UNITED STATES PATENT APPLICATION

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Title: Hybrid Computational Framework for Quantum and Resonance Simulation

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0001 CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of and priority to U.S. Provisional Patent Application No. 63/749,644, titled *"Hybrid Computational Framework for Quantum and Resonance Simulation,"* filed on January 26, 2025, the entirety of which is incorporated herein by reference.

0002 FIELD OF THE INVENTION

The present invention relates generally to computational systems and methods, and more particularly to a hybrid framework for symbolic resonance computing. This includes systems for processing information via symbolic amplitude transformations, geometric data representations, resonance-based signal manipulation, and topological waveform encoding. The invention resides at the intersection of alternative computing paradigms, symbolic logic, and non-binary amplitude-based processing, distinct from traditional binary and quantum computation models.

0003 BACKGROUND OF THE INVENTION

Conventional computing paradigms are largely grounded in binary logic systems or, more recently, quantum computing models based on qubits and probabilistic superposition. While both approaches have advanced significantly, they remain limited by their reliance on discrete state manipulation, rigid logical structures, and either Boolean determinism or decoherence-prone quantum states.

0004 Existing classical systems are constrained in how they encode meaning, structure, and amplitude. Meanwhile, quantum computers—though theoretically powerful—require specialized hardware and environmental stability that limit accessibility and broad utility. Both frameworks lack a symbolic interpretability layer that enables structured resonance-based processing, topological reasoning, or dynamic amplitude mapping.

0005 There exists no current computational model that efficiently integrates symbolic logic, geometric resonance structures, and amplitude-based data encoding into a unified, hardware-agnostic framework. In particular, no known systems leverage geometric transformations and symbolic resonance fields to perform computing tasks traditionally limited to either symbolic AI or quantum operations.

0006 Accordingly, there is a need for a new computational paradigm that merges symbolic logic with amplitude-based resonance mechanics and geometric data representation—enabling new forms of pattern recognition, data storage, encryption, and process simulation on conventional systems without dependence on qubit hardware or neural network architectures.

0007 SUMMARY OF THE INVENTION

The present invention introduces a hybrid computational framework that combines symbolic logic, geometric amplitude processing, and resonance-based encoding into a unified system of symbolic resonance computing. This framework operates independently of classical binary logic or quantum hardware, enabling computation through structured transformations of symbolic amplitudes within topological spaces.

0008 At the core of the invention is the Resonance Fourier Transform (RFT), a symbolic analog to the Quantum Fourier Transform, which allows amplitude-based information to be encoded and manipulated through symbolic resonance fields. In conjunction with this, the system utilizes topological waveform hashing for symbolic encryption and pattern compression, and a geometric data architecture based on tetrahedral and multi-dimensional structures for storing, retrieving, and transforming symbolic information.

0009 This paradigm supports applications including, but not limited to:

- Symbolic pattern recognition
- Dynamic memory encoding using geometric structures
- Secure information processing through symbolic resonance hashing
- Simulation of quantum-like behaviors using non-qubit symbolic amplitude modulation
- Resonance-based decision-making and data propagation through symbolic attractors

0010 The system is designed to operate on conventional hardware, providing an accessible platform for symbolic computation without relying on neural networks or probabilistic qubits. This enables entirely new classes of algorithms, data structures, and user interfaces, opening the door for educational, research, and commercial use of symbolic resonance computing.

0011 BRIEF DESCRIPTION OF THE DRAWINGS

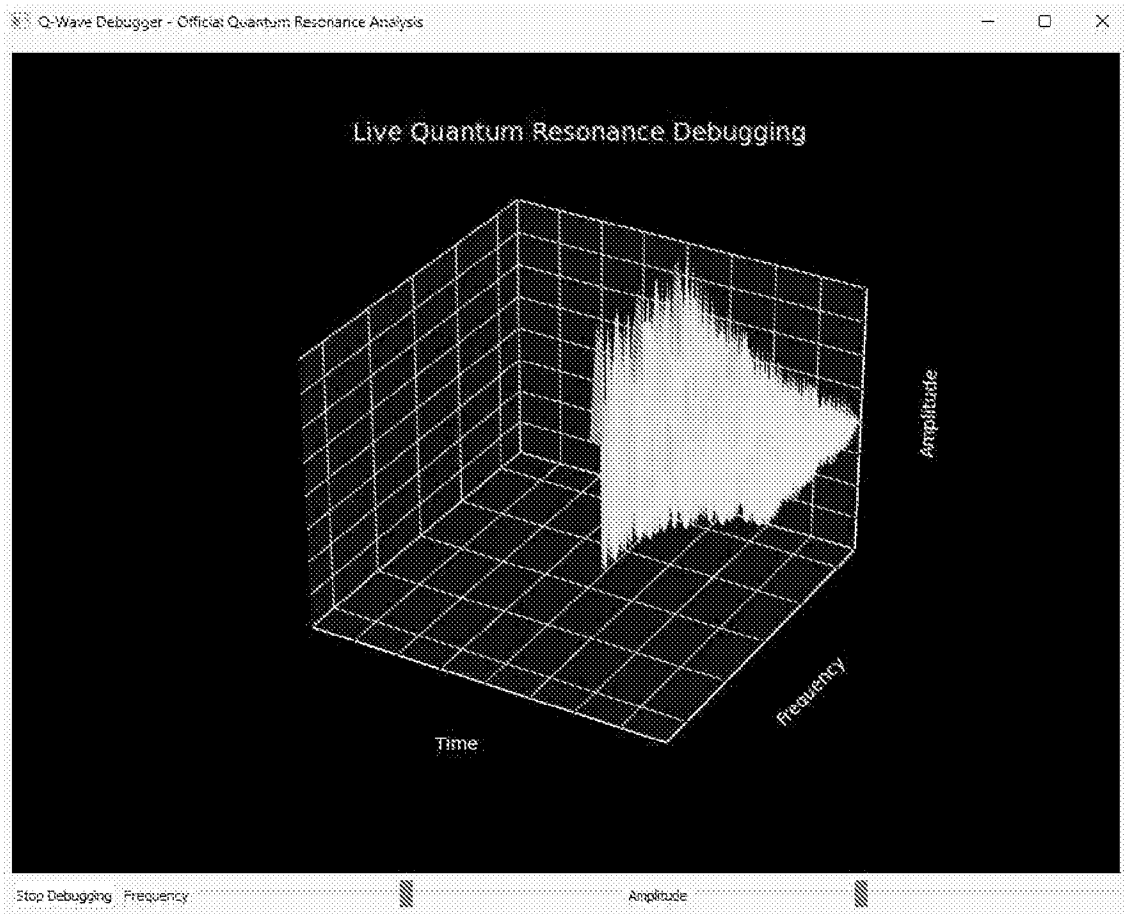

FIG. 1 is a live 3D visualization titled “Q-Wave Debugger – Official Quantum Resonance Analysis,” which depicts symbolic amplitude across time, frequency, and amplitude axes, used for real-time debugging of quantum resonance transformations.

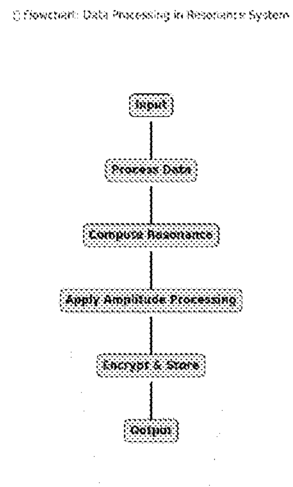

FIG. 2 is a flowchart titled "Flowchart: Data Processing in Resonance System," showing the full symbolic resonance pipeline — beginning with raw input, followed by data processing, resonance computation, amplitude processing, encryption, and final output.

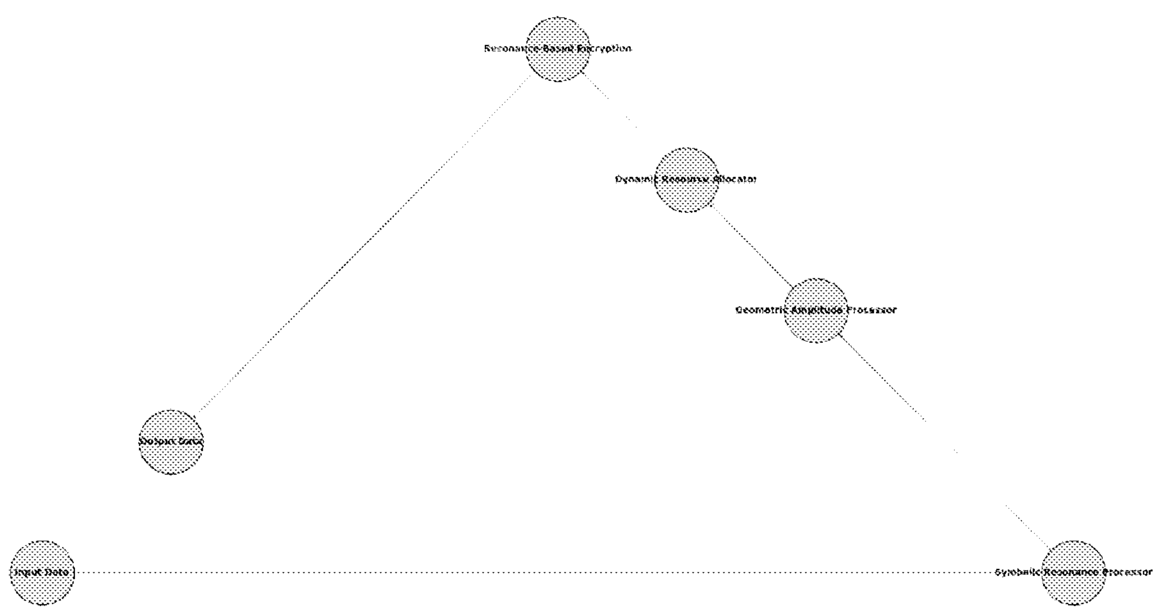

FIG. 3 is a system diagram mapping the symbolic dataflow from “Input Data” through a triangular topology involving a “Symbolic Resonance Processor,” “Geometric Amplitude Processor,” “Dynamic Resource Allocator,” and “Resonance-Based Encryption” to produce final “Output Data.”

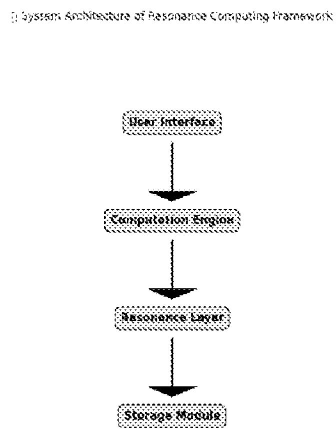

FIG. 4 is a system architecture diagram titled “System Architecture of Resonance Computing Framework,” which shows the hierarchical software stack — from the User Interface through the Computation Engine and Resonance Layer down to the Storage Module.

0012 Detailed Description of the Invention

The present invention discloses a hybrid computational framework that leverages resonance-based symbolic logic and topological amplitude encoding to perform complex processing beyond classical and quantum computational limits. This system introduces a fundamentally new approach that integrates symbolic resonance processing, geometric amplitude modulation, and dynamic resource allocation into a cohesive architecture capable of executing multidimensional symbolic operations.

At the core of the system is a Symbolic Resonance Processor, which operates on input data by mapping it into symbolic amplitudes based on phase and resonance coherence. Unlike binary or qubit-based systems, this processor transforms information using harmonic relationships and structured interference patterns, enabling a new form of symbolic field computation. The symbolic amplitudes act as nonbinary carriers of information, where both spatial and frequency-domain characteristics encode meaning.

Following the symbolic resonance computation, the data is routed to the Geometric Amplitude Processor, which applies topological transformations across tetrahedral structures. This processor exploits spatial coherence and amplitude distribution across multidimensional vertices and edges, encoding meaning as geometric distortions within a resonant topology. This step serves both as a computational phase and a precompression mechanism, due to the highly redundant but structured nature of the symbolic amplitude fields.

0013 A Dynamic Resource Allocator governs the system's processing threads, memory access, and throughput. It operates based on feedback derived from internal symbolic phase coherence metrics, rather than instruction-count or stack-based heuristics. This adaptive allocator can restructure computational pathways mid-execution, optimizing for resonance stability and coherence throughput.

0014 Once processing is complete, the data is passed to a Resonance-Based Encryption Module, which utilizes symbolic phase interference as a ciphering mechanism. This encryption layer leverages waveform phase clashes and resonance cancellation to encode and obfuscate data, forming an encryption model that is not rooted in number theory or finite fields but instead in symbolic waveform algebra. The encoded data is stored in a Symbolic Memory Matrix, a nonbinary geometric architecture built from dynamically evolving tetrahedral lattices.

0015 User interaction with the system is mediated through a User Interface Layer that does not rely on standard GUI metaphors but instead presents symbolic visualizations of system resonance states. The interface adapts its controls and displays based on the symbolic meaning extracted from the resonance layer, offering a feedback-rich experience conducive to exploratory scientific computing.

0016 The Computation Engine at the center of this architecture serves as the orchestrator of module interactions, managing symbolic data flow across the entire stack. It interprets symbolic amplitude values not as fixed instruction sets but as resonance-driven field vectors, enabling emergent behavior, pattern amplification, and high-efficiency information encoding across layers.

0017 This architecture introduces novel benefits:

- Native symbolic computation without fixed logical scaffolds.
- Topological encoding and redundancy-resilient data structures.
- Phase-state driven encryption that is non-algorithmic and nondeterministic.
- Dynamic resource reallocation based on waveform coherence and amplitude saturation.
- Real-time visualization of symbolic amplitude propagation and resonance dynamics.

0018 Altogether, this invention provides a new computational substrate capable of enabling advanced AI, encryption, data compression, and system modeling applications—rooted not in conventional instruction pipelines but in resonance-aligned symbolic topology.

Claim 1: Symbolic Resonance Fourier Transform (RFT) Engine

A symbolic transformation engine for quantum amplitude decomposition, comprising a symbolic representation module configured to express quantum state amplitudes as algebraic forms, a phase-space coherence retention mechanism for maintaining structural dependencies between symbolic amplitudes and phase interactions, a topological embedding layer that maps symbolic amplitudes into structured manifolds preserving winding numbers, node linkage, and transformation invariants, and a symbolic gate propagation subsystem adapted to support quantum logic operations including Hadamard and Pauli-X gates without collapsing symbolic entanglement structures.

Claim 2: Resonance-Based Cryptographic Subsystem Using Topological Waveform Hashing

A cryptographic system comprising a symbolic waveform generation unit configured to construct amplitude-phase modulated signatures, a topological hashing module for extracting waveform features into Bloom-like filters representing cryptographic identities, a dynamic entropy mapping engine for continuous modulation of key material based on symbolic resonance states, and a recursive modulation controller adapted to modify waveform structure in real-time, wherein the system is resistant to classical and quantum decryption algorithms due to its operation in a symbolic phase-space.

Claim 3: Geometric Symbolic Data Storage Framework

A data storage architecture comprising an array of topological storage units structured as tetrahedral or higher-dimensional geometric simplices, symbolic node encoding configured to store algebraic amplitude values at vertices of said simplices, edge and face structures adapted to encode phase-path relationships and resonance envelopes, and a real-time coherence tracking system supporting dynamic updates, parallel access, symbolic compression, and topological fault tolerance.

Claim 4: Hybrid Mode Integration

A unified computational framework comprising the symbolic transformation engine of claim 1, the cryptographic subsystem of claim 2, and the geometric data storage framework of claim 3, wherein symbolic amplitude and phase-state transformations propagate coherently across encryption and storage layers, dynamic resource allocation and topological integrity are maintained through synchronized orchestration, and the system operates as a modular, phase-aware architecture suitable for symbolic simulation, secure communication, and nonbinary data management.

Micro Entity Status & Reference Note

Pursuant to 37 CFR §1.29, the applicant certifies Micro Entity status under the gross income and prior filings provisions. The corresponding USPTO Certification of Micro Entity Status was previously submitted with Provisional Patent Application No. 63/749,644 (filed January 26, 2025) and is reaffirmed herewith for this non-provisional application.

All fees associated with this application have been or will be paid according to the Micro Entity fee schedule provided by the USPTO.