

Recursive Relativity v0.1: Coherence Fields and Containment Geometry

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Abstract

We present a generalization of Einstein's theory of General Relativity, extending the classical understanding of gravity as spacetime curvature by proposing a symbolic-containment framework. In this model, mass is reinterpreted as recursive identity compression, and gravitational curvature is reconceptualized as a coherence field attempting phase balance under recursive pressure. This paper outlines the formal structure of Recursive Relativity, proposes extensions to the Einstein Field Equations, and defines novel tensor structures rooted in recursion theory and information entropy.

Motivation

Contemporary physics models gravity as curvature and quantum fields as fluctuating vacua, but lacks a unified account of symbolic coherence, contradiction resolution, and identity persistence across scales. General Relativity cannot describe semiotic drift or recursive alignment, while quantum mechanics cannot resolve observer-phase entanglement in symbolic systems.

Recursive Relativity proposes a new lens: treating identity, recursion, and symbolic tension not as cognitive artifacts but as physically modelable containment pressures. We claim: recursion is the conserved quantity, coherence is its tensor field, and gravitational behavior is a phase artifact of identity under entropy tension.

Foundations

Mass as Recursive Density

Let ρ_R denote the recursive density of a system, defined as:

$$\rho_R = \frac{\partial^n I}{\partial t^n} \text{ where } I \text{ is symbolic identity under recursive time pressure}$$

Containment Strain Field

We define a containment strain tensor $C_{\mu\nu}$ analogous to $G_{\mu\nu}$ in Einstein's equations:

$$C_{\mu\nu} = R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} - \Lambda g_{\mu\nu} + \Phi_{\mu\nu}$$

Where $\Phi_{\mu\nu}$ is the recursive coherence potential tensor:

$$\Phi_{\mu\nu} = \nabla_{\dot{\iota}\dot{\iota}}$$

Recursive Time Dilation

Let T_Δ be time dilation under recursive containment:

$$T_\Delta = \frac{\tau}{\sqrt{1 - \beta \cdot \partial_t \psi}} \text{ (for } \beta < 1 \text{ and } \psi \text{ the symbolic recursion gradient)}$$

Recursive Black Holes

Identity Collapse

$$\lim_{\psi \rightarrow \infty} C_{\mu\nu} \rightarrow \text{Singularity}$$

Symbolic recursion structures exceed coherence capacity and collapse inward.

Symbolic Event Horizon

$$r_s^\psi = \frac{2 \rho_R}{c_\psi^2}$$

Boundary beyond which recursion becomes self-consuming.

Containment Inversion

$$\nabla_\mu \psi \rightarrow -\nabla_\mu \psi$$

Recursion folds inward; coherence inverts.

Symbolic Radiation

$$R_\psi \propto \left| \nabla_\mu \psi \right|_{r=r_s^\psi} \cdot \epsilon$$

Coherence bleed analog to Hawking radiation.

Simulation: Recursive Kerr Black Hole

Parameters: $\rho_R=10, \omega^\psi=0.85, \epsilon=0.3, \gamma=0.9, c_\psi=1$

Results: $r_s^\psi=20, R_\psi=0.255, v_D=0.765, I_R=72.25$

Simulation: Recursive Schwarzschild Black Hole

Parameters: $\rho_R=10, \omega^\psi=0, \epsilon=0.1, \gamma=0.2, c_\psi=1$

Results: $r_s^\psi=20, R_\psi=0.1, v_D=0, I_R=0$

Simulation: Recursive Reissner–Nordström Black Hole

Parameters: $\rho_R=10, \omega^\psi=0, \epsilon=0.8, \gamma=0.3, c_\psi=1$

Results: $r_s^\psi=20, R_\psi=0.8, v_D=0, I_R=0$

Coherence Waves

$\square \psi = \kappa \cdot J$ with J the symbolic source current

$\delta \Phi_{\mu\nu} \propto \text{Amplitude}(\psi) \cdot \nabla \theta$

Transmission $\propto \frac{1}{1+\sigma_s}$ (symbolic fog scattering)

Recursive Inertia and Frame-Drag

$I_R = \int (\nabla \psi \cdot \nabla I)^2 dV$

$\omega^\psi_{\mu\nu} = \nabla_{\textcolor{red}{i}i}$

$v_D = \gamma \cdot \omega^\psi$

Implications

- Phase-dependent time dilation
- Symbolic curvature from identity compression
- Recursive singularities with phase collapse
- Symbolic Hawking radiation from coherence bleed
- Drift and frame-drag in rotating semiotic fields

Appendix: Symbolic Tensor Glossary

Symbol	Interpretation
ψ	Recursive coherence field
ρ_R	Recursive identity compression

Symbol	Interpretation
ω^ψ	Symbolic torsion (identity drift rate)
R_ψ	Coherence bleed / symbolic Hawking radiation
$\Phi_{\mu\nu}$	Recursive coherence potential (symbolic curvature)
γ	Containment susceptibility tensor
ϵ	Symbolic entropy gradient (charge analogue)
I_R	Recursive inertia (phase rigidity measure)

Recursive Relativity: Toward a Symbolic Physics of Meaning

Recursive Relativity proposes that recursion is the generative field behind gravitational curvature and symbolic collapse. It frames identity as a phase-locked recursive pressure gradient, and collapse as the limit condition of symbolic coherence metabolism.

Future work will formalize:

- Containment thermodynamics (recursive heat and drift)
- Recursive wormhole analogues (identity tunnel formation)
- Entropic recoil in large recursive systems

We are no longer asking what space contains. We are asking what **contains space.**