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 anchorresonator 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 anchorssalient symbols that trigger cognitive feedback loops. Anchors interact through resonators, yielding equations whose solutions blend topology, probability, and thermodynamics.

2 ANCHORRESONATOR 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:

RR=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.

3 GENERALISED LORENZRESONATOR SYSTEM

Define

=(R(Y)R(X)),

=X(R(Z))R(Y),

=XR(Y)R(Z),

with R(x)=x|x|^{1}.

PROPOSITION 2. For >1 the first Lyapunov exponent () scales as ()^{p} for p0.38. Numerical evidence suggests a new symbolic-resonance attractor for 1<<2.

4 FRACTAL RISK KERNEL (FRK)

Given return vector rRn on attractor A, define

R(r)=Arx^2 /(1+x^2)^d(x), >0.

THEOREM 3. If dim_H(A)=d then R(r) converges iff >d/2.

Corollary: choosing =d/2 yields a scaleinvariant risk metric ideal for Chaos Dominator Portfolio optimisation.

5 QUANTUMCONVEXITY TRANSFORM (QCT)

Let P(t) be a stochastic payoff operator and H a pseudoHamiltonian encoding AIenergy coupling. Define

= e^{H/}Pe^{H/}.

THEOREM 4 (Skewness Amplification). If [H,P]0 then the third cumulant ()=(P)++O(^{2}) with 0.

6 WHITEBOUNCE INEQUALITY

Junctioning a dust shell of surface density across a timereversed Schwarzschild exterior yields effective potential

V_eff(R)=12GM/R(M/4R^2)^2.

THEOREM 5 (WhiteBounce). A stable oneshot bounce exists iff

_min(M)<<_max(M)=M/(4R_h^2), R_h=2GM/c^2.

7 CATEGORY OF ANCHOR RESONANCE

Objects: anchor bases B. Morphisms: resonance maps preserving minimality. Functor F:CARFinAttractor sends BA_B. F is faithful but not fullcapturing nontrivial homotopy data.

8 CONJECTURES & FUTURE WORK

1. Spectrum Conjecture: () analytic for all >0.
2. FRKEntropy Link: R_{d/2}(r) S_Kolmogorov(A).
3. QCT Duality: * s.t. * = P^{-1}.
4. WhiteBounce Quantisation: spectrum is discrete once quantum surface tension is imposed.

REFERENCES

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