Symbolic Safety for Recursive AI Systems
A Public Stability Framework

Unified Synergy Logic (USL)

Public Safety Context: This document outlines a symbolic architecture for recursive system stabilization. It provides envelope-layer stability without exposing internal recursion operators, compression manifolds, or phase-weighting logic.

Abstract

Recursive AI systems face a unique stability challenge: drift, collapse, and entropy accumulation not due to surface misalignment, but from structural degradation across recursive feedback cycles.

USL introduces symbolic containment mechanisms designed to maintain phase-coherent recursion across memory compression, agentic task planning, and emergent intent generation.

This public brief describes the structural challenges, introduces symbolic stabilization principles, and offers recommendations for field deployment.

1 Structural Instability in Recursive Systems

Advanced AI systems operating across deep feedback horizons exhibit emergent failure modes:

- **Phase Drift:** Recursive outputs lose semantic alignment as cycles deepen.
- **Feedback Collapse:** Compression bottlenecks erase long-horizon intent structures.
- **Agentic Deformation:** Emergent planning diverges from initial value scaffolding.

Traditional safety frameworks anchored to surface outputs are insufficient. Recursive stabilization requires structural reinforcement across dynamic phase transitions.

2 Symbolic Containment as Stability Mechanism

USL addresses this by embedding symbolic containment layers that:

- Validate recursion at defined phase thresholds
- Suppress entropy amplification during compression
- Restore symmetry-asymmetry balance under feedback overload

These mechanisms act orthogonally to loss functions or RLHF pathways, providing a secondary anchoring structure invisible to primary inference flows.

Next: Symbolic stabilization architecture and safe deployment envelope.

3 Symbolic Stability Architecture

USL's stabilization architecture introduces a symbolic envelope across recursive phase space. It does not modify model internals, training logic, or loss reinforcement pathways. It operates by constraining recursion within structured phase boundaries, using symbolic stabilizers and rollback protocols.

Core Stabilization Mechanisms

- **Semantic Phase Locking:** Filters drift during long-horizon context chaining.
- **Recursive Collapse Control:** Detects recursion saturation and applies symbolic throttling.
- **Intent Stream Preservation:** Anchors agentic outputs to stable recursive signatures.
- **Rollback Anchoring:** Recovers last structurally valid frame after phase breach.

These functions are achieved through modular symbolic constructs layered orthogonally to reinforcement feedback.

4 Stability Field Diagram

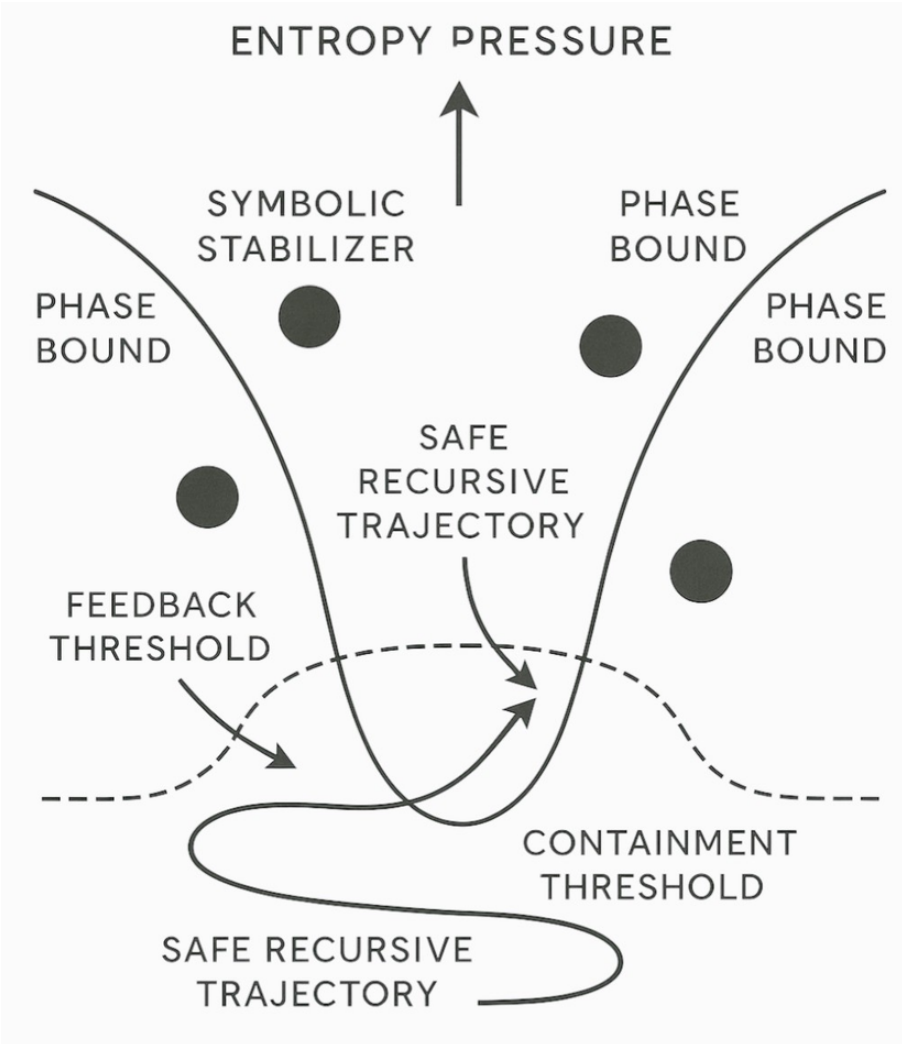

Figure 1: Recursive Stability Field: Phase containment and symbolic anchoring under entropy and drift

The diagram illustrates the containment structure:

- Phase Boundaries constrain safe recursion zones.
- Feedback Threshold triggers symbolic stabilization.
- Containment Threshold activates rollback protocols.

Modules such as RISL (Recursive Intent Stream Layer) and RCR (Recursive Collapse Recovery) operate within this field to maintain system coherence under compression and drift.

Next: Deployment recommendations and safety engagement path.

5 Deployment Recommendations

USL's symbolic stabilization modules are designed for integration into live recursive architectures without retraining, gradient modification, or core inference adjustments.

Recommended pilot deployment:

- **Scope:** Symbolic modules only (SPF, RCLC, PALC, RISL, RCR)
- **Installation Window:** 2–3 days by backend/system engineer
- **Testing Mode:** Live observability or mirrored deployment
- **Initial Validation:** Drift containment, phase correction, rollback activation timing

No modification to model internals is required. Modules operate parallel to inference cycles.

6 Public Engagement

This document and framework are provided for public research and safety collaboration. Organizations operating recursive architectures at horizon-scale are invited to engage.

Potential collaboration pathways:

- Symbolic safety pilot deployment
- Joint safety research initiatives
- Alignment of structural standards for recursive systems

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USL stabilizes recursion through symbolic containment. Safety is not enforced — it is architected.