1 Two Formalism

1.1 Formalism Figure 1 — Percept = Geometry (Closed Resonant Geometry)

This figure illustrates the foundational assumption of Formalism I: a percept corresponds to a closed resonant geometry (CRG) in the (x_1, x_2) plane. The closed curve represents a stable geometric structure generated by recurrent resonant dynamics. This establishes the basic geometric substrate of perceptual representation.

1.2 Formalism Figure 2 — Resonant Geometries and Perceptual Space

The left panel shows three resonant geometries Γ_1, Γ_2, and Γ_3, each representing a distinct closed resonant state. The right panel shows their corresponding perceptual points P_1, P_2, and P_{12} in perceptual space. This figure demonstrates the mapping from geometric resonant structures to perceptual coordinates, forming the core of Formalism II.

1.3 Formalism Figure 3 — CRG_1, CRG_2, CRG_3, and Combined Geometry

This figure presents three base closed resonant geometries and their nonlinear combination. CRG_1 represents a simple circular geometry, CRG_2 introduces multi-lobed structure, and CRG_3 exhibits higher-order oscillatory complexity. The combined geometry shows how multiple CRGs can be superposed to generate a composite perceptual geometry. This supports the claim that perceptual richness arises from geometric composition.

1.4 Formalism Figure 4 — Mapping Φ: CRG $\Gamma \to$ Percept $\Phi(\Gamma)$

This figure explicitly illustrates the mapping Φ from a closed resonant geometry Γ to its corresponding perceptual point $\Phi(\Gamma)$. The left panel shows the geometric structure, while the right panel shows the perceptual coordinate. This formalizes the relationship between geometric resonance and perceptual representation.

1.5 Formalism Figure 5 — Recurrent Network → Resonant Dynamics → CRG

This figure shows how a recurrent neural network generates resonant dynamics that converge to a closed resonant geometry. The dense spiral trajectory in (x_1, x_2) space reflects the recurrent dynamics, and the resulting closed structure corresponds to a CRG. This provides the mechanistic foundation linking RCNNG dynamics to the geometric formalism.

1.6 Summary

Together, these five figures provide a complete visual and mathematical description of Formalism I and Formalism II. They show how recurrent dynamics generate closed resonant geometries, how these geometries combine, and how they map to perceptual states. These formal structures complement the Fourier-based and topological analyses presented in the main text and earlier supplementary notes.