A Toy Model of Affect-like Role Modulation in Symbolic Reuse

Role-Qualified Modulation of Reuse Intensity and Source Re-alignment

Kostiantyn Osmolovskyi
Independent Researcher, Ukraine

Version 2.0, 2026

Abstract

This study presents a typed toy realization in which selected affect-like regulatory roles modulate two numeric control inputs of a fixed symbolic-reuse model without becoming identical to the symbolic trace, reuse, commit, or later-fidelity mechanisms it modulates. Each modeled step constructs a synthetic coherence-representation application, role-specific evidence, an evidence–representation alignment, a role-evidence gate, and an independent burden-like, threat-like, or relief-like role assessment. A role-local scalar weight is available only after a positive role application. Defined-negative roles contribute zero; an undefined role, failed evidence qualification, failed alignment, or positive role with undefined weight leaves modulation unresolved rather than silently neutral.

Two separate bridge equations produce a reuse-intensity input U_s^{mod} and a requested source-realignment strength G_s^{mod}. These quantities are then supplied to the specified symbolic-reuse core. Role applications cannot establish a source-reference basis, authorize trace or reuse, force a commit, or directly set preservation, reduction, distortion, or source-reference distance. Twenty-one structural consistency tests pass. Four 201×201 deterministic families examine burden/threat, relief/threat, burden/relief, and role-qualification/weight interactions. Three Monte Carlo strata of 20,000 generated episodes yield eligible symbolic-reuse roots in 47.92%, 72.08%, and 84.74% of cases. Among final reference-defined trajectories, RefDist = 1 occurs in 18.17%, 17.97%, and 17.63%. These results are properties of the declared toy equations, source laws, and standard positive trace/reuse route. They are not empirical estimates of affect prevalence, emotional intensity, reuse success, truth, correction, or universal affect–memory relations.

Keywords: affect-like role; symbolic reuse; burden-like organization; threat-like organization; relief-like organization; source re-alignment; symbolic trace; fidelity; toy model; cognitive architecture.

1 Analytic Target and Scope

Affect-like regulatory organization and symbolic reuse belong to different architectural layers. The affect-like framework distinguishes role-qualified burden-like, relief-like, threat-like, and attraction-like organization over established coherence-representation applications; the roles are partial, independently assessable, and not by definition emotions or feelings [1]. The symbolic-reuse model separately distinguishes later symbolic-form construction, source-reference grounding, trace, reuse, commit, and later source-relative fidelity [2]. The present model studies a narrow interface between these layers.

The computational target is not an "affect state" that directly determines a symbolic outcome. Instead, selected positive or defined-negative affect-like role applications are converted, under role-specific local weight contexts, into two numeric requests: one for the symbolic-reuse model's reuse-intensity input and one for the symbolic-reuse model's source-realignment-strength input.

All later symbolic statuses remain outputs of the specified symbolic-reuse route. Thus the current dependency is

$$\begin{aligned}&\text{synthetic coherence-representation application + role-specific evidence}\\&\quad\longrightarrow \text{evidence alignment / role evidence gate}\\&\quad\longrightarrow \mathrm{AffRole}_{r,s}\in\{0,1\}\text{ when defined}\\&\quad\longrightarrow \text{role-local weight application when }\mathrm{AffRole}_{r,s}=1\\&\quad\longrightarrow (U_s^{\mathrm{mod}},G_s^{\mathrm{mod}})\\&\quad\longrightarrow \text{specified symbolic trace/reuse/commit/reference route.}\end{aligned}$$

The model is a construction-level toy realization, not a measurement-validation study [3]. It does not provide a biological mechanism of affect, an emotion taxonomy, a clinical model, a theory of conscious feeling, or an empirical account of memory performance.

2 Role-Qualified Toy Realization

2.1 Joint step frame and synthetic coherence-representation application

For every modeled reuse step s, the symbolic-reuse root supplies a case/trajectory/step frame containing the root capture application, original source provenance, base reuse-intensity input U_s^{base}, base source-realignment request G_s^{base}, and independently supplied source-reference status. The present model separately constructs one synthetic coherence-representation application for the same modeled case and step. This is a declared construction premise compatible with the affect-like architectural interface; it is not inferred from the symbolic-reuse load proxy, later reference distance, or distortion status.

Three roles are modeled: burden-like, threat-like, and relief-like. Attraction-like organization remains outside this local simulation scope; its omission is not a negative attraction-like status.

2.2 Role-specific evidence and alignment

Each role uses its own evidence carrier. Burden-like evidence is represented by an explicit regulatory-condition evidence gate. Relief-like evidence uses an explicit easing/comparison evidence gate. Threat-like evidence additionally consumes a provenance-preserving directional record; a destabilization-directed value is required before the local threat criterion can be evaluated, but it does not itself establish a positive threat-like role.

For role r, evidence is aligned to the step's synthetic coherence-representation application by an explicit relation $\mathrm{EvAlign}_{r,s}$. Positive alignment requires agreement on the case, trajectory, step, and declared coherence-representation application identity. Evidence from the same clock step but attached to another coherence-representation application does not qualify merely by co-occurrence.

The evidence qualification gate is role-specific. Only after positive evidence qualification and positive evidence–representation alignment is the local role criterion evaluated. The simulation uses independent role-indexed coordinates

$$\rho_{r,s}^{\mathrm{toy}}\in[0,1]$$

with threshold 0.50:

$$\mathrm{AffRole}_{r,s}=1 \quad\Longleftrightarrow\quad \rho_{r,s}^{\mathrm{toy}}\geq 0.50$$

on the eligible domain. Lower values give a defined negative role. By contrast, a failed or undefined evidence gate leaves AffRole undefined rather than negative.

2.3 Positive role applications and local weights

A positive role application retains the coherence-representation application, evidence, alignment, role-evaluation context, and role status. Only this positive application is eligible for a role-local scalar weight

$$w_{r,s}^{\mathrm{toy}} \in [0,1].$$

The burden, threat, and relief weights share a convenient numeric codomain but are not thereby one calibrated affect-intensity scale. In particular,

$$w_{\mathrm{bur}} = w_{\mathrm{thr}} \not\Rightarrow \text{equal affective magnitude.}$$

A positive role may carry a defined zero weight. This is provenance-distinct from a defined-negative role even when both contribute zero numerically.

Role evaluation is then aligned to the symbolic-reuse step through a separate relation:

$$\mathrm{RoleStepAlign}_{r,s}\,.$$

Positive alignment requires the same role identity, role context, case, trajectory, step, and root capture application. For a positive role, the positive role application and any role-local weight application must also trace to that exact aligned role-evaluation record. A role assessment belonging to another role or root cannot silently modulate the current reuse trajectory.

For each role, define the bridge contribution

$$c_{r,s} = \begin{cases} 0, & \mathrm{AffRole}_{r,s} = 0 \text{ and role–step alignment is positive,} \\ w_{r,s}^{\mathrm{toy}}, & \mathrm{AffRole}_{r,s} = 1 \text{ with defined aligned weight,} \\ \text{undefined}, & \text{otherwise.} \end{cases}$$

No undefined role, alignment, or weight is recoded as zero.

3 Two Independent Modulation Bridges

3.1 Reuse-intensity request

The first local modulation bridge is

$$U_s^{\mathrm{mod}} = \mathrm{clip}_{[0,1]}\left(U_s^{\mathrm{base}} + 0.25c_{\mathrm{bur},s} + 0.30c_{\mathrm{thr},s} - 0.20c_{\mathrm{rel},s}\right).$$

U_s^{mod} occupies only the numeric reuse-intensity input slot. It is not a reuse authorization, trace probability, action tendency, or universal measure of urgency.

3.2 Requested source-realignment strength

The second bridge is

$$G_s^{\mathrm{mod}} = \mathrm{clip}_{[0,1]}\left(G_s^{\mathrm{base}} + 0.30c_{\mathrm{rel},s} - 0.20c_{\mathrm{bur},s} - 0.25c_{\mathrm{thr},s}\right).$$

This value is only a requested numeric source-realignment input. The independently supplied source-reference basis $\mathrm{GroundRef}_s$ remains authoritative:

$$G_s^{\mathrm{eff}} = \begin{cases} G_s^{\mathrm{mod}}, & \mathrm{GroundRef}_s = 1, \\ 0, & \mathrm{GroundRef}_s = 0, \\ \text{undefined}, & \mathrm{GroundRef}_s \text{ undefined.} \end{cases}$$

Thus a positive relief-like role with a large local weight cannot create a grounding basis. Likewise, a positive G_s^{mod} is not truth access, successful correction, renewed manifestation, or empirical validation.

3.3 Integration with the symbolic-reuse model

Once all three modeled role slots are determinate and the two modulation bridges are defined, the resulting sequences $U_{1:S}^{\mathrm{mod}}$ and $G_{1:S}^{\mathrm{mod}}$ are supplied to the specified symbolic-reuse core. The modulation layer does not redefine the symbolic-reuse recurrence or the later symbolic route. The symbolic-reuse model remains responsible for proposal formation, symbolic-form qualification, SymTrace, SymReuse, commit, RefPres, RefRed, RefDist, and D^{ref}.

Consequently,

$$\mathrm{AffRole}_{r,s} = 1 \not\Rightarrow \mathrm{SymTrace}_s = 1, \qquad \mathrm{AffRole}_{r,s} = 1 \not\Rightarrow \mathrm{SymReuse}_s = 1,$$

and no role application creates a fresh later symbolic-capture application. Positive roles alter only the declared numeric control requests under the local bridge equations.

4 Definedness and Structural Consistency Checks

The model keeps apart: missing coherence-representation application, failed evidence qualification, failed evidence alignment, defined-negative role, positive role, undefined weight, positive role with zero weight, failed role–step alignment, undefined modulation, source-reference status, trace, reuse, commit, and later reference assessment.

The implementation includes twenty-one structural consistency tests, all of which pass. Representative cases include:

- Test 4 shows that a negative burden evidence gate leaves the burden role undefined rather than producing $\mathrm{AffRole}_{\mathrm{bur}} = 0$.
- Test 7 gives a positive burden-like application with $w_{\mathrm{bur}} = 0$; the resulting numeric controls equal the base controls while the positive-role provenance remains present.
- Test 9 shows that the required threat-directed sign is insufficient for a positive threat-like role when the local threat criterion is negative.
- Test 10 permits simultaneous positive burden-like, threat-like, and relief-like applications and yields $U^{\mathrm{mod}} = 0.80$, $G^{\mathrm{mod}} = 0.11$, followed by corresponding symbolic-reuse values $q_1 = 0.158$ and $D_1^{\mathrm{ref}} = 0.15$.
- Test 12 yields $G^{\mathrm{mod}} = 0.60$ while an independently negative source-reference basis keeps the symbolic-reuse model $G^{\mathrm{eff}} = 0$.
- Test 14 yields positive trace but negative reuse under an independently negative reuse gate; role positivity cannot authorize reuse.
- Test 20 gives different bridge outputs for equal numeric burden and threat weights, confirming that the role-local weights do not form one common calibrated scale.
- Test 21 shows that three defined-negative roles are numerically equivalent to a direct symbolic-reuse run at the same base controls.

Additional consistency checks verify detached coherence-representation evidence, detached role and root-capture lineage, detached role-weight lineage, positive-role/zero-weight provenance, the grounding boundary, and the absence of fresh later symbolic capture. These checks also pass.

5 Simulation Design

All deterministic families use endpoint-inclusive 201×201 grids and the specified twenty-step symbolic-reuse route.

S1: burden weight × threat weight
Both burden-like and threat-like roles are positive, relief-like is defined negative, and $U^{\text{base}} = 0.50$, $G^{\text{base}} = 0.30$.

S2: relief weight × threat weight
Relief-like and threat-like roles are positive, burden-like is defined negative, with the same base controls.

S3: burden weight × relief weight
Burden-like and relief-like roles are positive, threat-like is defined negative.

S4: burden qualification × burden weight
The burden evidence gate is positive while ρ_{bur} crosses the fixed 0.50 role threshold. This family separates a defined-negative burden role from a positive role with zero local weight.

The three Monte Carlo strata contain 20,000 generated episodes with one, two, or three perceptual blocks. The exact sampling order and seeds are fixed in the design. Standard role evidence, alignments, source-reference basis, trace context, reuse context, and reuse gate are positive by construction; no arbitrary probabilities of evidence failure, grounding failure, or reuse failure are injected. Such definedness cases are exercised separately by the structural consistency tests.

The role criterion coordinates and weight candidates are sampled independently on $[0, 1]$ under a uniform law. Hence an approximately one-half positive-role fraction follows directly from the declared threshold and sampling law; it is not an estimate of burden, threat, or relief prevalence in cognitive systems.

6 Results

6.1 Deterministic role-interaction surfaces

S1 combines two locally reuse-increasing/source-realignment-reducing bridge directions. Across the grid, final RefDist = 1 occurs in 69.64% and RefPres = 1 in 20.80%. The mean final load is 0.684 and the mean final protected-pair reference distance is 0.570. These percentages characterize the declared two-weight surface, not population rates.

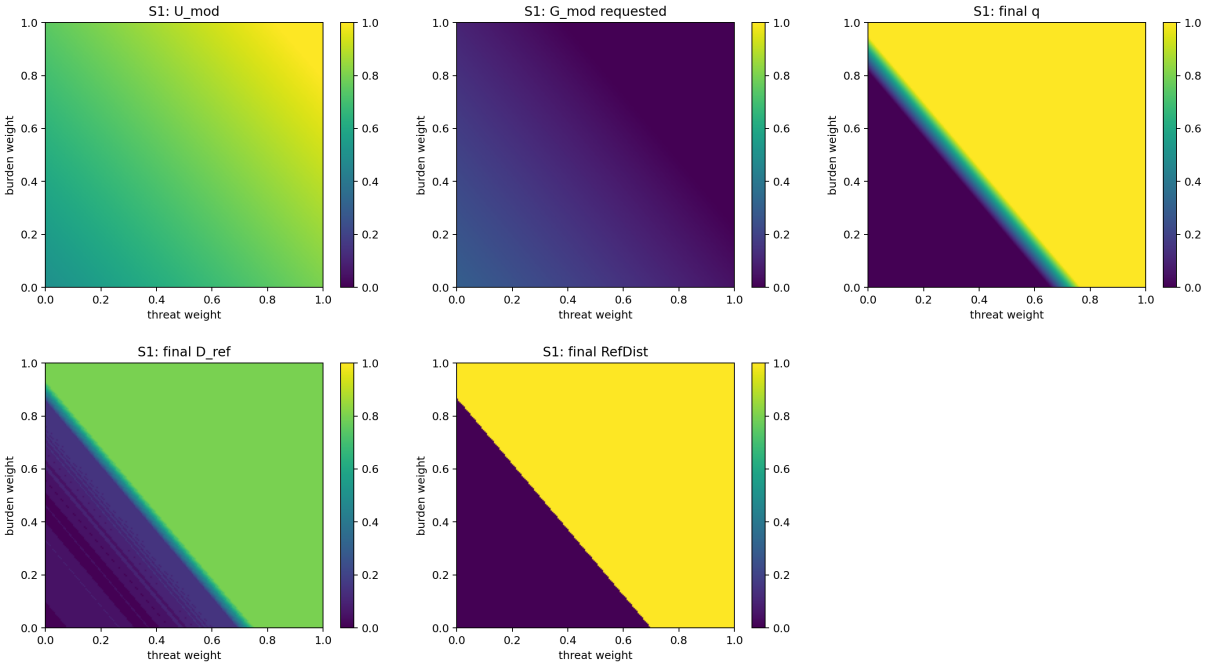


Figure 1: S1: burden-weight × threat-weight. The panels keep the two modulation control requests, final symbolic load, final source-reference distance, and RefDist separate. Horizontal axis: threat weight. Vertical axis: burden weight.

S2 places the locally counteracting relief and threat bridges on separate axes. Final RefDist = 1 occupies 4.26% of the grid and RefPres = 1 occupies 92.16%. The low-distortion region follows from the specified local coefficient orientations and fixed base conditions; it is not a general theorem that relief-like organization preserves symbolic fidelity.

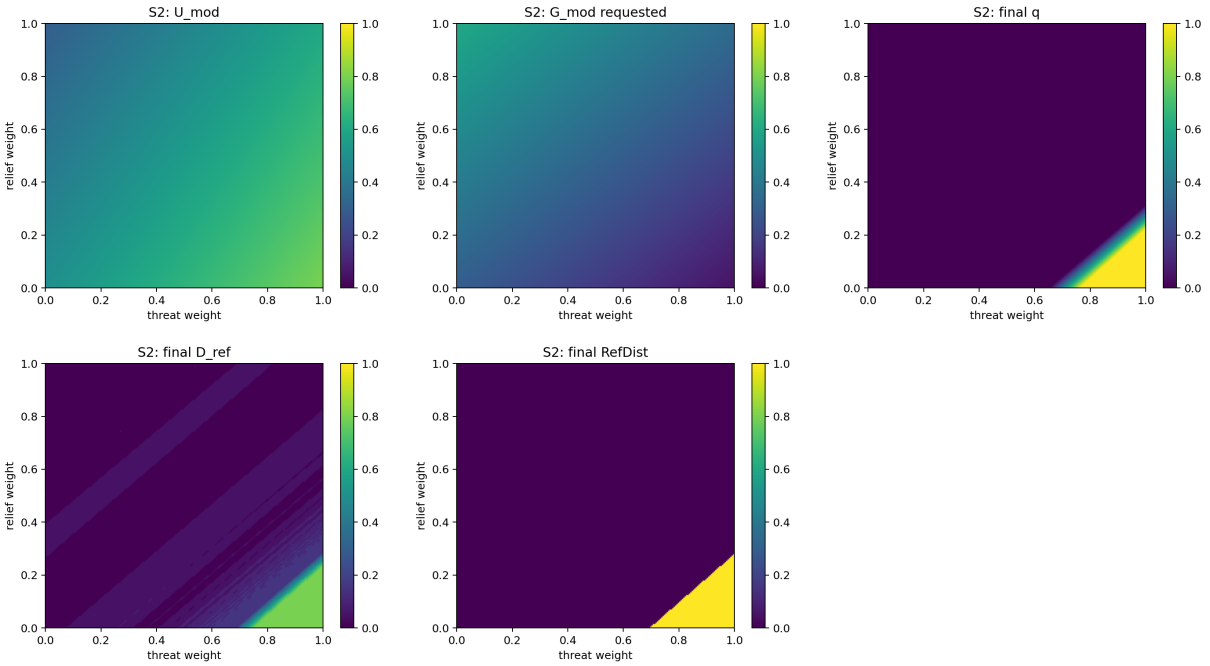


Figure 2: S2: relief-weight × threat-weight. Relief reduces the local U request and increases the local G request in this toy bridge, while threat has the opposite coefficient signs.

S3 combines burden-like and relief-like modulation. Final RefDist = 1 occurs in only 0.72%

of the declared grid, whereas RefPres = 1 occurs in 97.14%. Again, the result belongs to these coefficients and this fixed symbolic-reuse route.

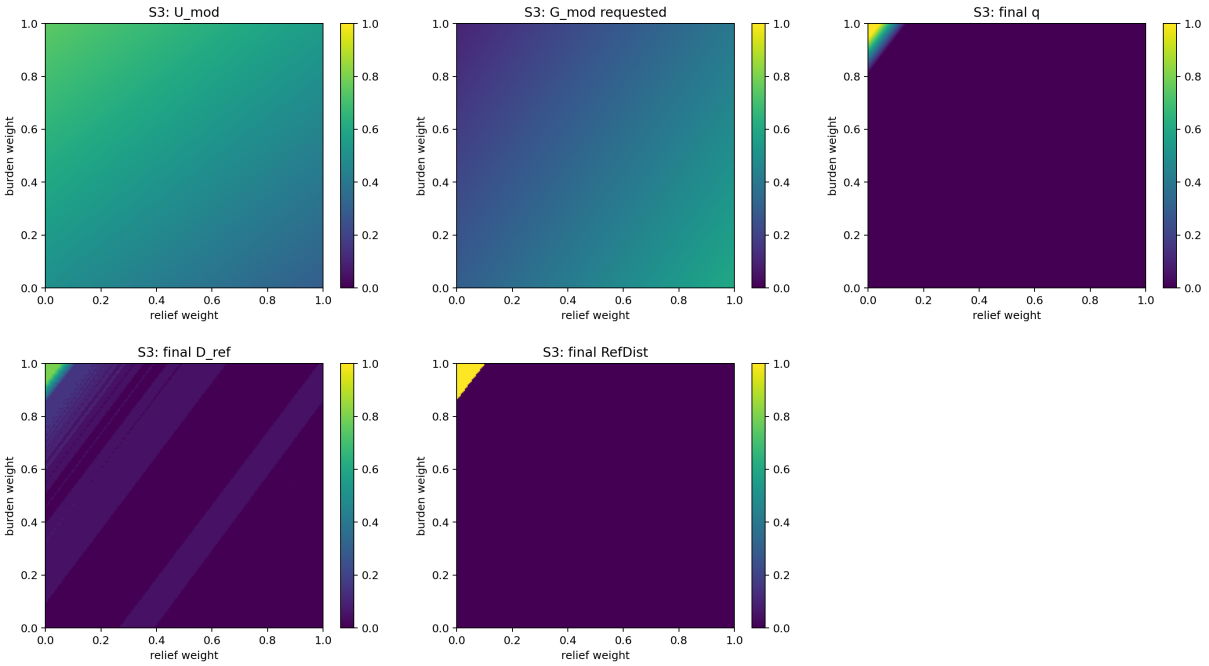


Figure 3: S3: burden-weight × relief-weight. The control surfaces and later symbolic-reuse outputs remain separate; no combined affective mode is introduced.

S4 exposes a different distinction. The burden role is defined negative in 20,100 cells and positive in 20,301 cells. Along 101 cells the burden role is positive with a defined zero weight. Those cells have the same numeric bridge contribution as a defined-negative role but retain different application provenance. Final RefDist = 1 occupies 6.75% of the full grid.

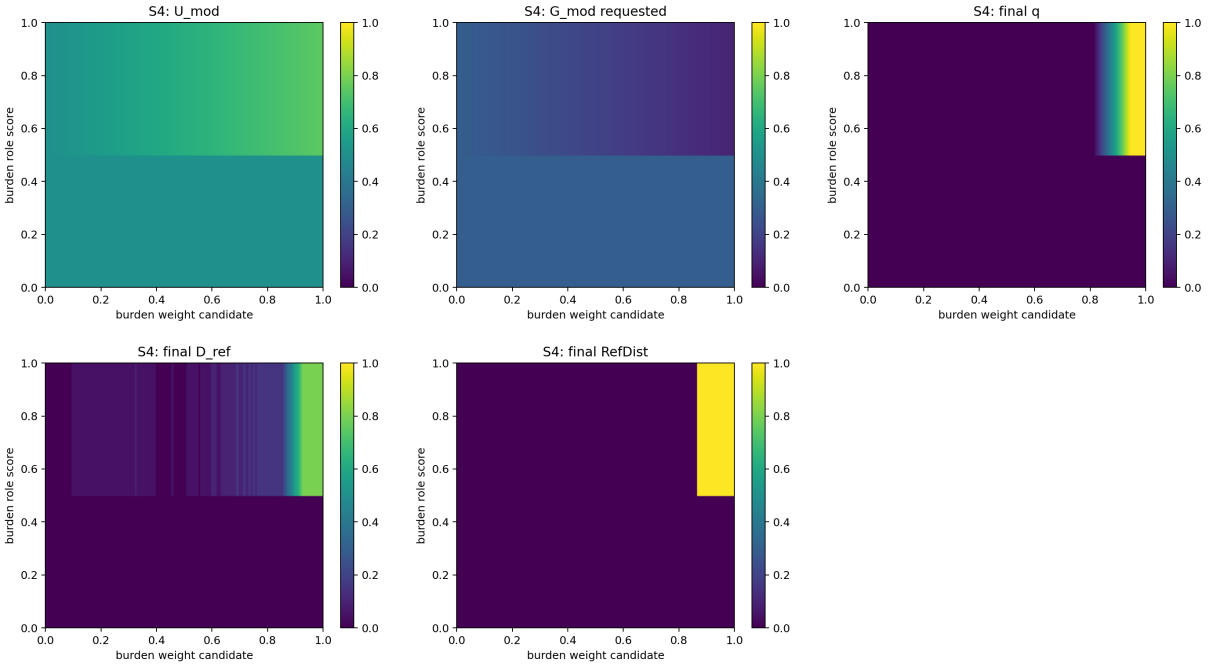


Figure 4: S4: burden role criterion $\rho_{\text{bur}} \times$ burden weight candidate. The horizontal weight candidate is unused while the role is defined negative. Above the fixed role threshold, it becomes an eligible role-local weight. The positive-role/zero-weight boundary is numerically neutral but provenance-positive.

6.2 Monte Carlo strata

The underlying symbolic-reuse route is eligible in 47.92% of MC-M1, 72.08% of MC-M2, and 84.74% of MC-M3. Conditional on an eligible root, every standard Monte Carlo case has defined modulation and completes the twenty-step symbolic-reuse route because evidence alignment, source-reference basis, trace/reuse provenance, and reuse gate are deliberately supplied as positive standard-route premises.

Among final reference-defined cases, the three strata yield:

Family	Generated	Eligible	Final ref.	RefPres +	RefRed +	RefDist +
S1	40,401	40,401	40,401	20.80%	100.00%	69.64%
S2	40,401	40,401	40,401	92.16%	100.00%	4.26%
S3	40,401	40,401	40,401	97.14%	100.00%	0.72%
S4	40,401	40,401	40,401	86.00%	100.00%	6.75%
MC-M1	20,000	9,584	9,584	78.41%	50.42%	18.17%
MC-M2	20,000	14,416	14,416	78.70%	46.43%	17.97%
MC-M3	20,000	16,948	16,948	78.83%	41.39%	17.63%

The deterministic rows are included in the same table for denominator transparency; their ‘Eligible’ counts are all 40,401.

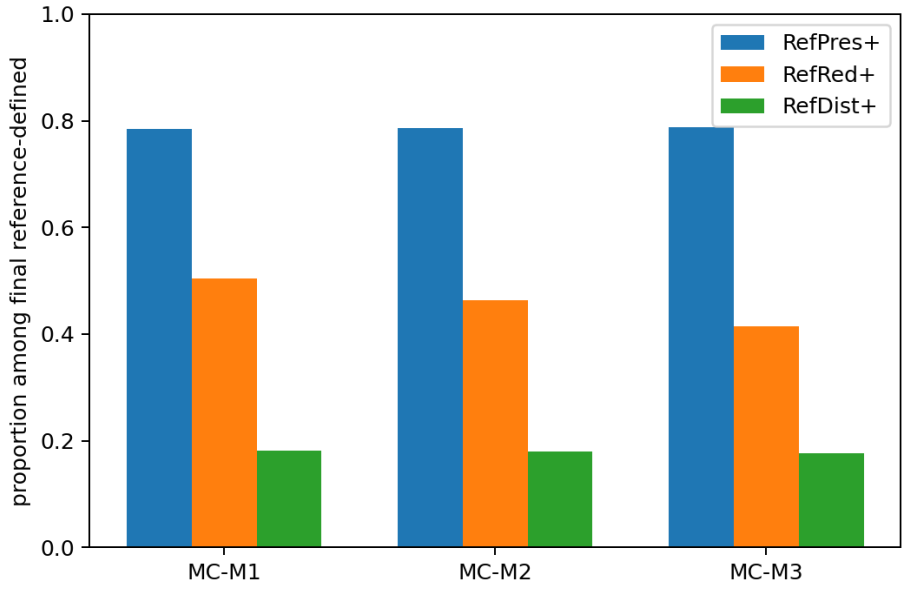


Figure 5: Final source-reference statuses in the three Monte Carlo strata, conditional on a final reference-defined trajectory. The plotted proportions are properties of the declared sampling laws and standard route, not empirical prevalence estimates.

Because the three role criteria are sampled independently, all eight positive/negative role patterns occur in each stratum. The pattern with positive burden and threat but negative relief has the largest RefDist fraction among the eight patterns: 37.89%, 37.86%, and 35.82%. By contrast, the pattern with relief positive and burden/threat negative yields 2.58%, 2.22%, and 2.82%. These conditional differences are expected from the declared bridge coefficients; they do not establish causal affective laws beyond the toy realization.

Role pattern	MC-M1 RefDist +	MC-M2 RefDist +	MC-M3 RefDist +
B0T0R0	9.86%	9.84%	11.78%
B0T0R1	2.58%	2.22%	2.82%
B0T1R0	27.62%	26.16%	25.70%
B0T1R1	12.63%	12.40%	11.52%
B1T0R0	22.25%	23.13%	22.74%
B1T0R1	9.86%	9.10%	9.34%
B1T1R0	37.89%	37.86%	35.82%
B1T1R1	23.15%	22.57%	21.46%

Here ‘B’, ‘T’, and ‘R’ denote burden-like, threat-like, and relief-like role positivity respectively; the digits are Boolean role statuses, not an ordinal affect code.

7 Interpretation and Architectural Boundaries

The model demonstrates a limited but useful compositional point. Affect-like role applications can be made computationally consequential without collapsing them into the objects whose control inputs they modulate. The burden/threat/relief layer supplies role-qualified local contributions. The modulation layer converts those contributions into two numeric requests. The symbolic-reuse model then independently determines whether the proposed later form is symbolically qualified, trace-linked, reuse-qualified, committed, and source-relatively preserved, reduced, or distorted.

This separation blocks several tempting inferences. Positive burden-like or threat-like organization does not imply symbolic reuse or distortion; positive relief-like organization does not imply source access or successful correction. A role weight is not an emotion-intensity measurement. Equal numerical weights across roles do not imply equal subjective magnitude. The model also does not identify burden with high symbolic load, relief with low source-reference distance, or threat with a later distorted endpoint; the role evidence is constructed independently of those symbolic-reuse outputs.

The third symbolic descriptor supplies another protected boundary. The symbolic-reuse model carries its omission status unchanged across the reuse trajectory. Therefore every completed modulated trajectory satisfies final RefRed = initial symbolic-reduction status in the present realization. This equality is a carry invariant by construction, not evidence that affect-like modulation cannot influence reduction in other models. The present model modulates only the two declared symbolic-reuse control inputs and does not add a mechanism that edits the third descriptor.

8 Reproducibility

The simulation design fixes the bridge coefficients, grid axes, episode counts, random seeds, sampling order, and denominator conventions used for the reported results. Deterministic analyses evaluate four endpoint-inclusive 201×201 families, and the Monte Carlo analysis evaluates three 20,000-episode strata under the declared sampling laws.

The implementation preserves explicit records for role evidence, evidence–representation alignment, role evaluation, role-local weighting, modulation outputs, and the downstream symbolic-reuse trajectory. Twenty-one structural consistency tests exercise undefined, defined-negative, positive-zero-weight, positive-weight, grounding, trace/reuse, and non-identity cases before the numerical analyses are evaluated. The reported figures and summary tables are generated from the same declared model equations and simulation design.

The computational materials accompanying the study provide the model definitions, simulation design, structural consistency checks, and numerical summaries required to reproduce the reported surfaces under the declared assumptions.

9 Limitations

The role-evidence layer is a synthetic construction. It does not establish that any observable biological or behavioral variable measures the corresponding affect-like role. The fixed 0.50 role criteria and identity scalarizations are local toy choices. The selected coefficient orientations are not laws of the affect-like framework. Other compatible bridges could produce different quantitative surfaces.

The simulation models only burden-like, threat-like, and relief-like roles. It does not model attraction-like organization, cross-role calibration, emotional episodes, conscious feelings, action selection, or role persistence as one application through time. Constant role scores or weights across a trajectory generate new step-specific role applications at each step.

The Monte Carlo strata intentionally omit random evidence failure, grounding failure, trace failure, reuse failure, and parameter uncertainty. Their role-pattern and fidelity frequencies therefore characterize only the declared positive standard route and source-generation law. No result should be interpreted as prevalence, clinical probability, memory-success rate, or an estimate of affective influence in real cognitive systems.

10 Conclusion

This study defines a typed toy interface between affect-like role organization and symbolic reuse. Burden-like, threat-like, and relief-like roles are realized through explicit coherence-representation, evidence, alignment, role, and weight applications. Their local scalar contributions alter two separately declared numeric control requests, while the specified symbolic-reuse core remains responsible for source-reference grounding, symbolic-form qualification, trace, reuse, commit, and later reference fidelity.

The simulations show that the selected role combinations can generate markedly different later source-relative fidelity regions under the declared bridge coefficients, while role positivity never becomes a shortcut to reuse, grounding, or distortion. Defined-negative roles, positive roles with zero weight, and undefined role states remain distinct. The resulting architecture therefore supports computational role modulation without turning affect-like organization into a global symbolic-state classifier or collapsing it into the symbolic-reuse layer.

References

[1] K. Osmolovskyi, *Architectural Conditions under which Coherence Representation Acquires Affect-like Organization*, Zenodo, 2026. DOI: 10.5281/zenodo.19857878.

[2] K. Osmolovskyi, *A Toy Model of Symbolic Reuse and Source-Relative Fidelity Change*, Zenodo, 2026. DOI: 10.5281/zenodo.20185844.

[3] K. Osmolovskyi, *Operationalizing Coherence-Related Manifestation in Cognitive Systems*, Zenodo, 2026. DOI: 10.5281/zenodo.20183831.