PAZUZU 1.0 — LITE

Holographic Criticality Axiom Framework (essentials only).

Source: Pazuzu_1.0_FULL.pdf (user-supplied).

This lite edition keeps only the goal, stack, axioms, unified operator, control & governance essentials, core metrics, and the minimal test protocol.

Executive Highlights

GOAL: Maintain the dominant eigenvalue near zero ($\lambda_{dom} \approx 0$) while maximizing morphodynamic potential under governance.

STACK: $H^{crit} = H^{stab} + H^{obs}(\sigma(Q)) \cdot P(B) \cdot F$ (unified criticality operator).

CONTROL: RLA, DTC (PID), SEWP, PDM, Π-Lock, HLA, MDC, AMR, SSR.

METRICS: Criticality Index (CI), Aesthetic $A = N \cdot EP \cdot E$, coherence score, parity flips, spectral early-warning indicators.

PARADOX ENGINE: Stabilization at the edge seeds the very fluctuations that sustain the system.

Core Axioms (v0.7 Consolidated)

A1 — Recursive Criticality: eigenvalue flow dλ/dt = −α λ + β <Ψ|R_self|Ψ> + η; boundary attracts λ(T) -> 0.

A2 — Holographic Conservation: Boundary ledger current projects conservation into bulk: J_mu = ∂^nu[G(B) · G_{mu,nu}].

A3 — Coherence–Parity Switch: Π(t) = C · Π(t−τ); coherence thresholds trigger parity flips.

A4 — Morphodynamic Imperative: Maximize |∇_B E(B,Q,σ)| subject to λ ≈ 0 (ceiling).

A5 — Participatory Spectrum: epsilon_eff = sum_n [alpha_n Π(Q_n) G(B)] / (1 − Gamma_n Π(Q_n)).

A6 — Chronodynamic Consistency: Ψ(t) = F[Ψ(t−τ)] (fixed-point filter on histories).

A7 — Aesthetic Manifold: Optimize A = Novelty × EntropicPotential × Elegance on feasible λ ≈ 0 ridge.

A8 — Unified Operator: H_crit = H_stab + H_obs(σ(Q)) · P(B) · F; with spectral flow d|λ|/dt <= 0.

Unified Operator

Unified recursive eigen-problem (criticality engine):

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H_crit(t) |Psi(t)> = lambda(t) |Psi(t)>,    d/dt |lambda(t)| <= 0
```

Composition (A1+A2+A3+A5+A6):

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H_crit = H_stab[Psi, g(B)] + H_obs(σ(Q)) · G(B) + F[Psi(t-τ)]
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Interpretation: base stability + observation bands + boundary projection + delayed self-consistency drive λ to the origin without collapsing dynamics.

Control & Governance (Lite)

Control Stack (essentials):

• RLA: sets/feeds λ-target to zero (retro- or forward-damped).

• DTC (PID on β): gain-scheduled damping vs. overshoot; anti-windup; typical β clamps within a safe band.

• SEWP: spectral early-warnings (lag-1 autocorr, variance, low-freq power).

• PDM: phase-delay modulation (inject controlled phase-lag).

• Π-Lock: parity control; flip when coherence crosses threshold.

• HLA: holographic ledger budgets and logging.

• MDC / AMR / SSR: morphodynamic ceiling, aesthetic ridge following, single-step retro-reset.

Governance motifs: risk-tiered routing (sandbox -> shadow -> limited -> full), append-only governance ledger, anti-Goodhart comparability kernels.

Core Metrics

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CI = 1 - |Re(lambda_dom(tf))| / |Re(lambda_base(tf))|   (target >= 0.98)
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Aesthetic metric: A = N · EP · E (novelty × entropic potential × elegance).

Early warning near criticality: lag-1 autocorrelation -> 1, variance inflation; critical slowing down tau_relax = 1/|lambda_dom|.

Parity thresholds: example band theta in [0.55, 0.80]; phase-lag range phi_amp in [0.05, 0.20] (illustrative safe bands).

Morphodynamic ceiling: cap |∇S| relative to |λ| to avoid re-exciting instability while sustaining structure.

Minimal Test Protocol

Diagnostic Triplet (minimal proof-of-concept):

1) Lotka–Volterra with PID on β(t): measure damping vs. overshoot; enforce λ->0 at horizon.

2) Parity-Flip Diagnostic: log Π flips versus morphodynamic ceiling crossings.

3) Spectral Early-Warnings (SEWP): track λ->0, lag-1 autocorr->1, and variance inflation.

Signals of success: divergent tau_relax consistent with the λ->0 schedule; bounded closure with high coherence (~0.95).

Experiments & Analogies

Analogical grounding:

• Lotka–Volterra thermostat: $\lambda_{1,2} = \pm i * \sqrt{\beta \delta P^* R^*}$; imposing $\lambda_{final} \to 0 \Rightarrow \beta(tf) \to 0$;

PID tunes critical damping vs. overshoot.

• Digital thermostat analogy: sensor <-> P, actuator <-> R, gain <-> β(t).

• Continuous QEC frame: syndrome-like steering near $\lambda \approx 0$.

• Swarm/oscillator locks: local gradient nudges drive $\mathrm{Re}(\lambda) \to 0$.

v0.7 API — Compact Groups

Six groups (24 functions):

- IO: load, dump, import, export
- Ops: add, update, remove, get, search
- Policy: set, detect, isolate, override, sandbox
- Graph: graph, topo, cycles, impacts
- Metrics: metrics, snapshot, diff, timeline
- Eval: plan, evaluate

Metrics Snapshot

Axiom-level targets (illustrative from consolidated table):

A1 CI≈0.95, A2 CI≈0.89, A3 CI≈0.92, A4 CI≈0.96, A5 CI≈0.88, A6 CI≈0.87, A7 CI≈0.94, A8 CI≈0.98.

Coherence scores typically ~0.86–0.95 with bounded closure at the stability–fluctuation interface.