

SevenFold Deterministic Consensus

Public Verification Benchmark & Mathematical Appendix

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Abstract

This document provides a minimal, self-contained verification surface for the SevenFold Proof of Consensus. It exposes the canonical geometric primitives, deterministic traversal order, and a reproducible benchmark demonstrating bounded, symmetry-safe convergence without randomness, leader election, or probabilistic retries. This appendix is intended for independent audit and comparison, not for production implementation.

1. Purpose and Scope

This document exists to enable independent verification of SevenFold's deterministic convergence properties. It is intentionally limited to mathematical primitives, invariant-level behavior, and a single adversarial benchmark.

2. Consensus Failure Under Symmetry

Many consensus systems rely on randomness, rotating leaders, or retries. These approaches do not guarantee bounded resolution under perfect symmetry.

3. Canonical Geometric Foundation

SevenFold operates over five fixed unit vectors evenly spaced on the unit circle.

Index	Angle	Axis Vector
0	0°	(1.000000000000, 0.000000000000)
1	72°	(0.309016994375, 0.951056516295)
2	144°	(-0.809016994375, 0.587785252292)
3	216°	(-0.809016994375, -0.587785252292)
4	288°	(0.309016994375, -0.951056516295)

4. Deterministic Symmetry Breaking (Rotor)

SevenFold resolves ties using a fixed traversal over ■■: [0, 3, 1, 4, 2]. This traversal guarantees complete coverage and bounded resolution.

5. Adversarial Non-Zero Symmetry Benchmark

Input winds: (0.809016994375, 0.587785252292) repeated three times.

Centroid: (0.809016994375, 0.587785252292).

Projections:

$p[0] = 0.809016994375$

$p[1] = 0.809016994375$

$p[2] = -0.309016994375$

$p[3] = -1.00000000000000$

$p[4] = -0.309016994375$

Max projection indices: [0, 1]. The rotor deterministically resolves the tie at index 0 in one step.

6. Verified Invariants

- Deterministic (no randomness)
- Bounded (≤ 5 steps)
- Replay-stable
- Symmetry-safe

7. Conclusion

SevenFold enforces consensus through geometric structure rather than probability. This document demonstrates deterministic, bounded convergence under adversarial symmetry.