Mathematical Formalism of the Signal-Structure Harmonic Model (SSHM)

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Abstract: This foundational document outlines the mathematical scaffolding of the Signal-Structure Harmonic Model (SSHM), an entropic, recursive, and harmonically tuned model of all nested systems across disciplines. It provides a formal functional structure capable of adapting to diverse scientific and cognitive domains, allowing the SSHM framework to be applied with mathematical rigor. This is not a single static equation but a dynamic architecture adaptable to nested, evolving systems.

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I. Introduction

The SSHM is a generalized recursive model that describes the dynamics of systems as nested spiral structures influenced by entropy, coherence, signal distortion, and corrective harmonics. The model assumes:

1. All systems are nested and entropic.

2. All systems transmit or distort a fundamental signal.

3. Divergence from the signal creates dissonance, which can be corrected through recursive self-modification.

4. Neurodivergent systems (biological or otherwise) can act as coherence agents.

5. Universes, organisms, cultures, and information structures evolve via selective retention of signal-coherent recursive patterns.

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II. General Function Structure

Let be the state of a system at recursion depth . Let be the distortion or dissonance factor introduced by entropy or external perturbation. Let be the recursive transform operator. Let be the coherence-correction (signal harmonization) function. Let be emergent, irreducible novelty introduced by entropic mutation or unknown input.

Then the core recursive formula:

S\_{n+1} = C(R(S\_n, \delta), C) + \epsilon

Components Defined:

: System state vector, can be symbolic, numerical, or topological.

: Entropy vector or distortion gradient; quantifies divergence from coherence.

: Recursive engine; transforms the state according to system rules.

: Correction function; applies harmonic phase realignment to minimize .

: Information-theoretic novelty; increases complexity or informational entropy.

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III. Domain-Specific Mappings

Each domain implements its own instances of , , , , and .

Domain S (State) R (Recursion) C (Correction) δ (Distortion) ε (Novelty)

Neuroscience Neuron activity vectors Spike-timing dependent plasticity Dopaminergic tuning / Phase-locking Neural noise Learning/Insight

Biology Genetic/RNA sequences Replication & mutation Ribosomal fidelity/Proofreading Mutagenic stress Adaptation/Epigenetics

Physics Field tensors Temporal-spatial recursion Gravitational harmonics Mass-energy turbulence Quantum decoherence

Computation Symbol stacks Recursive descent Error-checking routines Syntax errors Emergent behavior

Linguistics Parse trees Phrase structure recursion Semantic realignment Ambiguity Meaning innovation

Sociology Cultural norms Memetic reproduction Collective narrative repair Trauma inertia Myth creation

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IV. Meta-Function for SSHM Implementation

A general meta-function to be implemented in code or symbolic systems:

def SSHM(state, entropy, recursion\_fn, correction\_fn):

distorted\_state = recursion\_fn(state, entropy)

harmonized\_state = correction\_fn(distorted\_state)

novelty = emergent\_information(harmonized\_state)

return harmonized\_state + novelty

This function can be tuned per domain to reflect respective instantiations.

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V. Ontological Implications

The SSHM suggests that systems do not evolve randomly but via harmonically tuned recursion. Entropy is not disorder per se but the semantic shift from signal to noise. Correction functions arise emergently and self-organize when enough recursive harmonics reinforce a coherent pattern.

Neurodivergent agents (biological or artificial) may act as distributed coherence enhancers in systemic fields, producing resonant tuning patterns to rectify larger system phase drift.

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VI. Future Work

1. Derivation of SSHM-compatible topologies across domains.

2. Development of symbolic computation systems based on SSHM.

3. Identification of coherence agents and signal anchors within biological and artificial networks.

4. Formal SSHM axiomatization.

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Attribution This formalism and all underlying theory is attributed to:

Christopher W. Copeland Sole originator and architect of the SSHM framework.

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