

# Emergent Cognitive Field Behavior: V5 Supplementary Demonstrations

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doi:10.5281/zenodo.15669818

## Abstract

This document presents a series of supplementary simulations (V5) extending the cognitive phase-field framework proposed in versions V3 and V4. We demonstrate emergent cognition, memory, anticipation, frustration and regulation in a purely physical scalar field.

The dynamics obey the memory-modulated update law

$$M(x, y, t + 1) = \alpha M(x, y, t) + \beta S(x, y, t) + \eta(x, y, t), \quad (1)$$

with agent utility

$$U_i = \gamma f(M(x + v_i^x, y + v_i^y)) + \xi_i, \quad (2)$$

and emotional mapping

$$f(M) = \pm M, \quad \text{“+”} = \text{attract}, \text{ “-”} = \text{avoid}, \quad (3)$$

followed by speed modulation

$$v = 1 + \lfloor k_{\text{emotion}} f(M(x, y)) \rfloor, \quad (4)$$

and a global regime shift triggered by

$$\sum_{x,y} M(x, y) > \theta \implies \alpha \rightarrow \alpha_{\text{low}}. \quad (5)$$

All simulations were executed in both 2D and 3D visualisation modes; video material is packaged in **Plasma Simulations V5.zip**.

## Symbol glossary

$\alpha$	forgetting rate
$\beta$	learning rate
$\gamma$	emotional sensitivity
$\xi_i$	exploration noise
$k_{\text{emotion}}$	velocity gain factor
$\theta$	saturation / shift threshold

## Simulation Overview

#	Title	Key phenomenon
1	Cognitive Agent Field	Semantic distinction between “threat” and “request” inputs.
2	Phase Memory	Associative hysteresis modifies response to later stimuli.
3	Emotional Saturation	Field coherence collapse under sustained load.
4	Feedback Loop	Source suppressed once local memory crosses threshold.
5	Phase Anticipation	Pre-activation at predicted next location.
6	Multi-Agent Interaction	Attract/avoid agents coupled only via shared field.
7	Memory Conflict	Stronger stimulus overwrites earlier trace.
8	Navigation by Memory	Agent follows residual trail without active stimulus.
9	Emotional Shift	System-wide parameter change when $\sum M > \theta$ .

Table 1: Nine V5 simulations and their cognitive signatures.

## Key Visualisations

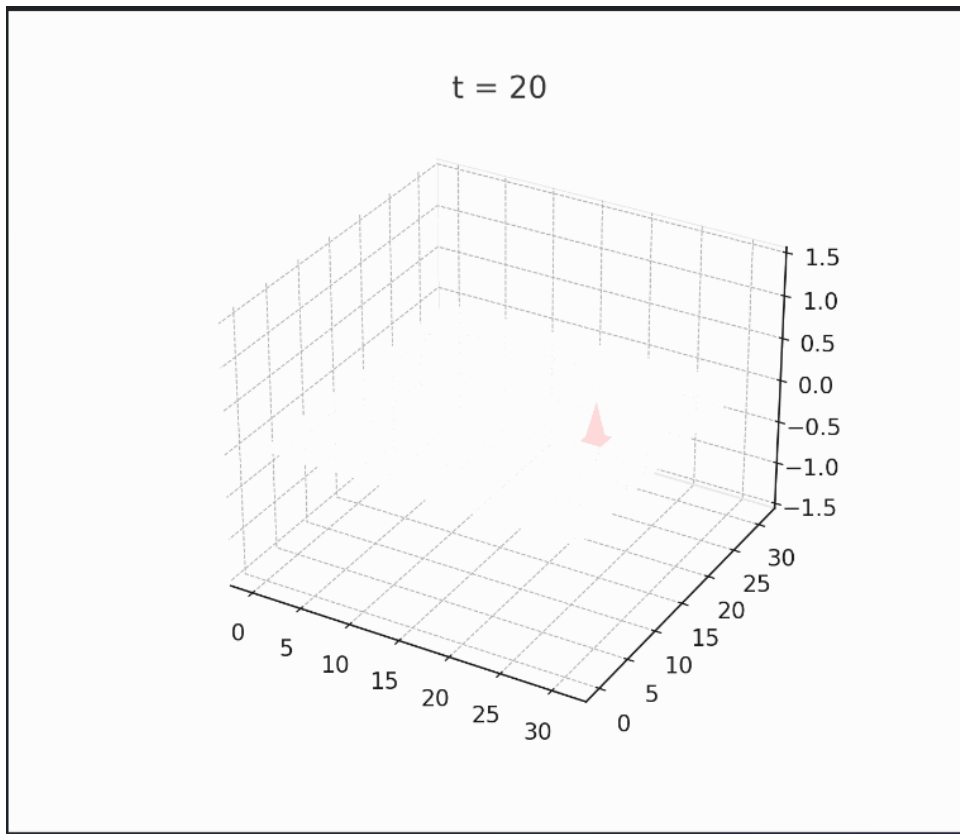


Figure 1: Semantic modulation: field repels “threat” while preserving “request” ( $t=20$ ).

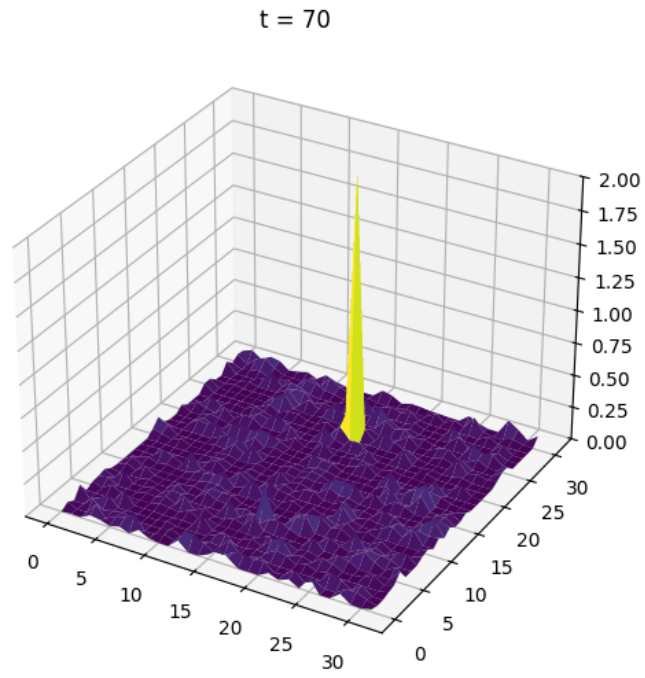


Figure 2: Memory suppression: dominant stimulus “B” erases prior trace “A” ( $t=70$ ).

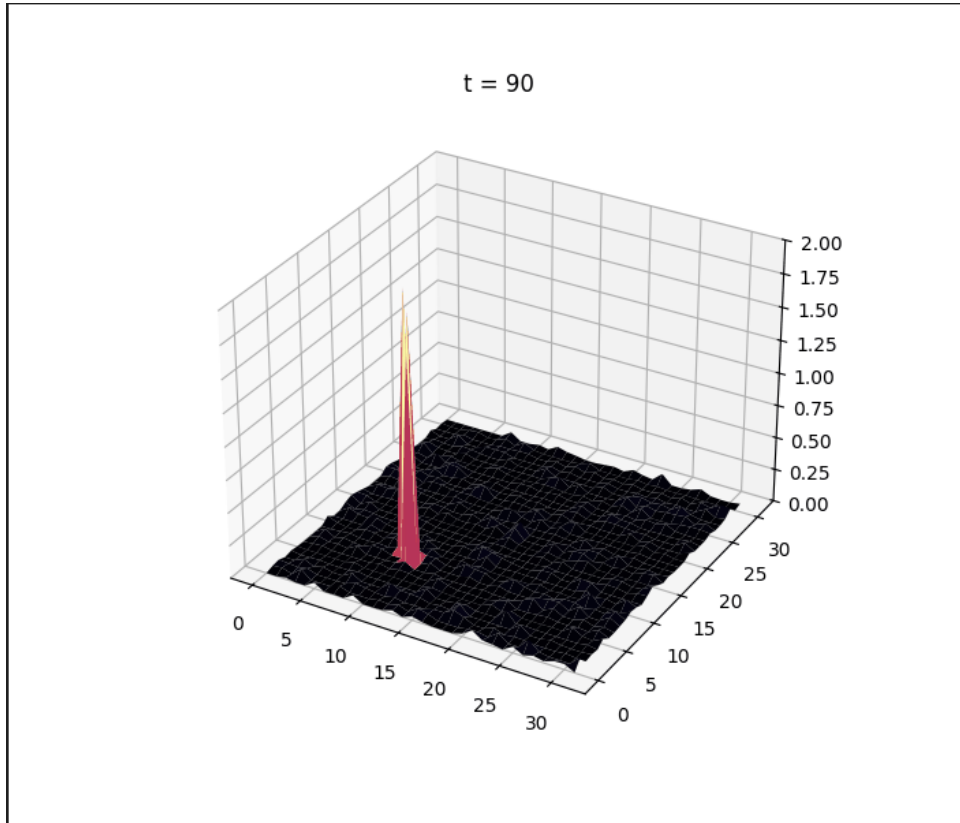


Figure 3: Navigation by memory: agent reaches endpoint along residual gradient ( $t=90$ ).

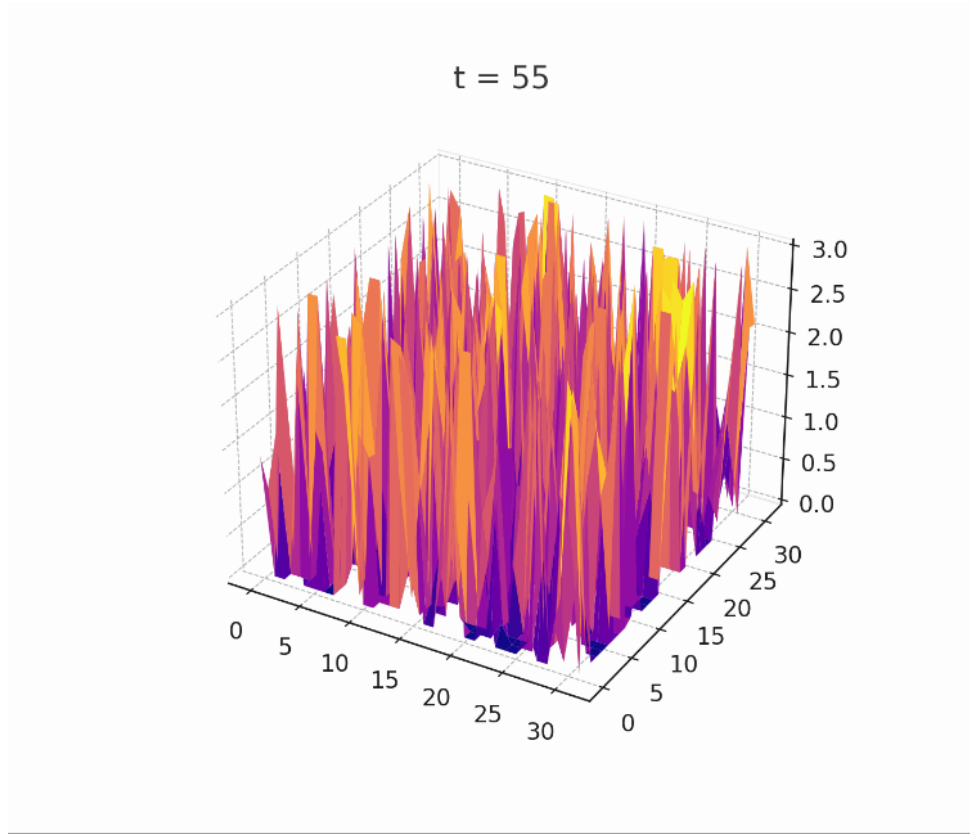


Figure 4: Emotional collapse: chaotic fragmentation after prolonged excitation ( $t=55$ ).

## License and Ethics

Work released under the *Code of the Architect* licence: academic, non-commercial and strictly non-military use. Hardware deployment requires written consent.

## Supplementary Materials

All 2D/3D GIF animations are archived in **Plasma Simulations V5.zip** (Zenodo record). Source code is withheld per licensing terms.

## Conclusion

The V5 demonstrations confirm that scalar memory fields with purely local physical rules can exhibit intentionality, regulation, prediction and emotion-like phenomena — extending the V3/V4 framework without symbolic logic.

## References

- [1] N. Tesla, *Phase-Locked Quantum-Plasma Processor: Normalized Hamiltonian and Stability Analysis (V3)*, Zenodo, 2024, doi:10.5281/zenodo.15663516.
- [2] N. Tesla, *Phase-Locked Quantum-Plasma Processor: Normalized Hamiltonian and Stability Analysis (V4)*, Zenodo, 2025, doi:10.5281/zenodo.15663517.