Nexus–Momentum–Atempus (NMA) Framework

Public Disclosure Statement

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Location: Pachuca, Hidalgo, México

Disclosure Date: June 10, 2026

PCT Status: International application filed with the WIPO International Bureau (IB). Patent Pending worldwide.

What This Is

This page constitutes the formal public disclosure of the Nexus–Momentum–Atempus (NMA) Framework, a relational theory of emergent temporality developed by the author for determining, evolving, bounding, and verifying the effective time of any complex physical, biological, informational, or computational system from its own internal state.

The framework proposes a single, overarching principle: observable time is not a fundamental, externally given coordinate but an emergent magnitude that arises from the joint evolution of three coupled components — relational structure, transformative dynamics, and informational representation. Instead of treating the relational origin of time, its dissipative dynamics, the physical bounds on information, the energetic cost of irreversible change, and the verification of state identity as separate ideas, the NMA brings them together into one coherent and auditable framework.

The full technical specification, mathematical formulation, evolution equations, closure algorithm, and implementation schema are contained exclusively in the filed PCT application and in associated confidential documentation. This disclosure presents a functional summary sufficient to establish inventorship priority without constituting an enabling disclosure of the complete method.

The Four Integrated Components of the Model

The model establishes that the temporal behavior of any complex system is shaped by the interaction of four structural components:

1. Relational Structure and Coupled Dynamics (the Substrate)

The system is described by a relational structure field, a transformation field, and an informational representation field defined over a bounded domain. These three coupled components form the substrate from which temporal behavior is derived.

2. Emergent Temporality (the Clock)

An effective temporal variable, designated Atempus, is reconstructed as a functional of the instantaneous state. A purely auxiliary ordering parameter is used only to sequence the evolution and carries no physical content of its own, which removes the circularity of pre-supposing a time coordinate in order to derive time.

3. Bounded and Priced Information (the Ceiling and the Cost)

The information displayed by any bounded region is capped by a physical information ceiling, and every irreversible change of information carries a strictly positive minimum energetic cost. Information is treated as a finite, physical, and economically scarce resource within the dynamics.

4. Causal Admissibility and State Identity (the Constraint and the Proof)

Evolution is admitted only along causally consistent trajectories, excluding physically impossible sequencing. Every realized state carries a deterministic identity descriptor that enables reproducible verification of state equivalence.

The Core Idea: An Emergent Temporality Condition

The framework combines these four components into a single dynamical condition. This condition states that the realized evolution of a system is the dissipative trajectory that:

- settles toward a global equilibrium of a single generating free-energy functional that also certifies its own stability,
- remains within an information ceiling equal to the tighter of the finiteness bound and the holographic bound, while paying the minimum energetic cost of any irreversible informational change, and
- respects causal admissibility, so that the emergent temporality is recovered only along physically consistent histories.

When this condition holds, the system displays a well-defined emergent time that tracks its own internal evolution. In the appropriate limiting regime — where structural heterogeneity and informational separation vanish — the emergent temporality reduces to relativistic proper time, so established physics is recovered as a special case. This is not merely computational: it is proposed as a universal organizing principle for any system whose time must be derived, bounded, evolved, and verified.

What the Framework Achieves

A Unified View of Emergent Time

The framework recovers established results on relational and emergent time but enriches them with a dissipative gradient-flow dynamics, an explicit information ceiling, an energetic cost of irreversible change, and a verifiable state identity — unifying what were previously separate ideas into a single operational and auditable theory.

A Bridge Between Physics, Information, and Time

The model treats time as a derived, physical, and information-dependent quantity rather than an abstract background coordinate. Every complex system carries an emergent temporality — the one consistent with its structure, dynamics, and information — that ensures coherence across scales and domains.

What This Resolves

1. Time as an Unexplained Primitive

What it means: classical and quantum descriptions take time as an external, primitive coordinate that is never derived.

What it resolves: the framework derives an effective temporality from the system's own relational, dynamical, and informational state.

2. Circularity in Emergent-Time Proposals

What it means: several emergent-time programs implicitly presuppose a notion of time in order to define the very flow that is supposed to generate it.

What it resolves: the framework separates a purely auxiliary ordering parameter from the emergent observable, eliminating the circularity.

3. Disconnection Between Dynamics, Information, and Time

What it means: relational time, the physical bounds on information, and the cost of information change are treated as unrelated.

What it resolves: the framework couples structure, dynamics, and information within a single generating functional, connecting all three to the emergence of time while keeping them logically distinct.

4. Unbounded and Unpriced Information in Temporal Models

What it means: many models allow unlimited information and treat its transformation or erasure as free.

What it resolves: the framework imposes a physical information ceiling and assigns a strictly positive minimum energetic cost to irreversible informational change.

5. Absence of Causal Guarantees

What it means: simulated or modeled histories can admit physically impossible, superluminal, or paradoxical sequencing.

What it resolves: the framework enforces causal admissibility, so the emergent temporality is recovered only along causally consistent trajectories.

6. Lack of Reproducible State Verification

What it means: there is usually no canonical way to certify that a system's state has been preserved across a transformation.

What it resolves: the framework attaches a deterministic identity descriptor to each state, enabling reproducible verification and provenance.

7. Lack of a Falsifiable Temporal Principle

What it means: statements that “time is emergent” are often interpretive and not directly refutable.

What it resolves: the framework states its central claim as a measurable relation — a temporal correction that depends on heterogeneity, complexity, and informational distance — making the principle falsifiable rather than merely descriptive.

Applications

The framework is applicable to, without limitation:

- Geophysical and seismological systems: emergent time-to-rupture estimation from localized structural stress rather than chronological averaging
- Digital infrastructure and telecommunications: prediction of causal bottlenecks and anomaly detection independent of absolute timestamps
- Computational biology and oncology: prediction of cellular state transitions and systemic equilibrium shifts
- Artificial-intelligence and machine-learning systems: internal progress scheduling and human-machine synchronization based on emergent state evolution
- Autonomous transportation, swarm robotics, and supply chains: collision and bottleneck avoidance without exclusive reliance on global positioning clocks
- Financial and macroeconomic systems: early detection of liquidity failures and equilibrium collapse
- Distributed ledgers: minimum-energetic-cost consensus for irreversible informational state changes
- Complex-systems modeling and simulation: stable, causally consistent, information-bounded evolution with reproducible verification

State of the Art — What Exists and What This Adds

The Nexus–Momentum–Atempus Framework has been developed following review of the current published scientific and patent literature. As of the date of this disclosure:

Existing approaches separately treat time as relational, derive it from modular or thermodynamic flow, bound the information of a region, or price its erasure, but they are treated as independent results and are not combined into a single dynamical theory that derives, evolves, bounds, and verifies an emergent temporality.

Existing emergent-time frameworks propose that time arises from correlations, causal order, or algebraic flow, but they do not couple relational structure, dissipative dynamics, and bounded information within one generating functional, nor do they provide a causal admissibility guarantee and a reproducible state-identity verification layer.

Existing complex-systems and predictive methods model state transitions against an external clock, but they are not grounded in a unified principle that simultaneously derives the system's own time, constrains it physically, and certifies it.

No prior art known to the author defines the combination of an emergent relational temporality, a dissipative gradient-flow dynamics with provable stability, a physical information ceiling and energetic cost, a causal-admissibility constraint, and a deterministic state-identity descriptor within a single framework for deriving and verifying the time of a complex system.

Dissemination and Registration

The Nexus–Momentum–Atempus (NMA) Framework has been formally registered with the World Intellectual Property Organization (WIPO) International Bureau, ensuring international recognition, authorship protection, and traceable documentation of its originality and scope. Its conceptual structure, formal foundations, and implications for physics, complex-systems modeling, predictive analytics, and verification systems are available for academic review and theoretical evaluation by qualified researchers and institutions upon request.

This combination of global intellectual property registration and formal public disclosure reinforces the NMA as a rigorously presented, internationally acknowledged contribution to the fields of emergent temporality, complex systems, and the foundations of physics.

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