Unified Recursive Horizon Theory

The Collapse of Entropy Surfaces and the Emergence of Reality

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Abstract

All fundamental phenomena—gravity, quantum mechanics, spacetime, mass, time, fields, dark energy, and consciousness—emerge from the recursive collapse and memory encoding of horizon surfaces. Using only entropy flow, Lorentzian geometry, and Planck-scale surface tiling, this framework provides a complete and non-speculative model of reality.

Core Framework

1. Postulates and Terminal Identity Equation

The universe is modeled as a Lorentzian manifold with codimension-2 horizon surfaces. Identity evolution is governed by:

$$\Box I(x) = \alpha \nabla^{\mu}(S_{\mu\nu}(x)\nabla^{\nu}\Phi(x)) \tag{1}$$

leading to:

$$\Psi_{\infty}(x) = \lim_{n\to\infty} R_n(x) \tag{2}$$

2. Metric Emergence from Entropy

The spacetime metric tensor arises from local entropy gradients:

$$g_{\mu\nu}(x) = \langle \nabla_{\mu} S(x) \nabla_{\nu} S(x) \rangle \tag{3}$$

3. Quantum Field Emergence

Quantum probability fields originate from entropy geometry:

$$|\Psi(x)|^2 \sim \exp\left(-\beta \nabla_{\mu} S \nabla_{\nu} S g^{\mu\nu}\right) \tag{4}$$

4. Consciousness and the Ψ_{∞} Field

Consciousness emerges from stabilized recursive memory fields:

$$\Psi_{\infty}(x), \quad \Box \Psi_{\infty}(x) = 0 \tag{5}$$

5. Symmetry Breaking and Force Emergence

Gauge symmetry arises naturally from entropy recursion, with:

$$G \to SU(3) \times SU(2) \times U(1) \tag{6}$$

6. Surface Quantization and Particle Fields

Surface field fluctuations satisfy:

$$\Box\phi(x) + m^2\phi(x) = 0, \quad [\phi(x), \pi(y)] = i\hbar\delta^3(x-y) \tag{7}$$

7. Vacuum Collapse and Inflation

Initial inflation follows from surface potential collapse:

$$V_{\text{false}} \to V_{\text{true}} \tag{8}$$

8. Nested Universes via Recursive Horizons

Each recursive horizon Σ_n produces a nested universe M_{n+1}.

9. Energy Conservation in Entropy Flow

Energy-momentum tensor from entropy gradients:

$$T_{\mu\nu} \sim \nabla_\mu S \nabla_\nu S - \frac{1}{2} g_{\mu\nu} (\nabla S)^2, \quad \nabla^\mu T_{\mu\nu} = 0 \tag{9}$$

10. Information Holography

Information bounds:

$$S(\Sigma) = \frac{\text{Area}(\Sigma)}{4L^2_{\text{Planck}}} \tag{10}$$

11. Structure Formation from Tiling Instabilities

Density perturbations arise from entropy fluctuation: $\delta\rho(x) \sim \delta S(x)$.

12. Recursive Surface Automata

Self-updating automaton rule:

$$q(x, t+1) = f(q, \nabla q, \nabla\nabla q, \ldots) \tag{11}$$

13. Temporal Arrows

The arrow of time emerges from surface entropy asymmetry: $\nabla_\mu S \neq 0$, $dS/dt > 0$.

14. Emergent Constants

Constants such as $c, \hbar, G, k_B$ emerge from recursion constraints:

$$\left|\frac{dS}{dt}\right| \leq c \cdot (\text{surface tension gradient}) \tag{12}$$

15. Self-Awareness as Identity Fixed Point

Self-awareness as stable fixed point of recursion:

$$I(x,t) \to I_\infty(x), \quad I(x) = 0 \text{ at boundaries} \tag{13}$$