The Many-Minds Interference Model of Consciousness

Introduction

This document develops a Many-Minds Interference Model (MMI) of consciousness, combining the core assumptions of the Many-Worlds Interpretation (MWI) of quantum mechanics with the idea of interfering parallel self-states. We attempt to reconstruct subjective consciousness as an emergent structure from interference-capable neural states across parallel worlds. The approach is speculative but logically consistent and broadly compatible with David Deutsch's Constructor Theory.

1 Theoretical Concept

We consider subjective consciousness as a snapshot of a coherent interference pattern among many nearly identical versions of the self in the multiverse. Each self is a locally emergent neural state maintained through constructive processes, exhibiting minimal decoherence compared to nearby versions.

We assume that:

- Consciousness is not a single physical state but an ensemble of interference-capable self-states.
- The experienced moment arises from constructive interference among these neighboring neural configurations.
- Loss of consciousness (e.g., trauma, sleep, death) can be interpreted as collapse or decoherence of the interference zone.

This leads to a novel concept of *self-continuity* in the multiverse: not identity within a single branch, but a trajectory of coherent interference across many variants of the self.

2 Formal Scheme of the Many-Minds Interference Model

2.1 Multiverse Structure

The universal wave function is given by:

$$\Psi_{\text{total}}(t) = \sum_i \psi_i(t) \otimes \phi_i(t)$$

- $\psi_i(t)$: Observer state in branch i
- $\phi_i(t)$: Environmental state in branch i

Decoherence separates environmental states:

$$\langle \phi_i(t) | \phi_j(t) \rangle \approx 0 \quad \text{for } i \neq j$$

2.2 Local Consciousness Space

We define the subjective interference space:

$$\mathcal{B}(t) := \sum_{i \in \mathcal{N}(Z_t)} c_i(t) \cdot \psi_i(t)$$

- $\mathcal{N}(Z_t)$: Set of coherent neighbor states around reference state Z_t
- $c_i(t) \in \mathbb{C}$: Interference coefficients (normalized)

Neighborhood is defined by:

$$\mathcal{N}(Z_t) = \{ i : \|\psi_i(t) - \psi_{Z_t}(t)\| < \varepsilon \}$$

2.3 Consciousness Amplitude

The interference structure is quantified by:

$$A_{\text{conscious}}(t) = \int_{\mathcal{N}(Z_t)} \langle \psi_i(t) | \psi_{Z_t}(t) \rangle \cdot \mu(i) \, \mathrm{d}i$$

- $\mu(i)$: Measure over coherent states

2.4 Decoherence Dynamics

Coherence decays exponentially:

$$\frac{\mathrm{d}}{\mathrm{d}t} \langle \psi_i(t) | \psi_j(t) \rangle = -\gamma_{ij} \cdot \langle \psi_i(t) | \psi_j(t) \rangle$$

2.5 Consciousness Gradient

The dynamic change of self-awareness within the interference zone is defined by:

$$\nabla_{\mathcal{B}}(t) = \frac{\partial \mathcal{B}(t)}{\partial t}$$

2.6 Self-Operator

An operator to extract the core self-component:

$$\hat{I} \cdot \mathcal{B}(t) := \sum_{i \in \mathcal{N}(Z_t)} c_i(t) \cdot P_{\text{core}}(\psi_i(t))$$

- P_{core}: Projection onto self-modeling neural states

2.7 Interference Potential Between Self-Versions

$$P_{i \to j}(t) = |\langle \psi_j(t) | \psi_i(t) \rangle|^2$$

2.8 Relation to Constructor Theory

In Constructor Theory, transitions between self-states can be seen as *possible constructions*:

- **Task:** Maintain the self-model under changing physical and informational conditions
- **Constructor:** The neural system producing stable self-structure from interference
- **Context-sensitive constructions:** Dreaming, decision-making, loss of consciousness, mental simulation

3 Summary

The Many-Minds Interference Model describes consciousness as a zone of constructive interference among coherent self-versions in the multiverse. Mathematically, this results in a structured consciousness space $\mathcal{B}(t)$, whose dynamics can be described via interference, decoherence, gradients, and constructor operations. The link to David Deutsch's Constructor Theory opens the way for a more formal treatment of "possible self-constructions" within a universal wave function framework.