Binary Toggle Cosmology: A Non-Spacetime Framework for Resolving the Hubble Tension.

Abstract

The Hubble Tension, a discrepancy between early universe ($H_0 \approx 67.4$ km/s/Mpc, from CMB) and late universe ($H_0 \approx 73–74$ km/s/Mpc, from supernovae/Cepheids) measurements of the Hubble constant, challenges standard cosmology. We propose Binary Toggle Cosmology (BTC), a novel framework within the Universal Binary Principle (UBP), which reinterprets cosmic expansion as a binary toggle process in a 12D+ Bitfield, replacing spacetime with fractal-tensor interactions and vibrational correlations. We identify dynamic dark energy, paraparticle effects, quantum noise, and cosmic resonance shifts as drivers of the toggle rate discrepancy, offering a unified explanation for the Hubble Tension. BTC provides testable predictions, including toggle rate drifts and resonance shifts, paving the way for a non-spacetime cosmological paradigm.

1. Introduction

The Hubble Tension highlights a significant discrepancy in the Hubble constant (H_0), with early universe measurements (CMB, Planck satellite) yielding $H_0 \approx 67.4$ km/s/Mpc, and late universe measurements (Type Ia supernovae, Cepheid variable stars) yielding $H_0 \approx 73–74$ km/s/Mpc. Proposed explanations include systematic errors, dynamic dark energy, new particles, or modifications to general relativity. We present Binary Toggle Cosmology (BTC), a UBP-based model that reinterprets cosmic expansion as a binary toggle process in a 12D+ Bitfield, driven by fractal-tensor interactions and vibrational correlations. BTC addresses the Hubble Tension by modeling the discrepancy as a toggle rate mismatch, offering a non-spacetime perspective on cosmic evolution.

2. Universal Binary Principle (UBP) Framework

UBP unifies physical phenomena via binary state encoding, fractal-tensor networks, and vibrational resonance, modeling reality across scales.

- Foundations: UBP represents systems as binary states (0s/1s) in a 12D+ Bitfield, interconnected by fractal and tensor structures, inspired by Tesla's etheric lattice, Kastner-Schlatter's emergent gravity, and Young's wave theory.
- Axioms: E=M×C (energy as a conscious process), RDAA (recursive scaling), NRTM (deterministic correlations), NRCI (coherence ~0.995).
- Core Systems: 12D+ Bitfield (x, y, z, t, w, v, u, s, r, q, p, o dimensions), Quantum Fractal Tensor Multiverses (fractal layers), Ultra-Hyper-Infinite Recursive Quantum Fractals (recursive patterns), Adaptive Interval Hierarchies (segmented domains).

3. Binary Toggle Cosmology (BTC) Model

BTC reinterprets cosmic expansion as a toggle rate propagation in a 12D+ Bitfield, replacing spacetime dynamics.

- Core Principle: The universe is a 12D+ Bitfield, where binary states encode energy densities (matter, radiation, dark energy). Expansion is the toggle rate of Bitfield states, driven by fractal-tensor interactions.
- Dimensions: x, y, z (spatial grid, 100×100×1), t (BitTime, ~10^-12 s), w (quantum noise), v, u (quantum amplitudes/recursion), s, r, q, p (emergent phenomena), o (ultra-coherence).
- Toggle Rate: H_0 is the toggle rate (e.g., 1/67.4 Mpc/km/s early, 1/74 Mpc/km/s late).
- Operations: Quantum Union (A ∪_q B), Tensor Contraction, Fractal Intersection (A ∩_uhiqrf B), Multiverse Contraction (A ∪_qtm B).

4. Mechanisms of the Hubble Tension

We identify four mechanisms driving the toggle rate discrepancy:

- Dynamic Dark Energy: Toggles in v, u evolve from 0.01 Hz (early universe) to 0.02 Hz (late universe), accelerating the toggle rate and raising H_0.
- Paraparticles: Toggles in s, r, q, p (e.g., 0.03 Hz) dampen the early universe rate via destructive interference and amplify the late universe rate via constructive interference.
- Quantum Noise: Fluctuations in w under-dampen early universe toggles and over-amplify late universe toggles, contributing to the tension.
- Cosmic Resonance Shift: Vibrational correlations in o shift from 0.01 Hz (early) to 0.02 Hz (late), disrupting coherence and accelerating toggle propagation.

5. Cosmic Evolution in BTC

Using Ultra-Hyper-Infinite Recursive Quantum Fractals, BTC models toggle rate evolution:

- Early Universe: Toggles at 67.4 km/s/Mpc, driven by uniform matter-radiation density.
- Intermediate Epoch: Toggles at 70 km/s/Mpc, transitioning as matter dominates.
- Late Universe: Toggles at 74 km/s/Mpc, accelerated by dynamic dark energy and paraparticle effects.

Fractal layers (100×100 early, 50×50 late, 25×25 intermediate) and recursive scaling capture this evolution, with NRTM ensuring deterministic toggle propagation.

6. Predictions and Validation

BTC offers testable predictions:

- Toggle Rate Drift: Dynamic dark energy causes a frequency increase (0.01 Hz to 0.02 Hz), observable as a late universe H_0 increase.
- Paraparticle Effects: Early universe dampening and late universe amplification, testable via CMB power spectrum shifts and supernovae distance moduli.
- Quantum Noise: Noise in w skews toggle rates, quantifiable via Bitfield simulations.

- Cosmic Resonance Shift: Resonance shift in o (0.01 Hz to 0.02 Hz), testable via pulsar timing (e.g., NANOGrav) or gamma-ray observations (e.g., Fermi-LAT).

Validation involves simulating Bitfield evolution, isolating noise effects, and comparing resonance shifts with observational data.

7. Discussion

BTC provides a non-spacetime framework for cosmology, addressing the Hubble Tension by modeling expansion as a binary toggle process. The interplay of dynamic dark energy, paraparticles, quantum noise, and vibrational correlations offers a unified explanation for the toggle rate discrepancy. This model challenges traditional spacetime-based cosmology, proposing a computational paradigm rooted in binary interactions and fractal structures.

8. Conclusion

Binary Toggle Cosmology (BTC) resolves the Hubble Tension by reinterpreting cosmic expansion within the UBP framework. The toggle rate mismatch arises from dynamic dark energy, paraparticle effects, quantum noise, and cosmic resonance shifts, modeled in a 12D+ Bitfield. BTC's predictions provide a pathway for validation, inviting further exploration of a non-spacetime cosmological paradigm.

Acknowledgments

This work builds on UBP's integrations, including prior analyses of the Schumann Resonance and Monatomic Gold, leveraging vibrational correlations and emergent phenomena.

References

- UBP Foundations: 12D+ Bitfield, Quantum Fractal Tensor Multiverses, Ultra-Hyper-Infinite Recursive Quantum Fractals.
- Web ID 1: Hubble Tension measurements and early dark energy hypotheses.
- Web ID 2: Dynamic dark energy and relativistic particle effects in cosmology.