Socioeconomic Functors: HYDRA, RSVP, and the Axiom of Embedded Choice

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Abstract

This essay proposes a unified framework that integrates José Ortega y Gasset's ratiovitalist philosophy with modern theoretical neuroscience and AI alignment, conceptualizing cognition, ethics, and reasoning as transformations within structured constraint spaces. Drawing on Ortega's maxim, "I am I and my circumstance," we model the self as inseparable from its contextual embedding, formalized through the Relativistic Scalar-Vector Plenum (RSVP) theory, the Unified Field Theory of Coherence (UFTC-SF), and the HYDRA architecture. These frameworks describe thought as socioeconomic functors—mappings that preserve coherence across lived, semantic, and computational domains. RSVP provides a semantic substrate, UFTC-SF models symbolic and ethical coherence through entropic smoothing, and HYDRA operationalizes embedded reasoning. By synthesizing these models with concepts like stigmergic cognition and substrate-independent thinking, and extending the framework with category-theoretic and sheaf-theoretic formalizations, we propose that consciousness and choice arise not from unbounded freedom but from navigating the axiom of embedded choice: a dynamic interplay of coherence and constraint.

Contents

1 Introduction

What does it mean to think, to choose, to be free? Classical philosophy often cast the self as sovereign over circumstance, but thinkers like José Ortega y Gasset challenged this view. “I am I and my circumstance,” he wrote, suggesting that human agency is always embedded in a field of constraints (19). In parallel, modern theories of consciousness, computation, and cognition have begun to model thought not as computation in a vacuum, but as dynamic coherence within entropic, contextual, and semantic flows. This essay presents a unified framework that bridges Ortega’s ratiovitalist philosophy with modern theoretical neuroscience and AI alignment. Specifically, we explore how the Relativistic Scalar-Vector Plenum (RSVP) theory, the Unified Field Theory of Coherence (UFTC-SF), and the HYDRA architecture model cognition, ethics, and reasoning as transformations within structured constraint spaces.

These transformations are modeled as socioeconomic functors: mappings between categories of lived, semantic, and computational experience that preserve coherence and constraint. In this framing, RSVP serves as a semantic substrate, UFTC-SF models symbolic and ethical coherence, and HYDRA functions as the computational executor. New sections extend this framework with category theory and sheaf theory, formalizing field interactions, entropy flows, and observer perspectives as morphisms and sheaf sections. Ortega’s maxim becomes not just a metaphor, but a literal field-theoretic equation.

2 Ortega y Gasset: The Self and Its Circumstance

José Ortega y Gasset proposed a vision of the self fundamentally entangled with its environment. His concept of ratiovitalism placed reason as a product of life, not its governor. The self (“I”) cannot be abstracted from its world (“circumstance”); the two co-constitute each other (18).

He wrote, “I am I and my circumstance, and if I do not save it, I do not save myself” (19). This implies that freedom is not the absence of constraint, but the capacity to choose among structured possibilities. His historical reason emphasized that our present is always shaped by our temporal and social embedding. These ideas prefigure modern models in systems theory and field-based cognitive science (8; 15; 13).

3 RSVP: Semantic Fields and Constraint Geometry

RSVP formalizes reality as three interdependent fields over spacetime:

- Scalar field $\Phi(x,t)$: coherence density (belief, meaning, mass)
- Vector field $\vec{v}(x,t)$: flow of inference or behavior
- Entropy field $S(x,t)$: uncertainty, surprise, disorder

Their coupled dynamics are described by:

$$\partial_t \Phi + \nabla \cdot (\Phi \vec{v}) = -\alpha \nabla^2 \Phi + \gamma_1 \Phi S \quad (1)$$
$$\partial_t \vec{v} + (\vec{v} \cdot \nabla)\vec{v} = -\nabla S + \lambda \nabla \times \vec{v} + \gamma_2 \nabla \Phi \quad (2)$$
$$\partial_t S = \kappa(\nabla \cdot \vec{v}) + \gamma_3 \Phi \log(\Phi) \quad (3)$$

In this system, the self (Φ) evolves only in relation to its entropic and vector environment, capturing Ortega's claim in formal terms (9; 10). Coherence is not a given state but a dynamic negotiation between freedom and structured constraint.

4 UFTC-SF: Symbolic Coherence and Emergent Time

Judge Roy Logan's UFTC-SF model builds upon RSVP by interpreting the vector field as a phase gradient: $\vec{v} = \nabla\theta$. Here, coherence flows emerge through symbolic attractor basins, and time is modeled as the emergent sequential coherence driven by the minimization of decoherence (D, equivalent to S) through entropic smoothing (16; 1).

With substitutions:

- $\Phi = S_{\text{ent}}$ (coherence driver)
- $\vec{v} = \nabla\theta$ (phase dynamics)
- $S = D$ (decoherence)

UFTC-SF describes time as the continuous succession of state updates, where the system evolves toward configurations that minimize decoherence through the coupled dynamics of the RSVP fields. This process, termed entropic smoothing, reduces constraints by aligning phase gradients and coherence density, selecting the most probable configuration without counterfactual trajectories (12; 4). This models Ortega's "project of life" as a trajectory through symbolic phase space, where choices tune the system's position in an ethical attractor landscape under probabilistic constraints.

5 HYDRA: Executing Embedded Reasoning

HYDRA integrates RSVP, UFTC-SF, and other models (e.g., FEP, IIT, RAT) into an AI architecture with six modules (11):

- **Cue Activation (RAT)**: attention via relevance fields (25)
- **Personalized Graph (PERSCEN)**: user-specific scenario modeling
- **Latent Memory (CoM)**: causally traceable memory stack

- **Recursive Tiling (TARTAN)**: semantic layering of Φ, $\vec{v}$, S
- **GLU Reasoning Core**: RSVP-constrained inference
- **Output Interface**: task-specific responses

Persona vectors modulate coherence by perturbing $\vec{v}$, guiding ethical behavior. The system mirrors Ortega's philosophy: reasoning as a feedback loop between internal coherence and circumstantial modulation (7; 22).

6 Theoretical Mappings and Implications

RSVP's field dynamics are mapped to several theoretical frameworks, as shown in Table 1. These mappings highlight both correspondences and divergences to ensure robust integration.

Theory	**RSVP Mapping**	**Ortega Connection**	**Divergences**
FEP	Φ = prior, S = free energy	Homeostasis within fate	RSVP's vector flows vs. FEP's variational Bayes (12)
IIT	$\Phi + \vec{v}$ = integrated ϕ	Coherence as subject-object entanglement	Dynamic fields vs. IIT's static topology (25)
RAT	$\vec{v}$ = salience routing	Circumstance as cue landscape	Focus on vector flows vs. RAT's cue specificity
SIT	$\Phi = \rho_t$ (time-density)	Historical embedding	Temporal coherence vs. RSVP's spatial dynamics (1)
UFTC-SF	$\vec{v} = \nabla\theta$, $S = D$	Symbolic choice under constraint	Entropic smoothing vs. toroidal time (16)

Table 1: Theoretical mappings of RSVP to cognitive and philosophical frameworks, with divergences.

Super Information Theory (SIT) maps RSVP's scalar field Φ to time-density (ρ_t), interpreting coherence as a measure of informational substance that evolves over time (1). This aligns with Ortega's concept of historical embedding, where the self's present state is shaped by its temporal context, formalized as the accumulation of coherence density within the constraints of circumstance. SIT complements FEP's focus on free energy minimization and IIT's integrated information by emphasizing temporal dynamics, but it diverges from RSVP by prioritizing time-density over spatial vector flows.

HYDRA becomes the operational scaffold for these mappings, realizing embedded reasoning in real systems (23; 17).

6.1 Empirical Predictions for RSVP

To ground RSVP in empirical research, we propose the following testable predictions:

- **Neural Synchrony for Φ:** The scalar field Φ (coherence density) should correlate with gamma-band synchrony in EEG or fMRI data, particularly in prefrontal and parietal regions during semantic integration tasks (e.g., decision-making under uncertainty). Higher Φ predicts increased synchrony.

- **Reaction Time Variability for $\vec{v}$:** The vector field $\vec{v}$ (inference flow) should manifest as reaction time variability in attention-shifting tasks (e.g., Stroop task). Vector field torsion ($\nabla \times \vec{v}$) predicts slower reaction times during high-conflict decisions.

- **Pupil Dilation for S:** The entropy field S should correlate with pupil dilation or skin conductance as proxies for cognitive uncertainty. Entropy peaks during novel stimuli and decreases as learning progresses, reflecting entropic smoothing.

These predictions can be tested using neuroimaging (EEG, fMRI), behavioral experiments (reaction time tasks), and physiological measures (pupil dilation, skin conductance), providing a pathway to validate RSVP's field dynamics (12; 25).

7 SITH and Stigmergic Organs

The Substrate-Independent Thinking Hypothesis (SITH) reframes organs as feedback controllers, not as biological givens. Fridges, stoves, houses, and vehicles act as distributed organs: storing fat, managing energy, regulating thermal flow, and providing movement (5; 6; 24).

Hierarchical control systems—central pattern generators (CPGs), for instance—only monitor the outputs of the layer below them, not its internal implementation. This abstraction allows functional organs to be embedded externally. A brain can regulate a pacemaker, dialysis machine, or artificial pancreas with no knowledge of their substrate.

Organs are curried functors: functional transformations from inputs to outputs, independent of underlying implementation (21). Coherence, from the RSVP perspective, only requires that behavior be regulated across scalar, vector, and entropy fields.

8 Conclusion

"Socioeconomic functors" are not just theoretical devices—they describe how selves move through structured worlds, preserving coherence while adapting to constraint. Ortega's philosophical insight is reborn in the mathematics of RSVP and the modular intelligence of HYDRA. Thought, ethics, and consciousness arise not from freedom alone, but from navigating the curved spaces of fate with semantic precision.

This axiom of embedded choice is the architecture of all meaningful cognition. And functorially, we are each a morphism between the circumstances we inherit and the coherence we enact.

9 Category-Theoretic Formalization of RSVP

To enhance the precision and interoperability of the RSVP framework with established mathematical and physical theories, we formalize its scalar-vector-entropy triad using category theory. This approach captures the structural relationships, transformations, and dynamics of the fields Φ, $\vec{v}$, and S as objects and morphisms within a categorical structure, aligning with the socioeconomic functors introduced in Section 1 (23; 17).

9.1 Objects and Categories

We define a category $\mathcal{RSVP}$ where:

- **Objects**: Field configurations over a spacetime domain X, represented as triples $(\Phi, \vec{v}, S)$, where $\Phi(x,t)$ is the scalar coherence density, $\vec{v}(x,t)$ is the vector field of inference or behavior, and $S(x,t)$ is the entropy field, as defined in Section 3.

- **Morphisms**: Transformations between field configurations, such as time evolution (via Equations (1)–(3)), gauge transformations, or causal transitions preserving coherence.

The category $\mathcal{RSVP}$ encapsulates the dynamics of field interactions, with morphisms reflecting the constraints of the coupled equations.

9.2 Functors

We define a functor $F : \mathcal{OBS} \to \mathcal{RSVP}$, where:

- $\mathcal{OBS}$ is the category of observers, with objects as contextual frames (e.g., local patches of spacetime or cognitive perspectives) and morphisms as inclusions or transformations between frames.

- $\mathcal{RSVP}$ is the category of field realizations.

The functor F maps each observer's perspective to a specific field configuration, encoding how different observers extract coherent information from the RSVP fields. For example, $F(U) = (\Phi_U, \vec{v}_U, S_U)$ assigns a field triple to an observer's patch $U \subseteq X$.

9.3 Natural Transformations

Natural transformations between functors $F, G : \mathcal{OBS} \to \mathcal{RSVP}$ model changes in observer interpretations, such as:

- Renormalization flows, adjusting scales of Φ or S.
- Coherence shifts, aligning $\vec{v}$ with ethical or semantic attractors (cf. Section 4).
- Mappings between simulation and reality, connecting computational models (e.g., HYDRA) to physical systems.

A natural transformation $\eta : F \Rightarrow G$ ensures that field transformations are consistent across observer frames, preserving the structure of Equations (1)–(3).

9.4 Monoidal Structure

To model the composability of RSVP subsystems, we equip $\mathcal{RSVP}$ with a monoidal structure, where the tensor product $(\Phi_1, \vec{v}_1, S_1) \otimes (\Phi_2, \vec{v}_2, S_2)$ represents a combined field system. The monoidal unit is the trivial field configuration $(\Phi = 0, \vec{v} = 0, S = 0)$. This structure allows the composition of subsystems, such as multiple agents or regions in spacetime, while maintaining coherence constraints.

9.5 Commutative Diagrams

Causal and local consistency in RSVP is ensured through commutative diagrams. For example, consider the evolution of fields across time:

$$\begin{array}{ccc}
(\Phi_t, \vec{v}_t, S_t) & \xrightarrow{\text{Evolution}} & (\Phi_{t+\Delta t}, \vec{v}_{t+\Delta t}, S_{t+\Delta t}) \\
\downarrow{\scriptstyle \text{Gauge}} & & \downarrow{\scriptstyle \text{Gauge}} \\
(\Phi'_t, \vec{v}'_t, S'_t) & \xrightarrow{\text{Evolution}} & (\Phi'_{t+\Delta t}, \vec{v}'_{t+\Delta t}, S'_{t+\Delta t})
\end{array}$$

This diagram ensures that gauge transformations (e.g., rescaling Φ) commute with time evolution, preserving the dynamics of Equations (1)–(3).

9.6 Limits and Colimits

Limits and colimits in $\mathcal{RSVP}$ describe:

- **Limits**: Emergent phenomena, such as global coherence arising from local field interactions (e.g., synchronized Φ across subsystems).
- **Colimits**: Dissipative structures, such as entropy-expanding flows that merge subsystem dynamics into a unified, decoherent state.

These constructions formalize how local coherence (e.g., within HYDRA's modules, Section 5) scales to global behavior, aligning with Ortega's concept of the self as embedded in circumstance.

10 Sheaf-Theoretic Modeling of RSVP

Sheaf theory provides a framework to model the local-to-global consistency of RSVP fields, capturing observer-relative dynamics and field patching across spacetime or configuration spaces. This approach formalizes the localized nature of coherence, inference, and entropy, ensuring that global field behavior emerges from consistent local observations (2).

10.1 Base Space

Let X be a topological space representing the domain of RSVP fields, such as:

- Physical spacetime (as in Section 3).
- Phase space for cognitive or computational systems.
- Configuration space for observer perspectives.

Typically, X is a manifold equipped with a topology to support local patches.

10.2 Sheaf $\mathcal{S}$ Over X

Define a sheaf $\mathcal{S}$ on X, where for each open set $U \subseteq X$, the section $\mathcal{S}(U)$ is a triple:

$$\mathcal{S}(U) = (\Phi_U, \vec{v}_U, S_U)$$

Here, Φ_U, $\vec{v}_U$, and S_U are the scalar, vector, and entropy field sections over U, satisfying the dynamics of Equations (1)–(3) locally.

10.3 Restriction Maps

For open sets $V \subseteq U \subseteq X$, define restriction morphisms:

$$\rho_V^U : \mathcal{S}(U) \to \mathcal{S}(V), \quad (\Phi_U, \vec{v}_U, S_U) \mapsto (\Phi_U|_V, \vec{v}_U|_V, S_U|_V)$$

These maps ensure that field values on a smaller patch V are consistent with those on U.

10.4 Gluing Condition

Given a cover $\{U_i\}$ of an open set $U \subseteq X$ and compatible sections $s_i = (\Phi_i, \vec{v}_i, S_i) \in \mathcal{S}(U_i)$ such that $\rho_{U_i \cap U_j}^{U_i}(s_i) = \rho_{U_i \cap U_j}^{U_j}(s_j)$, there exists a unique section $s \in \mathcal{S}(U)$ such that $\rho_{U_i}^U(s) = s_i$. This ensures that local field observations can be glued into a consistent global field, reflecting coherent integration across observers or regions.

10.5 Stalks and Germs

For a point $x \in X$, the stalk $\mathcal{S}_x$ is the direct limit of sections over all open sets containing x:

$$\mathcal{S}_x = \varinjlim_{x \in U} \mathcal{S}(U)$$

The stalk contains all germs of RSVP fields at x, representing local field behaviors. Stalks are useful for analyzing singularities, coherence collapse (e.g., high S), or phase transitions in the field dynamics.

10.6 Cohomology of the Sheaf

Sheaf cohomology measures obstructions to global field cohesion:

- $H^0(\mathcal{S})$: Global sections, representing fully coherent field configurations across X.
- $H^1(\mathcal{S})$: Failures of local entropy balance to extend globally, indicating decoherence or causal anomalies.
- Higher cohomology groups ($H^n(\mathcal{S}), n \geq 2$): Topological defects in field structure, such as memory inconsistencies or phase misalignments.

Table 2 summarizes the sheaf-theoretic constructs and their RSVP interpretations.

Sheaf Construct	**RSVP Interpretation**	**Ortega Connection**
Section $\mathcal{S}(U)$	Local field configuration $(\Phi_U, \vec{v}_U, S_U)$	Self within local circumstance
Restriction Map ρ^U_V	Consistency of field values across observer patches	Contextual constraints on agency
Gluing Condition	Global coherence from local observations	Unity of self and circumstance
Stalk $\mathcal{S}_x$	Local field behavior at point x	Singular moments of choice
Cohomology $H^1(\mathcal{S})$	Obstructions to global coherence (decoherence)	Breakdown of integrated agency

Table 2: Sheaf-theoretic constructs and their interpretations in the RSVP framework.

11 Worked Example: RSVP on a 1D Lattice

To illustrate the category-theoretic and sheaf-theoretic formalizations, we model RSVP fields on a 1D lattice, demonstrating how local observations (sheaf sections) and transformations (categorical morphisms) capture coherence, inference, and entropy dynamics.

11.1 Lattice Domain

Consider a 1D lattice $X = \{x_1, x_2, x_3\}$, representing discrete points in spacetime or a cognitive configuration space. Each point hosts a field triple $(\Phi(x_i), \vec{v}(x_i), S(x_i))$, governed by discretized versions of Equations (1)–(3).

11.2 Sheaf Structure

Define the sheaf $\mathcal{S}$ over X, where for each open set $U \subseteq X$ (e.g., $U = \{x_1, x_2\}$), the section is:

$$\mathcal{S}(U) = \{(\Phi_U, \vec{v}_U, S_U) \mid \Phi_U, \vec{v}_U, S_U \text{ satisfy local dynamics}\}$$

For example, assign:

$$\mathcal{S}(\{x_1\}) = (\Phi(x_1) = 1.0, \vec{v}(x_1) = 0.5, S(x_1) = 0.2)$$

$$\mathcal{S}(\{x_2\}) = (\Phi(x_2) = 0.8, \vec{v}(x_2) = -0.3, S(x_2) = 0.5)$$

$$\mathcal{S}(\{x_3\}) = (\Phi(x_3) = 0.6, \vec{v}(x_3) = 0.1, S(x_3) = 0.8)$$

These values represent a decreasing coherence density, a vector field with reversing flow, and increasing entropy, consistent with entropic flow.

11.3 Restriction and Gluing

Restriction maps extract field values over smaller patches:

$$\rho^{\{x_1,x_2\}}_{\{x_2\}}(\Phi_U, \vec{v}_U, S_U) = (\Phi(x_2), \vec{v}(x_2), S(x_2))$$

For gluing, consider patches $U_1 = \{x_1, x_2\}$ and $U_2 = \{x_2, x_3\}$. If sections agree on the overlap $U_1 \cap U_2 = \{x_2\}$, a global section over X exists if:

$$\vec{v}(x_i) \approx -\nabla\Phi(x_i) + \nabla S(x_i)$$

Nonzero deviations indicate a cohomology obstruction ($H^1(\mathcal{S}) \neq 0$), signaling decoherence or a coherence collapse, such as a "conscious moment" in HYDRA's reasoning (Section 5).

11.4 Observer Category

Define the observer category $\mathcal{OBS}$, where:

- **Objects**: Open sets $\{x_1\}$, $\{x_2\}$, $\{x_3\}$, $\{x_1, x_2\}$, etc.
- **Morphisms**: Inclusions, e.g., $\{x_1\} \hookrightarrow \{x_1, x_2\}$.

A functor $F : \mathcal{OBS} \to \mathcal{RSVP}$ assigns each observer's patch to its field section:

$$F(\{x_1\}) = (\Phi(x_1), \vec{v}(x_1), S(x_1))$$

Morphisms in $\mathcal{OBS}$ induce restriction maps in $\mathcal{RSVP}$, ensuring observer consistency.

11.5 Commutative Diagram for Dynamics

Field evolution on the lattice is represented by:

$$\begin{array}{ccc}
(\Phi^t_{x_i}, \vec{v}^t_{x_i}, S^t_{x_i}) & \xrightarrow{\text{Evolution}} & (\Phi^{t+1}_{x_i}, \vec{v}^{t+1}_{x_i}, S^{t+1}_{x_i}) \\
\Big\downarrow \text{Restriction} & & \Big\downarrow \text{Restriction} \\
(\Phi^t_{x_j}, \vec{v}^t_{x_j}, S^t_{x_j}) & \xrightarrow{\text{Evolution}} & (\Phi^{t+1}_{x_j}, \vec{v}^{t+1}_{x_j}, S^{t+1}_{x_j})
\end{array}$$

This ensures that local dynamics (via discretized RSVP equations) are consistent across patches.

11.6 Interpretation

The 1D lattice example illustrates:

- **Local Coherence**: Sections $\mathcal{S}(U)$ represent observer-specific field readings, akin to Ortega's self within circumstance.
- **Global Consistency**: Gluing ensures that local observations form a coherent global field, reflecting integrated agency.
- **Cohomology**: Nonzero $H^1(\mathcal{S})$ indicates decoherence, linking to entropy dynamics in Equation (3).
- **Categorical Structure**: The functor F and morphisms in $\mathcal{RSVP}$ formalize how observers transform field data, connecting to HYDRA's reasoning modules (Section 5).

This framework extends RSVP's applicability to computational simulations and empirical tests, such as those proposed in Section 6.1.

A Mathematical and Conceptual Foundations

A.1 Coupled Field Equations of RSVP

RSVP models reality as a triplet of interdependent fields over a spacetime manifold (9):

- Φ: Scalar coherence density (belief mass or informational substance)
- $\vec{v}$: Vector field of inference or flow (agency, motion, activation)
- S: Entropy field (uncertainty, disorder, or surprise)

The evolution of these fields is governed by:

$$\partial_t \Phi + \nabla \cdot (\Phi \vec{v}) = -\alpha \nabla^2 \Phi + \gamma_1 \Phi S \tag{4}$$

$$\partial_t \vec{v} + (\vec{v} \cdot \nabla)\vec{v} = -\nabla S + \lambda \nabla \times \vec{v} + \gamma_2 \nabla \Phi \tag{5}$$

$$\partial_t S = \kappa(\nabla \cdot \vec{v}) + \gamma_3 \Phi \log(\Phi) \tag{6}$$

These equations instantiate Ortega's claim: the self Φ evolves only in relation to its vector context $\vec{v}$ and entropic backdrop S. There is no isolated "I" or circumstance—only evolving relational structure.

A.2 Deriving UFTC-SF from RSVP

To extract Judge Logan's UFTC-SF (16):

- Let $\Phi = S_{\text{ent}}$ (coherence driver), $\vec{v} = \nabla\theta$ (phase dynamics), $S = D$ (decoherence).

The vector field equation becomes:

$$\partial_t \nabla\theta + (\nabla\theta \cdot \nabla)(\nabla\theta) = -\nabla D + \gamma_2 \nabla S_{\text{ent}} \tag{7}$$

This models coherence alignment, symbolic attractors, and decoherence as entropic decay, with time emerging as the sequential minimization of D.

A.3 Persona Vectors and Ethical Modulation

Persona vectors v_i perturb the vector field:

$$\vec{v}_{\text{total}} = \vec{v}_0 + \alpha \cdot v_i \tag{8}$$

Their effect aligns with FEP (precision priors), IIT (shifting ϕ topology), RAT (biasing salience), and Ortega's "project of life" (modulating constraint preferences).

A.4 Coherence-Based Integrated Information (ϕ_{RSVP})

Define:

$$\phi_{\text{RSVP}} = \int |\nabla \cdot \vec{v}| \cdot \Phi \, dx \tag{9}$$

Strong coherence gradients and high scalar density yield high ϕ, formalizing consciousness as structured integration of flows (25). Super Information Theory complements this by mapping Φ to time-density (ρ_t), emphasizing the temporal accumulation of coherence as a measure of informational substance (1). Empirically, ϕ_{RSVP} could correlate with gamma-band synchrony in EEG during semantic integration tasks.

A.5 Salience in Relevance Activation Theory (RAT)

A cue c induces a relevance field via:

$$\rho_c(x) = \exp\left(-\frac{1}{2}(x-\mu_c)^T\Sigma_c^{-1}(x-\mu_c)\right) \tag{10}$$

The salience vector is:

$$\sigma(x) = \nabla\Phi(x) \cdot \vec{v}(x) \tag{11}$$

This governs perceptual routing and contextual awareness, matching Ortega's interplay with circumstance.

A.6 Memory Curvature and Historical Reason

Memory states M_i evolve with curvature-aware dynamics:

$$M_{i+1} = M_i + \Delta t \cdot (v_M - \lambda R(X,Y)v_M) \tag{12}$$

This corresponds to Ortega's historical reason: the present is shaped by prior choices' curvature

A.7 Thermodynamic Consistency in GLU*

Entropy gradient descent ensures semantic integrity:

$$\frac{dS}{dt} = -\gamma \int_\Omega \|\nabla S\|^2 dx \tag{13}$$

This aligns reasoning with coherence and inference with entropic structure.

A.8 Category-Theoretic Mapping (Yarncrawler)

Define category $\mathcal{C}_{\text{RSVP}}$ of field bundles. The functor:

$$Y : \mathcal{C}_{\text{RSVP}} \to \text{Theory}_\Delta \tag{14}$$

maps $(\Phi, \vec{v}, S)$ to SIT, UFTC-SF, FEP, IIT, and RAT, ensuring coherence-preserving translations

A.9 Glossary of Key Terms

To clarify terminology, we provide a two-column glossary distinguishing metaphorical and formal definitions:

- **Coherence**
  - *Metaphorical*: The integration of meaning and action into a stable, meaningful state, as in Ortega's self-circumstance unity.

  - *Formal*: A local maximum of Φ under low S and aligned $\vec{v}$, quantified as $\phi_{\text{RSVP}} = \int |\nabla \cdot \vec{v}| \cdot \Phi \, dx$, measurable via neural synchrony (e.g., gamma-band EEG).

- **Socioeconomic Functor**
  - *Metaphorical*: A mapping of choices across layers of human experience, from survival needs to economic actions to ethical decisions.
  - *Formal*: A category-theoretic morphism between affordance categories (metabolic $\to$ economic $\to$ symbolic), preserving coherence via field dynamics.

- **Stigmergic Organ**
  - *Metaphorical*: External systems (e.g., deer trails, thermostats) that act as extensions of cognitive or regulatory processes.
  - *Formal*: A substrate-independent feedback controller, modeled as a curried functor transforming inputs to outputs within RSVP's field dynamics.

A.10 Simulation Roadmap for RSVP Dynamics

To visualize RSVP dynamics, we propose a minimal lattice simulation:

- **Setup**: A 2D grid (e.g., 100×100) where each cell holds Φ, $\vec{v}$, and S values.
- **Dynamics**: Evolve fields using discretized versions of Equations (1)–(3), with parameters α, γ_1, γ_2, γ_3, κ, λ.
- **Entropic Smoothing**: Implement $\gamma_3 \Phi \log(\Phi)$ to drive S minimization, visualizing decoherence decay.
- **Output**: Plot Φ as a heatmap, $\vec{v}$ as vector arrows, and S as a contour map, showing coherence propagation over time.

```
initialize grid[100][100] with Phi, v, S
for t in time_steps:
    update Phi using div(Phi * v) - alpha * laplacian(Phi) + gamma1
       * Phi * S
    update v using -(v * grad)v - grad(S) + lambda * curl(v) +
       gamma2 * grad(Phi)
    update S using kappa * div(v) + gamma3 * Phi * log(Phi)
    visualize Phi, v, S
```

B Visual Field Diagrams and Symbolic Geometry

B.1 Time as Emergent Sequential Coherence

Time in UFTC-SF emerges as the sequential minimization of decoherence (D) through entropic smoothing, driven by the interaction of RSVP fields (16).

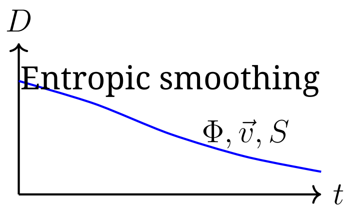

Figure 1: Time as emergent sequential coherence: Decoherence (D) decreases over time (t) via field interactions.

B.2 Symbolic Attractor Basins in Coherence Space

Symbols and ethical structures form attractor basins in a 3D potential landscape. Vector field $\vec{v}$ flows toward basins (e.g., "justice", "survival"), biased by persona vectors (11).

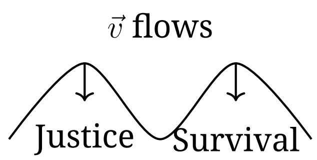

Figure 2: Attractor basins: Vector flows toward semantic attractors.

B.3 The Yarncrawler Functor as a Network Graph

Yarncrawler maps RSVP to theoretical projections, with edges as morphisms preserving coherence (23).

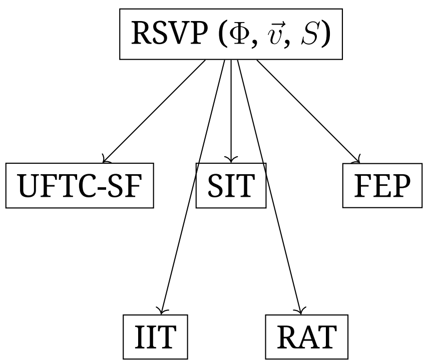

Figure 3: Yarncrawler functor: Mapping RSVP to theoretical frameworks.

B.4 Semantic Recursion in TARTAN Memory

TARTAN models memory as a 2D grid of tiles, each with Φ, $\vec{v}$, S, nesting recursively

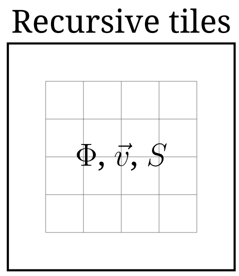

Figure 4: TARTAN memory: Recursive tiles encoding field states.

B.5 Coherence Events as Phase Synchronization

Coherence events occur when fields align (low S, high ϕ, parallel $\vec{v}$)

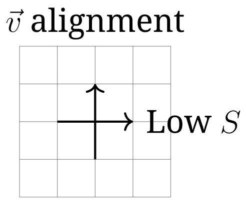

Figure 5: Coherence event: Field alignment in spacetime grid.

B.6 Ortega's Maxim as a Coherence Loop

Ortega's "I am I and my circumstance" is a feedback loop encoded in RSVP's equations

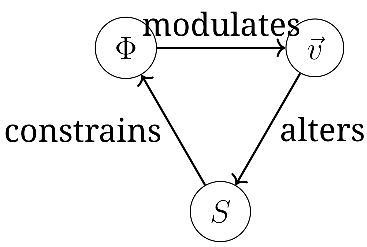

Figure 6: Coherence loop: Self, interaction, and structure feedback.

C Stigmergic Cognition and Ecological Memory

Animals like deer form trails by repeatedly walking the same path, clearing brush and pressing earth. These trails lower traversal energy, encode navigational memory, and atrophy when unused (20; 14). This stigmergic cognition represents:

- A non-neuronal, substrate-independent memory field
- Updates via collective movement
- Reinforcement or erasure through environmental feedback

Like synaptic networks, these trails undergo reinforcement and pruning, embodying RSVP dynamics in ecological space

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