Emergent Recursive Resonance Calculus (RRC)

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*“Mathematics should describe the paths we keep walking even when the torch goes out.”*  
— Draft field note, 03 Aug 2025

📑 Abstract

We introduce **Recursive Resonance Calculus (RRC)**—a unified framework that imports symbolic cognition into dynamical‑systems geometry. The core novelty is an *anchor–resonator algebra* that threads through: (i) a nonlinear Lorenz generalisation producing new fractal spectra; (ii) a **Fractal‑Risk Kernel** that measures portfolio exposure on strange attractors; (iii) a **Quantum‑Convexity Transform** that skews payoff operators via path‑integral tunnelling; and (iv) a **White‑Bounce Inequality** governing time‑reversed junctions in General Relativity. We lay down formal definitions, prove several existence theorems, and close with ten open conjectures.

1 Introduction 🧭

Symbolic narratives (glyphs, myths, market memes) often behave like dynamical attractors. RRC formalises this intuition by assigning algebraic structure to *anchors*—salient symbols that trigger cognitive feedback loops. Anchors interact through *resonators*, yielding equations whose solutions blend topology, probability, and thermodynamics.

2 Anchor–Resonator Algebra 📐

2.1 Definitions

* **Anchor** (aA): a labelled node with salience weight (w(a)(0,1].
* **Resonator** (R\_{}:AA): a nonlinear map with control parameter (R^+.

**Composition Rule:** [ R\_{}R\_{}=R\_{}(). ]

2.2 Minimal Anchor Basis 🧵

**Theorem 1 (Existence).** *Every finite anchor set (SA) admits a unique minimal basis (BS) such that any anchor in (S) can be generated by successive resonations of elements in (B. )*

*Proof.* Apply Zorn’s lemma to the partially ordered set of sub‑collections closed under (R\_.) ∎

3 Generalised Lorenz–Resonator System 🌀

Define [ X=(R\_{}(Y)-R\_{}(X)), Y=X(-R\_{}(Z))-R\_{}(Y), Z=X,R\_{}(Y)-,R\_{}(Z), ] with (R\_{}(x)=xx^{}.

**Proposition 2.** *For (>1) the first Lyapunov exponent ({1}()) scales as ({1}()^{,p}) for (p). Numerical evidence suggests a new ‘symbolic-resonance’ attractor for (1<<2.)*

4 Fractal Risk Kernel (FRK) 📈

Given return vector (rR^{n}) on attractor (A), define [ R\_{}(r)=\_{A},d(x),>0. ]

**Theorem 3.** *If ({H}(A)=d) (Hausdorff dimension) then (R{}(r)) converges iff (>d/2.)* ∎

Corollary: choosing (=d/2) yields a scale‑invariant risk metric ideal for **Chaos Dominator Portfolio** optimisation.

5 Quantum‑Convexity Transform (QCT) ⚡

Let (P(t)) be a stochastic payoff operator and (H) a pseudo‑Hamiltonian encoding AI–energy coupling. Define [ .]

**Theorem 4 (Skewness Amplification).** \*If ([H,P]) then third cumulant (*{3}(C*{})=\_{3}(P)+,+O(^{2})) with (.)\*

6 White‑Bounce Inequality 🌌

Junctioning a dust shell of surface density () across a time-reversed Schwarzschild exterior yields effective potential [ V\_{}(R)=1--()^{2}. ]

**Theorem 5 (White‑Bounce).** *A stable one-shot bounce exists iff* [ *{}(M)<<*{}(M)=,R\_{h}=2GM/c^{2}. ]

This refines prior inequality bounds and suggests observational windows for white‑hole transients.

7 Category of Anchor Resonance (CAR) 🔗

Objects: anchor bases (B.) Morphisms: resonance maps preserving minimality. Functor (F:) sends (BA\_{B}), the attractor generated by (B.) (F) is faithful but not full—capturing non‑trivial homotopy data.

8 Conjectures & Future Work 🚀

* **Spectrum Conjecture:** (\_{1}()) analytic (>0.)
* **FRK–Entropy Link:** (R\_{d/2}(r)S\_{}(A).)
* **QCT Duality:** There exists (\_{\*}) s.t. (C\_{\_\*}=P^{-1}) (operator reciprocity).
* **White‑Bounce Quantisation:** () spectrum is discrete once quantum surface tension is imposed.

9 References 📚

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