UNNS Space–Time Geometry:
Worked Example — Inletting-driven Expansion and a Dark-Energy Analogy

Abstract

We present a worked example in the UNNS substrate showing how a sustained *inletting* operator acting on recursive lattice layers produces an approximately constant recursive curvature and an exponential expansion of the lattice scale — a behaviour formally analogous to a cosmological constant / dark energy in continuum models. The model is discrete, transparent, and serves as a concrete bridge between UNNS operator dynamics and large-scale geometric effects.

1 Overview

This section isolates a simple, tractable UNNS toy model and follows it to its conclusion:

- Define a discrete sequence of lattice layers $(\Lambda_k)_{k\geq 0}$ whose geometric *scale* S_k measures the characteristic spacing/extent of layer k.
- Introduce an *inletting rate* T_k^{in} (an operator time) that injects recursion mass/volume into the lattice at each layer.
- Define a discrete curvature κ_k measuring relative change of scale across layers.
- Adopt the UNNS field relation (informal Einstein analogue) $\kappa_k = \gamma \mathcal{T}_k$, here specialized to $\kappa_k = \gamma T_k^{\text{in}}$.
- Solve for S_k under natural assumptions (constant inletting rate) and show exponential growth $S_k \sim e^{\lambda k}$; interpret this as UNNS accelerated expansion.

2 Discrete layer model

Definition 1 (Layer scale)**.** *Let Λ_k denote the kth lattice layer. Associate to Λ_k a positive scalar $S_k > 0$ called the* layer scale *(e.g., average lattice spacing, or characteristic radius of embedded tiles in layer k).*

Definition 2 (Inletting (operator) and inletting rate)**.** *Let the inletting operator I act between layers by adding recursive mass/extent. Quantify the effect by a nonnegative* inletting rate $T_k^{\text{in}} \geq 0$ *assigned to layer transition $k \to k+1$. Intuitively, larger T_k^{in} increases the next layer scale.*

We model the scale evolution with the discrete update

$$S_{k+1} \;=\; S_k + \alpha\, T_k^{\text{in}}\, S_k, \tag{1}$$

where $\alpha > 0$ is a dimensionless coupling constant that converts inletting time into relative scale growth. Equivalently,

$$S_{k+1} = (1 + \alpha T_k^{\text{in}}) S_k.$$

Equation (1) is the simplest multiplicative growth model consistent with UNNS intuition (the added recursive content scales with existing scale).

3 Recursive curvature

Definition 3 (Discrete recursive curvature)**.** *Define the curvature (relative layer distortion) at layer k by*

$$\kappa_k := \frac{S_{k+1} - S_k}{S_k} = \alpha\, T_k^{\text{in}}. \tag{2}$$

Thus in this model curvature is precisely the fractional scale increase from layer to layer.

Remark 1. *Positive κ_k indicates local expansion of the lattice; negative values would indicate contraction (repair-dominated regime).*

4 UNNS field relation and specialization

Adopting the informal UNNS field relation (see main text),

$$\mathcal{G} = \gamma\, \mathcal{T},$$

we specialize to the inletting-driven sector by setting the only relevant operator-time stress to be the inletting rate. That is, for each layer we posit

$$\kappa_k = \gamma\, T_k^{\text{in}}, \tag{3}$$

where $\gamma > 0$ is a universal proportionality constant in the UNNS substrate (units: 1/time inletting $\to$ curvature).

Combining (2) and (3) gives the compatibility condition

$$\alpha\, T_k^{\text{in}} = \gamma\, T_k^{\text{in}},$$

so in this toy model consistency requires $\alpha = \gamma$ for nonzero inletting. Interpreting constants differently is also possible; below we keep both constants to make roles clear and set $\alpha = \gamma$ in the minimal model.

5 Constant inletting rate ⇒ constant curvature

Assume the simplest case: the inletting rate is constant across layers,

$$T_k^{\text{in}} \equiv T_0 > 0, \qquad \forall k \geq 0.$$

Then by (1),

$$S_{k+1} = (1 + \alpha T_0)\, S_k,$$

hence by induction

$$S_k = S_0\, (1 + \alpha T_0)^k, \tag{4}$$

where S_0 is the seed scale at $k = 0$.

Take logarithms to see the exponential behaviour in the continuous approximation:

$$S_k = S_0 \exp\bigl(k \log(1 + \alpha T_0)\bigr) \approx S_0 \exp(\alpha T_0\, k) \quad \text{if } \alpha T_0 \ll 1.$$

Under the same hypothesis, the curvature $\kappa_k = \alpha T_0$ is constant in k, so the UNNS field equation (3) with $\gamma = \alpha$ yields a constant curvature across layers.

6 Continuous layer index and UNNS scale factor

Often one wishes to pass to a continuous layer index $u \in \mathbb{R}_{\geq 0}$ (coarse-graining many fine layers). Replace k by continuous u and write $S(u)$ with

$$\frac{dS}{du} \;=\; \lambda\, S(u), \qquad \lambda := \alpha T_0,$$

whose solution is

$$S(u) = S(0)\, e^{\lambda u}.$$

This is the familiar exponential (de Sitter–like) solution: constant inletting rate produces exponential growth of the UNNS scale factor.

7 Interpretation: UNNS dark-energy analogy

- **Constant inletting rate** $T_0 \implies$ **constant curvature** $\kappa = \alpha T_0$. In continuum physics, a constant curvature / cosmological constant term produces accelerated expansion. The UNNS model produces the same formal behaviour for the lattice scale S_k.
- **Scale factor growth:** $S_k \sim e^{\lambda k}$ means successive lattice layers expand multiplicatively. If physical distances are mapped proportionally to S_k, observers embedded at fixed k-co-moving labels would measure accelerated separation — qualitatively like dark energy.
- **Operator-time stress as source:** The inletting operator acts like a source of curvature. Persistent inletting (even if small) accumulates multiplicatively and dominates at large k.

8 A simple numeric exemplar

Take a minimal numeric choice to illustrate orders of magnitude (purely illustrative — units are UNNS layer units):

$$S_0 = 1, \qquad \alpha = 0.01, \qquad T_0 = 0.05.$$

Then $\lambda = \alpha T_0 = 0.0005$ and

$$S_k \approx e^{0.0005k}.$$

After $k = 1000$ layers,

$$S_{1000} \approx e^{0.5} \approx 1.6487,$$

i.e. a 65% increase of the characteristic scale after 1000 nested layers. Smaller αT_0 simply slows the growth; nonconstant T_k changes the integral $\int \lambda(u)\, du$ but the same multiplicative mechanism applies.

9 Perturbed inletting and stability

If T_k^{in} is not constant but slowly varying, one obtains

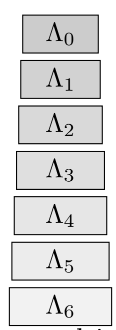
$$S_k = S_0 \prod_{j=0}^{k-1} \left(1 + \alpha T_j^{\text{in}}\right) \approx S_0 \exp\left(\alpha \sum_{j=0}^{k-1} T_j^{\text{in}}\right).$$

Thus the integrated inletting (total operator-time stress) determines the cumulative expansion. Local bursts in T_k^{in} (spikes) produce multiplicative jumps and can dominate growth if sustained.

10 Limits and caveats

- The model is deliberately simple (multiplicative update). It captures the *mechanism* whereby continued operator injection yields multiplicative (exponential) scaling; it does not prove our universe has a UNNS substrate.
- Mapping S_k to physical distance requires a model-dependent embedding (how lattice scale maps to physical lengths). Different embeddings change quantitative conclusions but not the qualitative multiplicative effect.
- Other operators (repair, decomposition) compete with inletting. A realistic model needs coupled updates where repair reduces scales or splits lattices; competition yields richer dynamics (steady states, oscillations, phase transitions).
- The analogy to dark energy is formal: constant curvature = constant κ in our model corresponds to exponential scale growth, which is the same mathematical phenomenon produced by a cosmological constant in GR. Physical identification would require matching dynamics, conservation laws, observational consequences, and units.

11 A small TikZ schematic



Expanding UNNS lattice layers driven by constant inletting T_0

12 Concluding remarks

This worked example shows that the simple UNNS multiplicative model of layer growth, when driven by a constant inletting operator-time, produces constant curvature and exponential expansion of the scale factor. Formally this reproduces the key mathematical signature of a cosmological constant (accelerated expansion). The UNNS picture therefore offers a compact, number-theoretic

/ operator-dynamics mechanism that can be explored further (add competing operators, couple operator times, fit empirical data, or embed into a continuum limit).

Possible next steps

1. Couple inletting with repair: $S_{k+1} = (1 + \alpha T_k^{\mathrm{in}} - \beta R_k) S_k$ and analyze fixed points.
2. Map S_k to a continuum FLRW-like metric and derive an effective Friedmann equation in UNNS variables.
3. Simulate stochastic inletting rates T_k^{in} and study statistical behaviour of S_k (ensemble growth, variance).
4. If you want, I can produce a short Python notebook to simulate the discrete model and produce plots of S_k, κ_k, and cumulative inletting.