The UNNS Gauge–Gravity Correspondence (UGGC): From Recursive Gauge Fields to Emergent Geometry

UNNS Research Notes

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Abstract

We propose a UNNS Gauge–Gravity Correspondence (UGGC), where recursion coefficients act as gauge connections and their curvature defines discrete geometry. Boundary recursions encode bulk gravitational dynamics, forming a discrete holographic duality. This construction parallels AdS/CFT, but arises from the recursive substrate of UNNS.

Contents

1 From Gauge Fields to Geometry

Definition 1.1 (Recursive Gauge Mesh). *Let $\mathcal{M}$ be a simplicial mesh carrying recursion coefficients $\{a_e\}$ on edges. Holonomies $U(C)$ define curvature $F(C)$ on cycles.*

Definition 1.2 (Discrete Ricci Curvature). *Assign to each 2-cell (face) a curvature*

$$Ric(f) = \sum_{C \supset f} Tr(F(C)).$$

Remark 1.3. *This parallels Regge calculus: geometry is reconstructed from deficit angles, here encoded in UNNS holonomies.*

2 UNNS Einstein–Hilbert Action

Definition 2.1 (Discrete Action). *The UNNS gravitational action is*

$$S_{UG} = \sum_f w(f)\, Ric(f),$$

where $w(f)$ are weights from the UNNS nesting hierarchy.

Theorem 2.2 (Gauge–Gravity Equivalence). *Minimizing S_G (gauge action) or S_{UG} (gravitational action) yields equivalent recursion dynamics in the large-nest limit.*
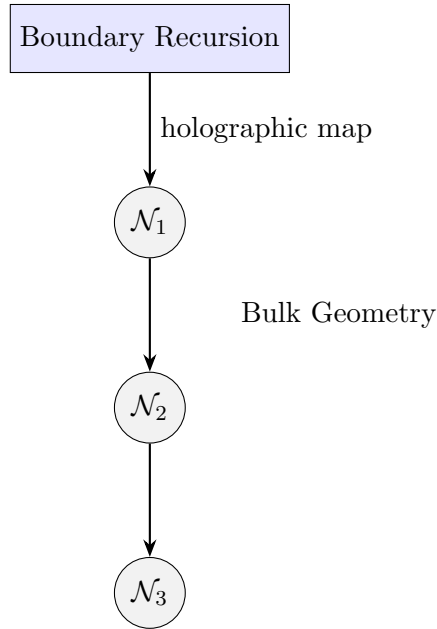
3 Holographic Duality

Lemma 3.1 (Boundary–Bulk Principle). *Let $\partial\mathcal{M}$ be the boundary recursion layer. Then:*

$$Boundary\ recursion\ data \iff Bulk\ geometric\ curvature.$$

Remark 3.2. *This establishes a UNNS holographic duality: recursion on the boundary encodes bulk emergent gravity.*

4 Diagrammatic Overview

5 Applications

5.1 Physics

- Maxwell theory: $U(1)$ recursion gauge group, abelian gravity dual.

- Yang–Mills: $SU(n)$ recursion gauge group, non-abelian dual geometries.

- Dark matter/energy: curvature residues from hidden recursion cycles.

5.2 Mathematics

- Provides a discrete model of Ricci flow on recursion meshes.

- Suggests new invariants from recursion-based characteristic classes.

5.3 Philosophy

- Numbers-as-nests yield space-as-recursion.

- Gravity emerges from algebraic recursion rather than being fundamental.

6 Conclusion

The UNNS Gauge–Gravity Correspondence reframes recursion as the substrate of both gauge dynamics and emergent geometry. Boundary recursions generate bulk gravity, creating a holographic bridge between algebraic number sequences and spacetime physics.