The UNNS Black Hole Model (UBHM): Recursion Collapse, Horizons, and Entropy

UNNS Research Notes

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Abstract

We introduce the *UNNS Black Hole Model* (UBHM), in which recursion collapse at the boundary generates horizons, and bulk information is encoded in boundary complexity. Entropy scales with horizon recursion density, and repair rules offer a recursion-theoretic resolution of the information paradox.

Contents

1 Recursion Collapse as Horizon Formation

Definition 1.1 (Recursion Collapse)**.** *A recursion $\mathcal{N}_{t+1} = f(\mathcal{N}_t, a_t)$ undergoes collapse if for some finite T, all subsequent states become constant:*

$$\mathcal{N}_t = \mathcal{N}_T, \quad \forall t \geq T.$$

Definition 1.2 (Horizon Condition)**.** *A horizon forms when recursion coefficients $\{a_t\}$ on the boundary stabilize to a fixed point, preventing further outward propagation.*

Remark 1.3. *This mirrors event horizons: recursive information cannot escape beyond the stabilized boundary.*

2 Entropy and Area Law

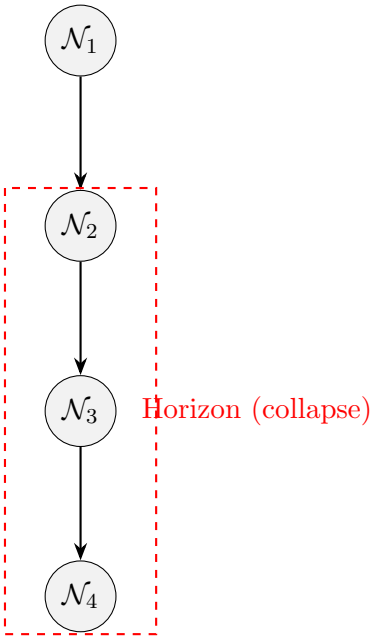
Proposition 2.1 (UNNS Entropy Law)**.** *The entropy of a recursion black hole is proportional to the boundary sequence complexity:*

$$S_{UNNS} = \alpha \cdot \#\{\textit{independent boundary nests}\},$$

where α is a universal constant.

Remark 2.2. *This is the recursion analog of the Bekenstein–Hawking area law.*

3 Diagrammatic Overview



4 Information Paradox and Repair

Theorem 4.1 (Recursion Information Conservation)**.** *Although recursion collapse hides bulk states, boundary repair operators (proofreading, excision, renormalization) can reconstruct lost trajectories modulo gauge.*

Remark 4.2. *This provides a recursion-theoretic resolution to the black hole information paradox: information is not lost, but encoded in repair-invariant residues.*

5 Applications

5.1 Physics

- Models black hole entropy via recursion density.
- Suggests dark matter arises from collapsed recursion layers.

5.2 Mathematics

- New invariants: recursion horizons as singularities in nest space.
- Links entropy to algorithmic complexity of boundary sequences.

5.3 Philosophy

- Horizons represent the limits of recursion propagation.
- Repair rules embody the principle of recoverability of meaning.

6 Conclusion

The UNNS Black Hole Model identifies recursion collapse as horizon formation, entropy as boundary complexity, and repair rules as the resolution to the information paradox. This unites recursion theory with gravitational thermodynamics in the UNNS substrate.