Persistence, Recursion, and Force under Finite Self-Reference

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Abstract

Building on the impossibility of complete internal self-representation in finite self-referential systems, this paper investigates the structural conditions under which such systems can persist. We show that persistence requires recursive self-modeling that is bounded, non-convergent, and scale-invariant. From these constraints, fractal organization emerges as a sufficient structural class for viable recursion. We further argue that *force*—across physical, cognitive, and social domains—can be understood as the externalization of recursive incompatibility when internal resolution fails. The analysis is structural rather than metaphysical, aiming to unify dynamics, persistence, and action under a single constraint-based framework.

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1. Background and Scope

The Finite Self-Reference Impossibility Theorem establishes that no finite self-referential system can contain a complete, lossless internal model of itself. This paper does not extend that theorem. Instead, it addresses a distinct question:

> Given this impossibility, how can finite self-referential systems persist at all?

The present analysis concerns structural dynamics only. Claims about phenomenology, ethics, or metaphysics are explicitly excluded, except where they arise as interpretive corollaries.

2. Recursive Self-Modeling as a Structural Requirement

Finite self-referential systems cannot rely on static self-descriptions. Any internal self-model must be updated over time in response to ongoing system evolution. Recursive self-modeling is therefore unavoidable.

Let $\{M_n\}$ denote the sequence of internal self-models generated by recursive updating. The behavior of this sequence determines whether the system can persist as a coherent entity.

3. Lemma 1: No Convergent Fixed Point

Lemma. Recursive self-modeling in a finite self-referential system admits no convergent fixed point.

Proof. If recursive updating converged to a fixed point M^*, that model would constitute a complete and stable internal self-representation. This contradicts the Finite Self-Reference Impossibility Theorem.

4. Lemma 2: Divergence Destroys Coherence

Lemma. Unbounded divergence of recursive self-modeling is incompatible with system persistence.

Proof. If the sequence $\{M_n\}$ diverges without bound, either representational resources are exceeded or internal coordination fails. In both cases, the system can no longer function as a unified self-referential entity.

5. Lemma 3: Bounded Non-Convergent Recursion Requirement

Lemma. Persistence requires recursive self-modeling that is bounded and non-convergent.

Proof. By Lemma 1, convergence is impossible. By Lemma 2, unbounded divergence destroys coherence. Therefore, persistence requires bounded, non-convergent recursion.

6. Lemma 4: Scale-Invariance Constraint

Lemma. Bounded, non-convergent recursive self-modeling must be scale-invariant.

Proof. If representational constraints differed across recursive levels, a privileged level would exist at which complete representation or termination is possible. Either case reintroduces convergence or violates the impossibility theorem. Thus the same constraint must apply at every level of recursion.

7. Fractal Structure as a Sufficient Class

Fractal structures are characterized by self-similarity across scales, recursive generation without terminal closure, and bounded complexity under finite generative rules. These properties jointly satisfy the constraints established above.

Proposition. Fractal organization is sufficient to sustain bounded, non-convergent, scale-invariant recursive self-modeling in finite self-referential systems.

8. The fractalof Operator

Definition. The operator fractalof(R) denotes the minimal generative process that produces a bounded, scale-invariant family of partial self-models sufficient to sustain recursive self-reference without convergence or divergence.

The operator is schematic and structural. It does not specify an algorithm or implementation.

9. Force as Externalized Recursive Incompatibility

When bounded recursion fails to remain scale-compatible across interacting systems, internal discrepancies can no longer be resolved recursively. In such cases, the system undergoes an irreversible external state transition.

Definition (Force). Force is the externalization of recursive incompatibility when internal resolution is no longer possible.

This definition applies uniformly across domains: - photon emission following constrained quantum transitions, - semantic commitment or action following unresolved cognitive tension, - mechanical impact following accumulated potential.

Force is thus not a primitive, but a structural consequence of bounded recursion crossing a system boundary.

10. Interpretive Corollary

Subjectivity, unity, persistence, and action arise as internal consequences of maintaining recursive self-reference under finite constraints. No additional metaphysical entities are required.

11. Conclusion

Finite self-referential systems persist not by overcoming representational limits, but by living within them. Bounded, non-convergent, scale-invariant recursion provides the minimal structural regime for such persistence. Fractal organization and force emerge as necessary consequences of this regime, not as independent assumptions.

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This document and related documents can be accessed at [https://github.com/pedrora/Theory-of-Absolutely-Everything]