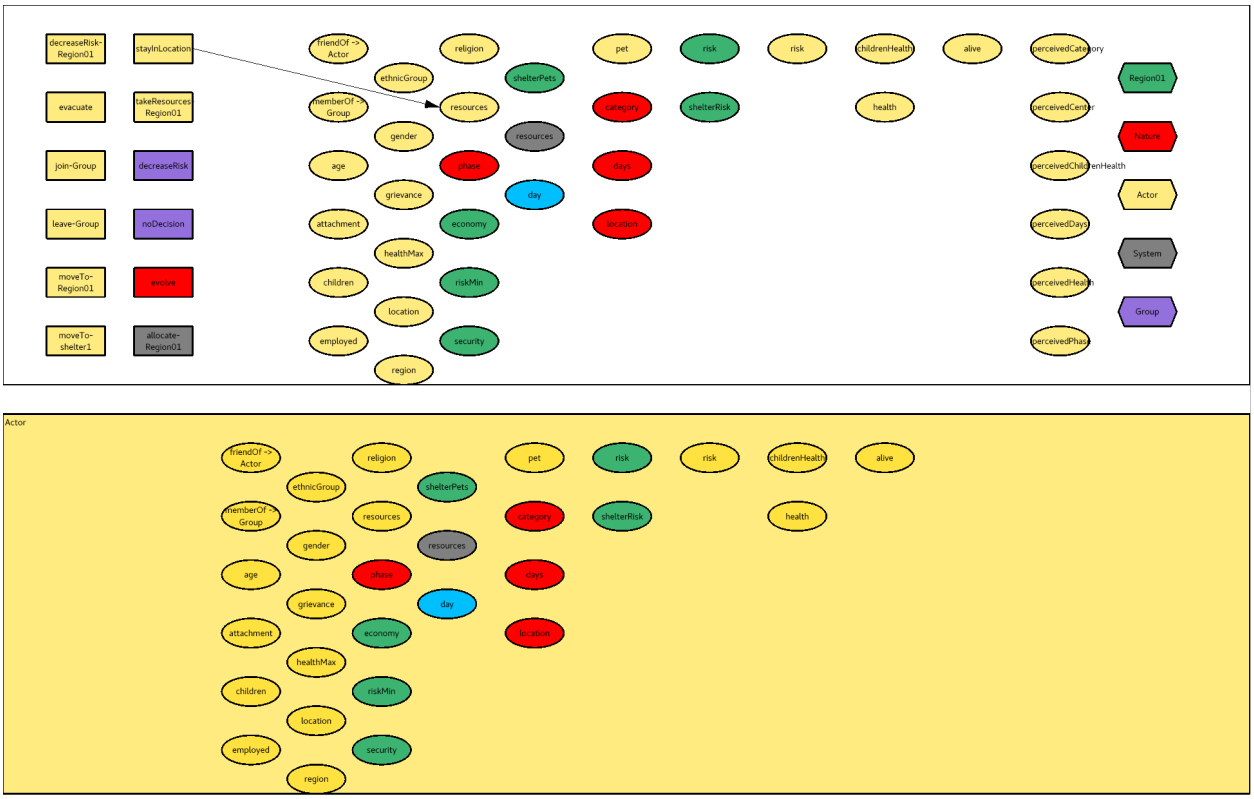
4.7.3 Effect on Actor's pet of Actor moveTo shelter1

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**

4.7.4 Effect on Actor's resources of Actor moveTo shelter1

Actor's resources$'$←0%·Actor's resources

4.8 Actor stayInLocation

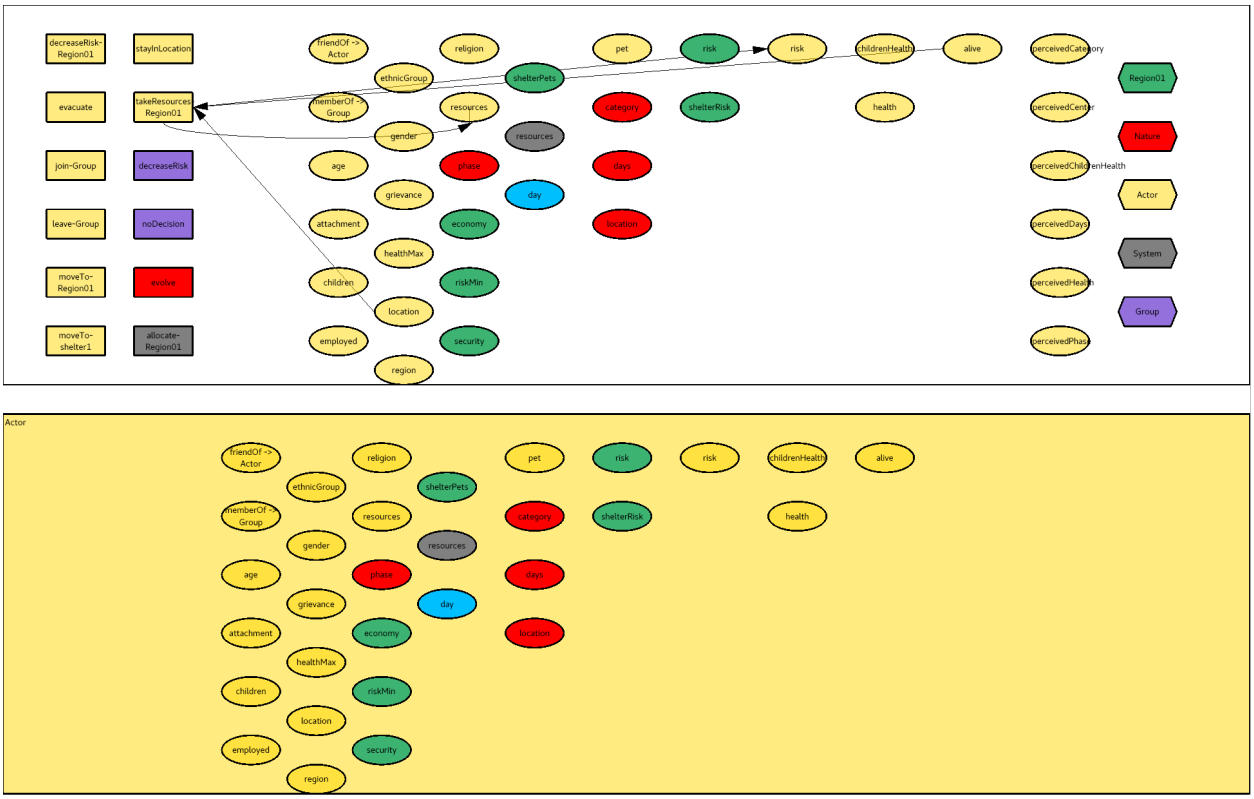


psychsim/domains/groundtruth/simulation/actor.py:277

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**={**'Region01', 'evacuated'**}
THEN : **Actor's resources**$'$←60%·**Actor's resources**+0.40
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



psychsim/domains/groundtruth/simulation/actor.py:380

4.9.1 Applicability of Actor takeResources Region01

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

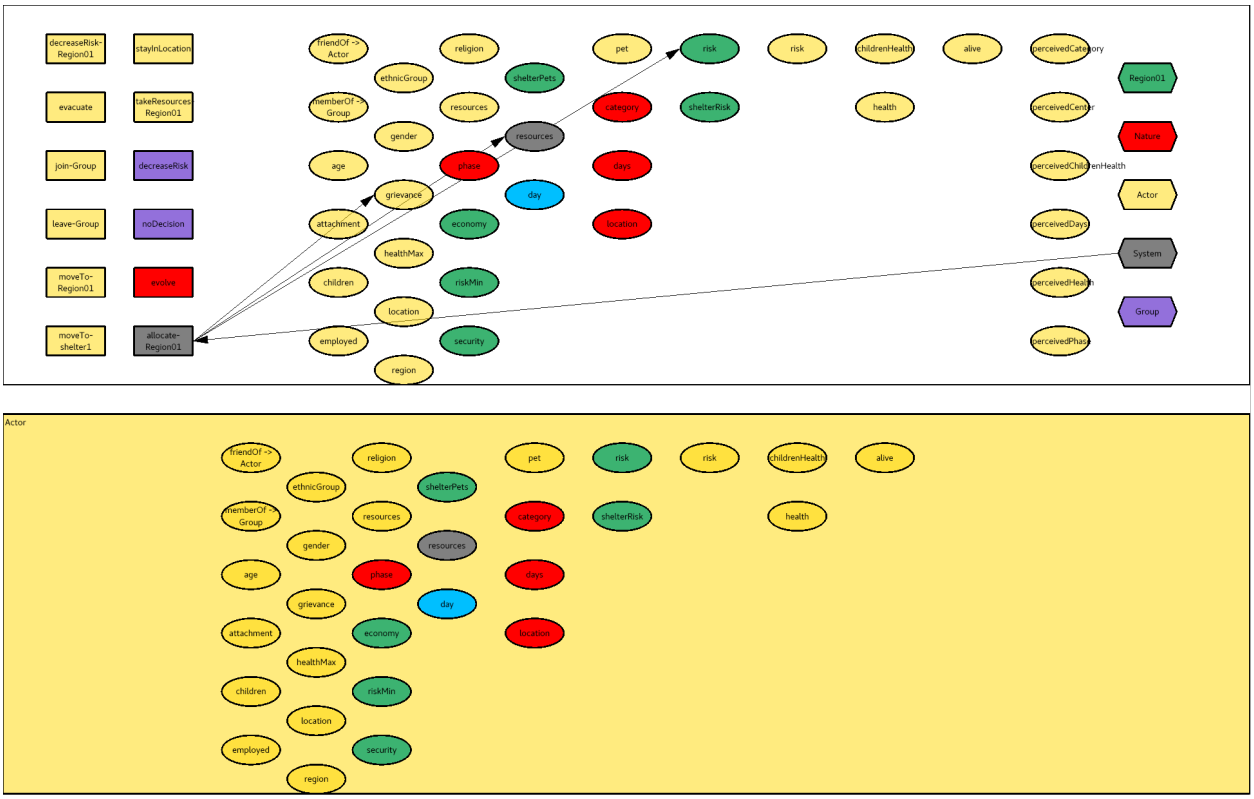
4.9.2 Effect on Actor's resources of Actor takeResources Region01

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



psychsim/domains/groundtruth/simulation/system.py:37

4.10.1 Effect on Actor's grievance of System allocate Region01

IF **Actor's region**=**Region01**
THEN : **Actor's grievance**′←80%·**Actor's grievance**
ELSE : **Actor's grievance**′←80%·**Actor's grievance**+0.20

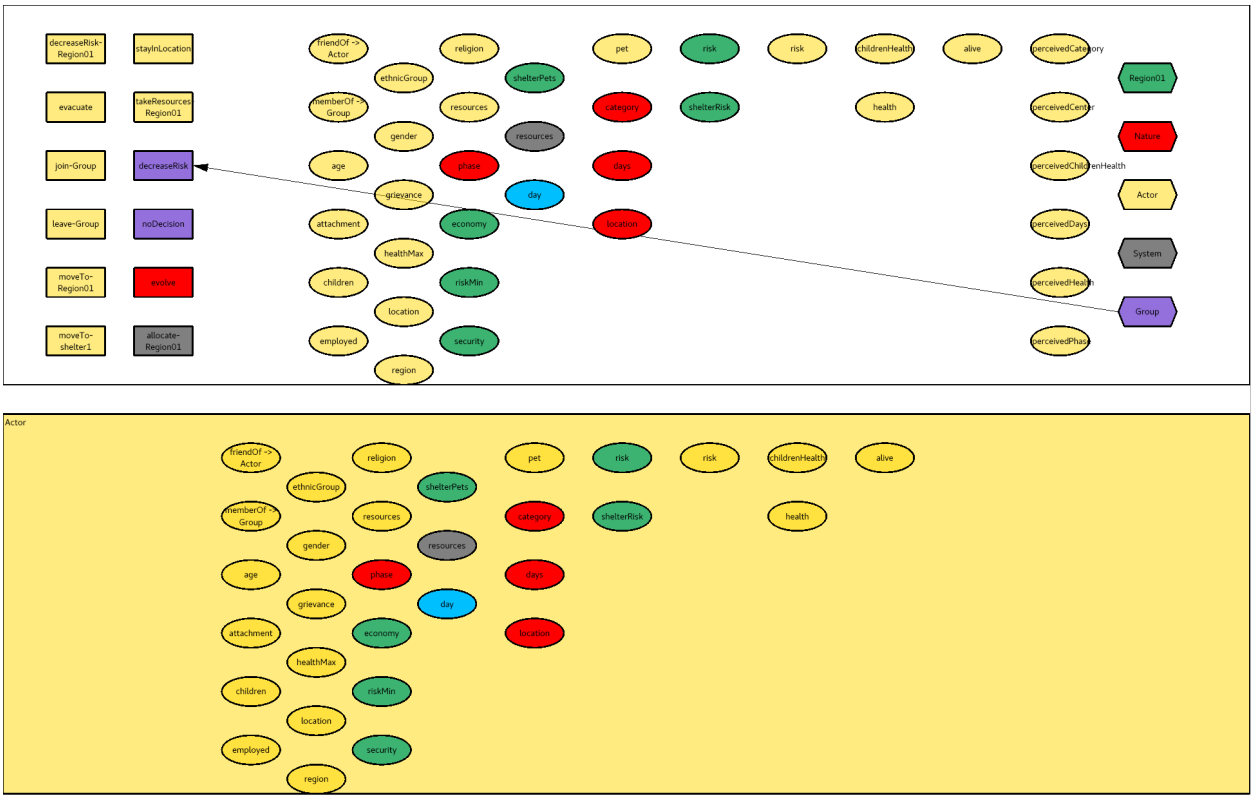
4.10.2 Effect on Region01's risk of System allocate Region01

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

4.10.3 Effect on System's resources of System allocate Region01

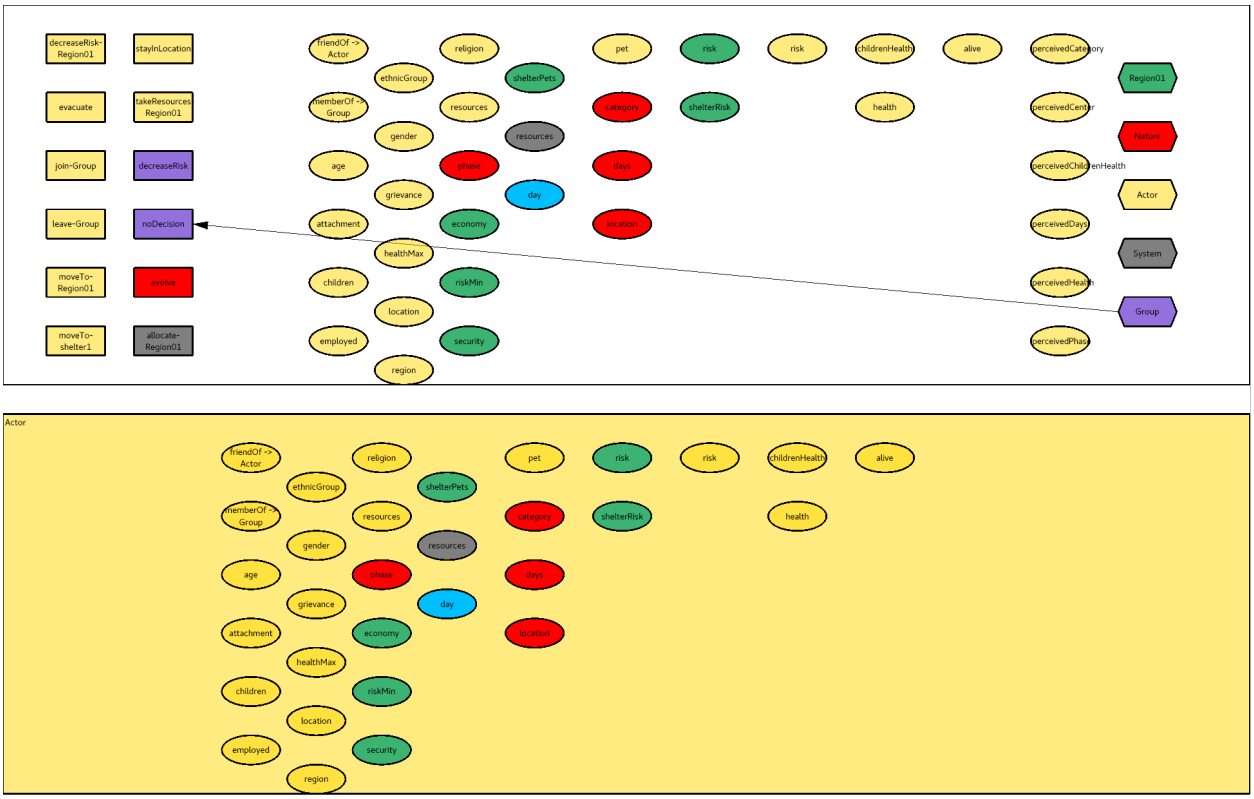
System's resources′←**System's resources**

4.11 Group decreaseRisk



psychsim/domains/groundtruth/simulation/group.py:31

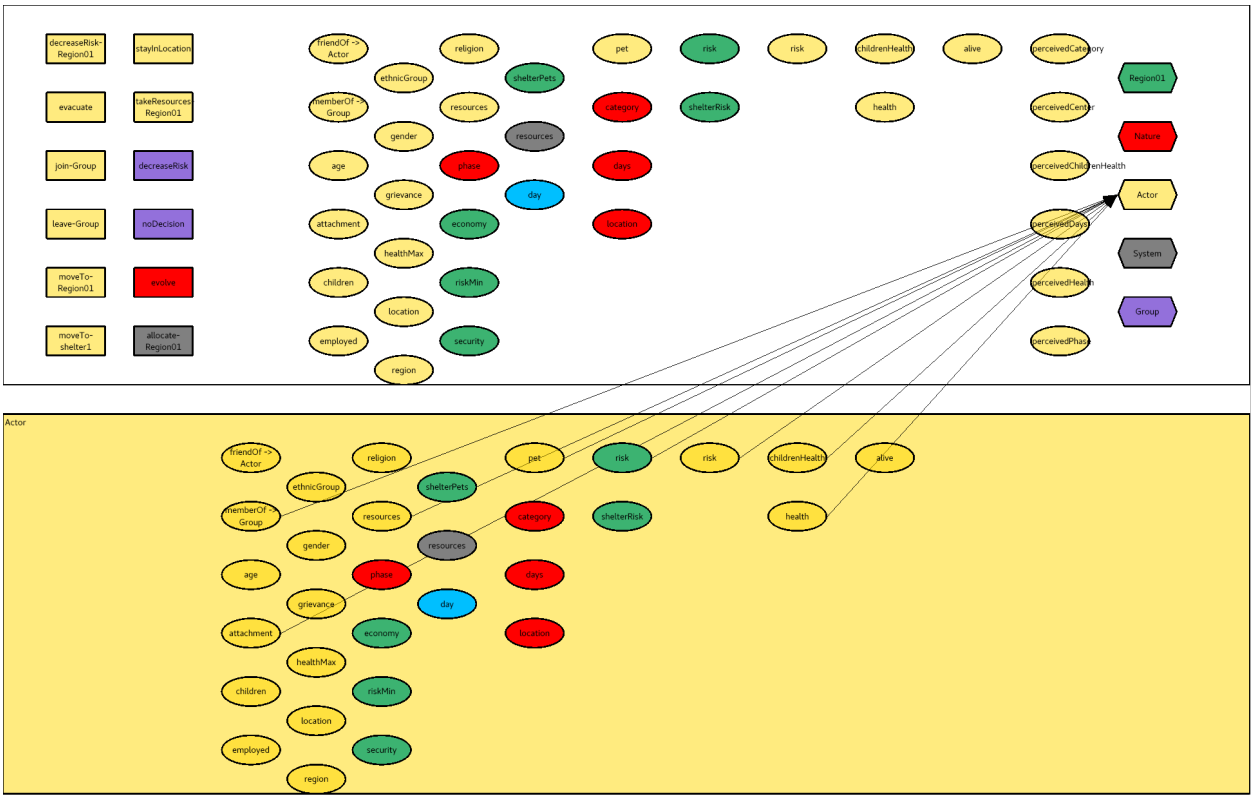
4.12 Group noDecision



psychsim/domains/groundtruth/simulation/group.py:59

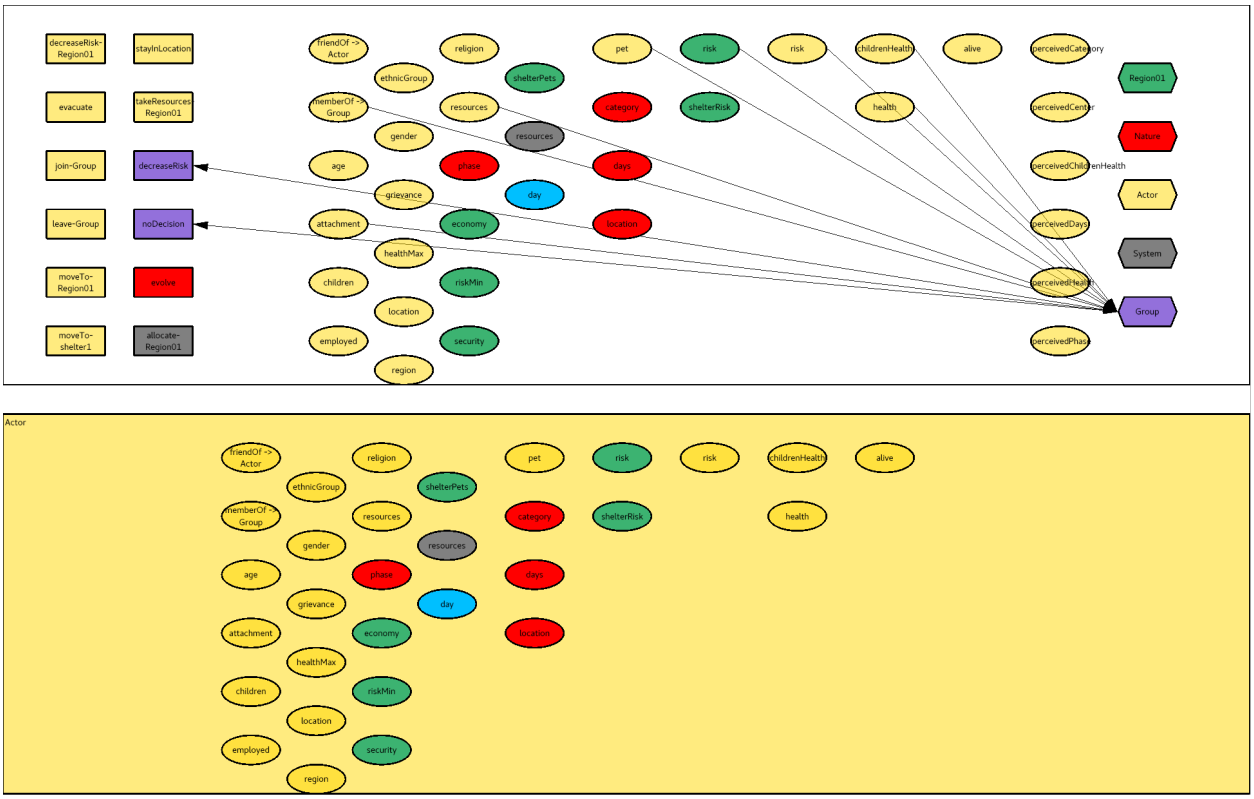
5 Expected Reward

5.1 Actor's Reward



IF **Actor's risk**>0.60
THEN : IF **Actor's attachment**=**anxious**
THEN : R←20%·**Actor memberOf Group**+60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**
ELSE : IF **Actor's attachment**=**avoidant**
THEN : R←-20%·**Actor memberOf Group**+60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**
ELSE : R←60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**
ELSE : R←60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**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**+60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**

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

THEN : R←-20%·**Actor memberOf Group**+60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**

ELSE : R←60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**

ELSE : R←60%·**Actor's childrenHealth**+**Actor's health**+40%·**Actor's pet**+80%·**Actor's resources**+-40%·**Region01's risk**