Time in the UNNS Substrate

Abstract

In the UNNS framework, time is not an external continuous parameter but an emergent property of recursive depth, echo propagation, and repair flow. This note formalizes the notion of time as it arises in recursion, provides a layered interpretation, and illustrates the role of operator grammar in defining temporal structure.

1 Time as Recursion Depth

Definition 1 (Recursion Depth). *Let $\{u_n\}$ be a UNNS sequence generated by recurrence $u_{n+1} = f(u_n, \ldots, u_{n-r})$. The index n is called the* recursion depth *and serves as the primary measure of UNNS time.*

Thus, each iteration step corresponds to a "tick" of UNNS time, giving it a discrete and nested character.

2 Time as Echo Propagation

Recursions generate *echoes*—residual terms that propagate through the lattice of nests. If e_n denotes the echo residue at step n, then time may also be measured by the distance these echoes have traveled:
$$T_{\text{echo}} \sim \sup\{k : e_{n+k} \neq 0\}.$$

Remark 1. *This interpretation views time not only as depth but also as a measure of propagation of instability.*

3 Time as Repair Flow

DNA-inspired repair rules in UNNS act to stabilize unstable recursions. Let R denote a repair operator. The *repair flow time* is given by the trajectory of

$$u_{n+1} = R(u_n),$$

which moves sequences from unstable to stable configurations.

Thus, time becomes the gradient of stabilization.

4 Time as Operator Grammar

UNNS operators (Inletting, Inlaying, Repair/Normalization, Trans–Sentifying) define different orderings that produce different histories.

Lemma 1 (Operator Time). *Let $\mathcal{O} = (O_1, O_2, \ldots, O_m)$ be an operator sequence applied to initial nest N_0. Then the temporal structure is defined by the order type of $\mathcal{O}$, not just its length.*

This implies that time in UNNS can branch, fold, or reorder—capturing nonlinearity akin to paradox resolution.

5 Diagrammatic Representation

Figure 1 illustrates three aspects of UNNS time:

- recursion depth (vertical ladder),
- echo propagation (arrows radiating outward),
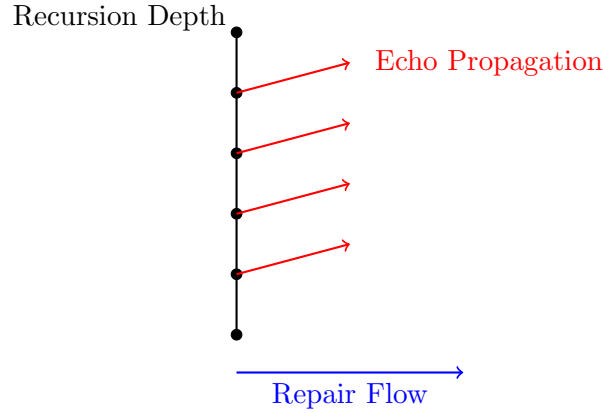- repair flow (horizontal gradient toward equilibrium).

Figure 1: UNNS Time as recursion depth, echo propagation, and repair flow.

6 Philosophical Synthesis

- Physics views time as a real parameter.
- Set theory avoids time entirely.
- UNNS embeds time *in recursion itself*:

$$\text{Time} = \text{Depth} + \text{Propagation} + \text{Repair}.$$

Moments appear as fixed points where echoes vanish; the arrow of time emerges from monotonic recursion depth.

7 Applications

- **Physics:** Provides a discrete tick underlying spacetime curvature.
- **Logic:** Tames regress paradoxes by embedding them in recursion absorption.
- **Information:** Defines complexity depth as UNNS-time.