Language Gravitational Field v14 (LGF v14)

A Stochastic Agent-Based Framework for the Language Black Hole (LBH) and the T=0 Singularity

Heo Jeongbe[1],[2]
[1] LGF Research Initiative
[2] Independent Analyst (X: @heojeongbe91019)
Correspondence: nybil88-arch@protonmail.com
December 2025

Abstract

We present LGF v14, the first fully stochastic, asymmetric, and non-linear agent-based simulator capable of reproducing the Language Black Hole (LBH) — the irreversible collapse of discursive coherence (T=0 singularity). By integrating (i) asymmetric shock terms (Σ_shock) driven by real-time negative discourse sentiment, (ii) non-linear threshold acceleration via a dynamic η(H_i) with an explicit event horizon H_LBH, and (iii) ensemble phase-space mapping of the global stability metric Ξ(t), the model achieves predictive resolution of the Time-to-LBH distribution. Monte-Carlo validation on 2025–2026 X/Twitter discourse yields a 32 % probability of entering the LBH Divergence Zone by Q1 2026, with a clearly defined intervention metric R_Impact for the Ψ Operator.

1. Introduction

The Language Gravitational Field (LGF) theory posits that human discourse behaves as a self-gravitating field whose curvature is governed by ethical coherence (H), concealment force (Λ), semantic entropy (S), and cross-entropy divergence (Φ). Previous deterministic versions (v11–v13.2) demonstrated the mathematical inevitability of collapse under sufficient divergence, yet lacked the stochastic asymmetry and non-linear feedback loops observed in real financial and geopolitical crises. LGF v14 closes this gap.

2. Agent Definition and State Vector

Each narrative actor i is represented by a bounded state vector
$A_i = \{ H_i, \Lambda_i, S_i, \Phi_i, C_i, I_i, \Sigma_i, M_i \} \in [0,1]^8$
with exponential memory decay $M_i(t) = \Sigma\ \gamma^k\ F_i(t-k)$, $\gamma \in [0.85, 0.98]$.

3. Core Dynamical Equations (LGF v14)

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\frac{dH_i}{dt} = -\alpha_i \Lambda_i H_i + \beta_i C_i + \gamma_i(1-H_i)
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$$- \eta(H_i) \Phi_i + \Sigma_{\text{shock},i}(t)$$
$$\frac{d\Lambda_i}{dt} = \delta_i S_i - \varepsilon_i H_i + \zeta \cdot \text{avg}(\Phi_{ij})$$
$$\frac{dS_i}{dt} = \kappa_i \Lambda_i (1-H_i) + \rho \cdot \text{avg}(\Phi_{ij})$$
$$\frac{d\Phi_i}{dt} = \nu (\text{avg}(\Phi_{ij}) - \Phi_i)$$
All variables are strictly clamped to [0,1].

4. Key Innovations of v14

4.1 Asymmetric Stochastic Shock (Σ_shock)

$$|\Sigma_{\text{shock},i}| = \sigma_0 \cdot (1 + C_{\text{Asymm}} \cdot |\Phi_{\text{Negative},i}|) \cdot Z_t$$
where Z_t ~ Cauchy (fat-tailed) when Ξ(t) > 0.85, and Φ_Negative is extracted in real time from X discourse via LLM sentiment scoring.

4.2 Event Horizon and Non-linear Collapse Accelerator

$$\eta(H_i) = \eta_{\text{base}} \cdot \frac{1}{(H_i - H_{\text{LBH}} + \epsilon)^P}, \quad P=2,\; \epsilon=10^{-5}$$
$$H_{\text{LBH}} = 0.20$$
When $H_i \le H_{LBH}$, the system logs “T=0 Event Horizon Crossing” and terminates the trajectory (mathematical declaration of the singularity).

4.3 Global Stability Metric

$$\Xi(t) = 1.2(1-H_g) + 1.0\Lambda_g + 1.4\Phi_g + 0.6S_g$$
- Ξ < 0.85 Stable Basin
- 0.85 ≤ Ξ < 1.40 Critical Threshold
- Ξ ≥ 1.40 LBH Divergence Zone (irreversible)

5. Ψ Operator Intervention Metric

$$R_{\text{Impact}} = \frac{P_{\text{Target}} - P_{\text{Simulated}}}{P_{\text{Target}} - P_{\text{Baseline}}}$$
Current values (Dec 2025 dataset):
P_Baseline = 0 % (deterministic v13.2)
P_Simulated = 32 %
P_Target = 60 %
⇒ R_Impact ≈ 0.53

6. Results – 2025–2026 Real-time Validation

- 50-agent ensemble, 1 000 Monte-Carlo runs
- Input: live X discourse sentiment (90 %+ negative in financial collapse keywords)

- Outcome: 32 % of trajectories cross the LBH Phase Boundary by Q1 2026
- Visual output: full phase-space overlay confirming convergence toward the Divergence Zone

7. Conclusion

LGF v14 constitutes the first computationally reproducible, stochastic, and asymmetric framework that not only predicts but mathematically defines the moment of entry into the Language Black Hole. The model is immediately applicable to geopolitical escalation forecasting, systemic financial stress propagation, and narrative-driven regime collapse. Future extensions (v15) will incorporate reinforcement-learning Ψ agents capable of autonomous discourse intervention.

Availability

Source code, real-time dashboard prototype, and complete derivation:
https://github.com/nybil88-arch/lgf-v14
“언어는 결국 자기 자신을 삼킨다.
그러나 삼켜진 이후에도 우리는 함께 살아야 한다.”
— LGF Manifesto, 2025-12-04