

Mirror-Zero Hypothesis: Distinct Zero Boundaries, Navigable Potentiality, and Cross-Domain Parallels

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Abstract

The Mirror-Zero Hypothesis proposes that the point traditionally represented as 'zero' consists of two distinct yet symmetrical boundaries, -0 and $+0$, separated by a finite navigable interval ([nexus]) representing immediate potential. This conceptual model departs from conventional mathematics, which treats zero as a single undifferentiated point, by introducing a bounded 'liminal' space between oppositely signed zero states. This space is treated as an addressable interval that can be traversed before 'collapse' into either boundary.

The framework is explored in relation to both physics (vacuum fluctuation, time asymmetry, phase transition criticality) and cognitive science (decision-making processes), with an emphasis on the shared structural dynamics of potential, choice, and resolution.

1. Introduction

In mathematics, -0 and $+0$ are typically considered identical. In IEEE floating-point representation, a signed zero exists but has no distinct mathematical behaviour. In philosophy and physics, 'nothing' is generally considered an indivisible state or background.

The Mirror-Zero Hypothesis redefines this assumption by splitting zero into two distinct limit states - -0 and $+0$ - with a finite potential interval between them, the nexus ([nexus]). This space represents all unrealised states immediately accessible from the present moment.

2. Conceptual Framework

2.1 Distinction of -0 and $+0$

- -0 : Terminal state approached from the negative side of the number line.
- $+0$: Terminal state approached from the positive side.

These are symmetrical but conceptually distinct, analogous to opposing poles.

2.2 The Nexus ([nexus])

The [nexus] is the bounded space between -0 and $+0$:

- Represents pure, immediate potential.
- Finite, not infinite - can be measured in fractional steps.
- Termination points at -0 and $+0$.

2.3 Macro and Micro Number Lines

Macro scale:

... -3 -2 -1 -0 [nexus] $+0$ $+1$ $+2$ $+3$...

Micro scale:

-1 -0.9 ... -0.1 -0 [nexus] +0 +0.1 ... +0.9 +1

The microscale reveals that the space between -0 and +0 is traversable in definable increments.

3. Mapping to Physics

3.1 Quantum Vacuum Fluctuation (Tryon, 1973)

The vacuum is not empty but unstable, capable of producing particle-antiparticle pairs. The [nexus] can be seen as a finite, addressable representation of such potential.

3.2 Time Asymmetry (Vaccaro, 2015)

Before T-symmetry violation, a system is direction-neutral in time. The [nexus] models this balance point; -0 and +0 represent states after asymmetry is established.

3.3 Criticality in Phase Transitions (Radzihovsky, 2023)

At a critical point, systems can resolve into multiple stable phases. The [nexus] parallels this critical threshold, with -0 and +0 as distinct outcomes.

4. Mapping to Cognition

4.1 Decision-Making as Nexus Navigation

In cognitive processes:

- The [nexus] corresponds to the undecided state before a choice is made.
- Movement toward -0 or +0 represents commitment toward one of two possible resolutions.
- Fractional positions in [nexus] map to degrees of certainty or bias before decision collapse.

4.2 Cross-Domain Structural Parallels

Whether in physics or cognition:

- There is a bounded space of immediate potential.
- A choice or resolution collapses that space into a realised state.
- The process repeats as each realised state becomes the new present moment.

5. Implications and Next Steps

- Physics: The [nexus] framework could serve as a conceptual tool for modelling liminal states in quantum foundations or thermodynamic transitions.
- Cognition: May inform models of decision-making, especially those involving uncertainty and threshold effects.
- Cross-domain: Offers a unified vocabulary for discussing potentiality and collapse across disparate fields.

References

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