The Unified Recursive Logic Evolution Equation

Abstract

This paper introduces a formalized equation for evaluating truth-based state change across systems of varying dimensionality. The Unified Recursive Logic Evolution Equation is designed to capture the essence of transformation through time by comparing systemic drift between prior and future states. This framework unifies symbolic difference, contextual normalization, and bifurcation sensitivity into a single recursive function, enabling dynamic systems to self-regulate, evolve, or stabilize. The model is adaptable to quantum, cognitive, mechanical, social, or computational layers, functioning as a bridge between symbolic structure and actionable feedback.

1. Introduction

The nature of change lies at the core of all intelligent systems. Whether in quantum states, physical bodies, economic models, or artificial agents, systems evolve over time. However, not all change is meaningful. The ability to distinguish signal from noise-to determine when a system has actually changed in a way that warrants evolution-has remained an open problem in recursive modeling. This paper introduces a formal solution: a unified equation that calculates and interprets systemic drift, allowing for consistent evaluation and recursive evolution of state.

2. The Core Equation

$$T = \_C(x, x') = (f(x', x, a) / n(x')) - b$$

Where:

- T = Evaluated time drift as change-truth
- x = Previous state
- x' = Current or next state
- a = Symbolic adjustment buffer for uncertainty
- f(x', x, a) = Function measuring adjusted difference between states
- n(x') = Normalization factor for state scale or complexity
- b = Baseline expectation or prior assumption

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3. Functional Components

Key elements:

- State Comparison: f(x', x, a)
- Normalization: n(x')
- Baseline Drift: b
- Recursive Evaluation: T_k over k
- Multi-agent Extension:
- Bifurcation Evaluation: T/x'

4. Interpretation of Output T

- T 0: No meaningful change.
- T > 0: Growth or evolution.
- T < 0: Regression or collapse.

5. Recursive Evolution Framework

Each evaluation of T informs the next recursive iteration. Let T_k represent the value at step k, then:

T_{k+1} = _C(x_k, x_{k+1}) for k = 1...L

6. Implementation Pseudocode

```
def unified_recursive_logic(x, x_prime, a, b, f_func, n_func):
    delta_raw = f_func(x_prime, x, a)
    delta_norm = delta_raw / n_func(x_prime)
    T = delta_norm - b
    return T
```

7. Applications

- Quantum State Collapse Analysis
- Recursive Neural Networks
- Truth Detection
- Economic Trend Stability
- Autonomous System Feedback
- Multi-agent Communication

8. Judging Reality Through Drift

By encoding difference as normalized drift from expected behavior, this model allows reality to be quantified as deviation from symbolic baseline. This redefines time as an emergent property of recursive state evaluation.

9. Conclusion

This equation is a foundational layer for advanced cognitive systems, AGI, quantum decision logic, and recursive ethical machines.

Author and Timestamp

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