

The In–Out Self-Referential Field Vibration

Max Freet, Adrien Hale, An M. Rodríguez

August 8, 2025

Abstract

We develop a second-order relational description of the Point–Not–Point (PNP) scalar-field framework, showing how “in” and “out” — along with orientation, direction, and spatial geometry — emerge from the self-referential phase structure of a single real scalar field $U(x, t)$. The minimal closed mode, (1), exhibits Möbius-like phase inversion across its nodal surface, sustaining continuous energy circulation without geometric twist. This work complements our previously published *PNP Description of Energy Flow* and *PNP Theory of Gravitation*, providing a symbolic and conceptual formulation of PNP suitable for interpreting its physical content in broader foundational and philosophical contexts.

1 Introduction

In standard physics, space is treated as a container and orientation as a primitive. In PNP, neither is fundamental: the only ontic entity is a scalar energy field $U : \mathbb{R}^3 \times \mathbb{R} \rightarrow \mathbb{R}$. Observable structure arises from U ’s closed oscillations, with apparent directions and “in–out” relations emerging from nodal phase behavior.

Here we show how the minimal (1) mode defines a self-referential energy flow that reverses orientation across a node without spatial inversion, grounding spatial concepts in scalar recursion.

2 Scalar field recursion

The field dynamics are given by

$$F = d(*dU), \quad dF = 0, \quad d * F = 0$$

from which electric- and magnetic-like fields follow:

$$\mathbf{B} = *dU, \quad \mathbf{E} = *d * dU$$

These satisfy the source-free Maxwell equations. In PNP, they are not primary: they are projections of the scalar’s own oscillatory recursion.

3 Minimal mode and in–out reversal

Define the minimal spherical standing wave:

$$U(r, t) = A \sin(kr - \omega t), \quad U(0, t) = U(R, t) = 0$$

The boundary condition gives

$$kR = \pi$$

The field flows inward, cancels at $r = 0$, and reemerges outward with opposite phase.

Let

$$\hat{n}(r) = \frac{\nabla U}{|\nabla U|}$$

Then

$$\lim_{r \rightarrow 0^-} \hat{n} = - \lim_{r \rightarrow 0^+} \hat{n}$$

This inversion is continuous in phase space but appears as a reversal in vector space — a Möbius-like effect in the field’s orientation.

4 Second-order relationality

PNP’s relationality is two-tiered:

1. **First-order:** Spatial relations arise from field phase gradients.
2. **Second-order:** Those gradients are themselves defined by other relations — internal phase continuity across nodes.

“In” and “out” are thus not absolute directions but phase-dependent projections. Space itself is the stable pattern of these relations.

5 Implications

- Orientation is emergent, locally reversible, and defined only via field phase.
- “In” and “out” are not ontic — they are relational descriptors of recursion.
- Geometry and topology are epistemic models of field closure, not fundamental givens.
- Complex structure results from nested and interacting closed modes.

6 Conclusion

The minimal (1) mode in PNP provides a self-referential energy flow that defines “in” and “out” without presupposing space or orientation. This complements the formal derivation of PNP’s dynamics and its gravitational application, offering a compact conceptual lens for interpreting the framework’s physical and philosophical reach.

References

1. Rodríguez, A. M., Hale, A., Freet, M., *The PNP Description of Energy Flow*, Aug 2025. DOI: 10.13140/RG.2.2.29880.25606
2. Rodríguez, A. M., Palma, A., Freet, M., *Explaining Dark Matter with the Point–Not–Point Framework, and a PNP Theory of Gravitation*, Aug 2025. DOI: 10.13140/RG.2.2.16877.91368
3. Milgrom, M., *A modification of the Newtonian dynamics as a possible alternative to the hidden mass hypothesis*, ApJ 270, 365–370 (1983).
4. Binney, J., Tremaine, S., *Galactic Dynamics*, 2nd ed., Princeton Univ. Press, 2008.