Prime Articulation Theory (PAT)

Formal Experimental Specification and Replication Protocol

Status and Scope

This document is a **formal experimental specification**. It is not a theory paper, an interpretive essay, or a philosophical argument. Its sole purpose is to define, with sufficient precision, an experiment demonstrating that the prime set may emerge as a **self-sustaining coherence object** under structural constraints alone.

No symbolic prime tests, divisibility checks, or number-theoretic axioms are permitted. Any implementation that relies on such mechanisms is invalid relative to this specification.

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1. Structural Posture

1.1 Ontological Separation

The experiment enforces a strict separation between:

- **Structure** — silent, invariant constraints that do not act
- **Instantiation** — an active process that must articulate under constraint

The experiment does *not* assume primes as objects. It tests whether articulation under constraint *forces* prime-like emergence.

1.2 Claim Type

This experiment provides an **existence proof by construction**:

> There exists a non-symbolic process in which a prime-like set emerges as a stable, persistent object solely from coherence constraints.

No uniqueness, optimality, or completeness claims are made.

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2. State Space

The runtime system maintains the following minimal state variables.

2.1 Core State Variables

- **t** : discrete time step (integer)

- **A(t)** : current articulated value (real or quantized scalar)
- **H(t)** : articulation history (ordered list of past A values)

2.2 Structural Scalars

These are real-valued parameters constrained but not semantically interpreted.

- **P(t)** — pressure
- **K(t)** — panic
- **R(t)** — resonance
- **C(t)** — coverage

These variables must be continuous (floating-point or fixed-point). Boolean or symbolic representations are disallowed.

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3. Constraints

3.1 Pressure Constraint

Pressure increases monotonically when articulation fails to increase coverage.

Informal condition:

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if ΔC(t) ≈ 0:
    P(t+1) > P(t)
```

3.2 Panic Constraint

Panic increases when pressure exceeds local structural tolerance.

```
if P(t) > θ_P:
    K(t+1) = K(t) + f(P(t))
```

Panic must never directly generate articulation.

3.3 Resonance Constraint

Resonance measures alignment between current articulation and historical patterning.

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R(t) = g(A(t), H(t))
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The function g must be history-sensitive (non-Markovian).

3.4 Coverage Constraint

Coverage measures how much of the articulation space has been spanned *without repetition*.

Coverage must increase only when articulation introduces genuinely new structure.

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4. Articulation Rule

4.1 Necessity Condition

A new articulation **must** occur when:

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K(t) > θ_K
```

4.2 Articulation Selection

The next articulation A(t+1) is selected to:

- reduce panic
- preserve or increase resonance
- minimally increase coverage

No optimization toward numeric novelty or magnitude is allowed.

4.3 Invalid Articulations

Any articulation that:

- trivially composes past articulations
- collapses resonance to zero
- artificially resets pressure or panic

is invalid and must be rejected.

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5. Emergence Criteria

An articulated value **qualifies as prime-like** if and only if:

1. It cannot be expressed as a composition of prior articulations *under the experiment's allowed operations*
2. Its introduction produces a measurable drop in panic
3. It increases global coverage
4. It remains structurally relevant (continues to influence resonance)

No divisibility or factorization tests are permitted.

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6. Prime Set Objecthood Criteria

The emergent collection of prime-like articulations qualifies as an **object** if it satisfies:

- **Persistence**: remains stable across extended runtime
- **Non-derivability**: cannot be eliminated without collapse of coherence
- **Generativity**: enables further articulation
- **Closure**: admits extension without redefinition

These criteria are structural, not semantic.

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7. Termination and Freezing

7.1 Freezing Condition

A run may freeze when:

- panic is fully relieved
- resonance saturates
- coverage growth stalls

Freezing is *not failure*. It indicates over-resolution.

7.2 Continuation Condition

Continuation requires residual panic or unresolved pressure.

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8. Replication Requirements

Any valid replication must report:

- parameter ranges for P, K, R, C
- articulation history
- panic and resonance trajectories
- emergence points

Symbolic shortcuts invalidate results.

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9. Interpretation Discipline

This specification **does not** claim:

- that primes are linguistic
- that numbers are semantic
- that mathematics reduces to grammar

It claims only that **irreducible articulation under coherence pressure produces prime-like structure**.

All higher-level interpretations are downstream and optional.

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10. End of Specification

This document is complete when it is precise enough to be implemented and interrogated without reference to metaphor, authority, or interpretation.