Tesselon — A Non-Binary Spatial Logic System for Field-Based Computation

Provisional Patent Application

Inventor: Brian Henry Medlock
Address: 70 Algona Rd, Charlestown, NSW 2290, Australia
Email: medlock@gmail.com
Phone: +61 490 900 663

Abstract

The invention proposes a new physical and conceptual architecture for computation based on a discrete, multi-state logic system. Unlike binary logic systems reliant on two states (e.g., 0 and 1), the system introduced here leverages a five-state model embedded within a rigid 3D cubic grid. This system facilitates signal transmission, storage, and transformation through field-based interactions rather than traditional voltage gates. The apparatus and method described allow for modeling and resolving problems where binary logic reaches practical or conceptual limitations.

Background

Modern computation is founded almost entirely on binary logic. Despite its universality and engineering success, binary systems have known limits in modeling complexity, natural symmetry, and continuous or chaotic systems. The proposed system reimagines computation as a spatial, multi-state process with greater similarity to natural patterning, such as cellular growth or wave interaction.

Introduction

Tesselon is a novel spatial computing system based on non-binary, directional signal propagation. Unlike traditional logic systems based on binary states (0 or 1), Tesselon operates within a spatial matrix composed of interconnected nodes, each capable of handling multiple directional inputs and outputs. This system is inspired by natural symmetry and physical pathways, and its computational behavior arises from signal flows rather than discrete switching states.

Tesselon System Overview – Technical Description

1. System Architecture
At the core of the Tesselon system lies a rigid cubic matrix, typically realized as a solid block of engineered material such as fused quartz, optical polymer, or other dielectric media. This matrix is precision-perforated with straight, evenly spaced channels running orthogonally along the X, Y, and Z axes, forming a three-dimensional grid.

2. Crosspoint Logic (Tessels)
Wherever three channels intersect (X×Y×Z), the intersection point is known as a Tessel — the system's fundamental logical crosspoint. These tessels may be Passive (permitting signal cross/through), Active (switching state under command),

or Dynamic (re-routing or modulating flow). Each tessel can serve as a routing node, logic gate, memory bit, or amplification point, depending on its embedded physical characteristics.

3. Switching Mechanism
Switching occurs at tessels through field-based control, material phase change, rotary nanomechanical shutters, or optically induced gating. These methods adjust the transmission, reflection, or re-routing behavior of the signal path.

4. Topology and Symmetry
The uniform cubic structure ensures isotropy and modularity. All tessels are equidistant. All channels are symmetric. Subsections can be stacked, expanded, or segmented for zones of computation or memory.

5. Computation Model
Instead of digital binary logic based on voltage thresholds, Tesselon uses a spatial logic model: computation emerges from signal interference, path modulation, and wavefront interactions. Logic states are mapped to presence, phase, polarity, angle, or frequency.

6. Control Interface
A control layer surrounds the matrix, delivering instruction sets via electrodes, light injectors, embedded metamaterial meshes, or supervisory microcontrollers. These interfaces configure computation at boot, during cycles, or dynamically.

7. Manufacture & Materials
Tesselon matrices can be constructed via laser etching, additive manufacturing, MEMS/NEMS embedding, or molecular self-assembly. Optical-grade fused silica, sapphire, and photonic polymers are candidate materials.

8. Applications
Tesselon logic suits spatial computing, pattern recognition, signal routing, embedded AI, and reversible or quinary logic exploration. It models simulated analog fields depending on signal encoding.

Summary of the Invention

Tesselon introduces a new class of computing architecture based on the following core principles:

• Quinary Logic States: The system defines five unique logical states per node (or cell), with distinct physical or signal-based representations.

• Rigid Cubic Matrix Structure: Computation occurs within a three-dimensional grid of fixed spatial cells or junctions. Each cell can hold one of five possible states and may interact with its orthogonal neighbors.

• Signal Flow via Field Interaction: State changes may be induced not by direct switching, but through influence from adjacent fields — including magnetic, optical, electrochemical, or proximity-based effects.

• Rotary Switching or Continuous Flow Paths: Signal transmission is modeled not as a pulse but as a continuous, steerable flow through multi-state junctions.

• State Memory and Path Dependency: Junctions may exhibit memory — retaining or adapting their state based on signal history.

• Nonlinear, Simultaneous Processing: Supports simultaneous input across many pathways, suitable for modeling wave behavior, fluid dynamics, or emergent systems.

Claims

Claim 1 (Independent) – Core Structure
A computational architecture comprising a rigid, three-dimensional matrix of uniformly distributed nodes, wherein each node supports a finite number of fixed linear passageways that allow for the routing of discrete signals through the structure.

Claim 2 (Dependent) – Signal Medium
The architecture of claim 1, wherein said discrete signals are selected from the group consisting of optical pulses, electromagnetic pulses, acoustic waves, or fluidic pressure changes.

Claim 3 (Dependent) – Tessel Configuration
The architecture of claim 1, wherein each node is a tessel with five passageways arranged to permit routing in a quinary logic model, and wherein said passageways intersect orthogonally or diagonally with respect to the surrounding matrix.

Claim 4 (Dependent) – Control Node Offset Bias
The architecture of claim 3, wherein signal routing is influenced by adjacent control elements whose positions are asymmetrically offset relative to the tessel, creating preferential path selection based on proximity-induced bias.

Claim 5 (Dependent) – Switching Method
A method for routing signals through the architecture of claim 1, comprising activating one or more control nodes proximal to a target tessel to induce a change

in internal pathway selection within said tessel.

Claim 6 (Dependent) – Passive Routing
The method of claim 5, wherein control is exerted without mechanical or electronic switching within the tessel itself, but instead via spatial proximity effects or pre-defined physical biasing in the control lattice.

Claim 7 (Dependent) – Modular Expansion
The architecture of claim 1, wherein the matrix is composed of modular sub-blocks of tessels, each sub-block independently operable and interconnectable to form a larger distributed computational volume.

Claim 8 (Dependent) – Fabrication by Laser Ablation
The architecture of claim 1, wherein the passageways are created by laser ablation or laser-assisted drilling through a solid transparent medium, forming smooth bore conduits within a single rigid block.

Claim 9 (Dependent) – Quinary State Routing
The architecture of claim 3, wherein each passageway represents one of five discrete routing states, allowing the system to represent and manipulate information using a base-5 logical framework.

Claim 10 (Independent) – Control Lattice
A control lattice for influencing signal flow in a rigid computational matrix, the lattice comprising a set of spatially distributed activation nodes, each capable of locally biasing path selection in adjacent routing tessels by differential field strength, proximity, or material distortion.

Claim 11 (Dependent) – Switching Without Moving Parts
The lattice of claim 10, wherein path selection within a tessel is achieved without moving parts, using energy gradients, index of refraction manipulation, or geometry-induced preference.

Claim 12 (Dependent) – Application to Non-Optical Media
The method of claim 5, wherein the signal medium is acoustic or magnetic rather than optical, and switching is achieved through impedance or field shaping effects at the control nodes.

Figures

FIG. 1: 3D coordinate orientation of a drilled block unit, showing X, Y, and Z axes for directional signal pathways.

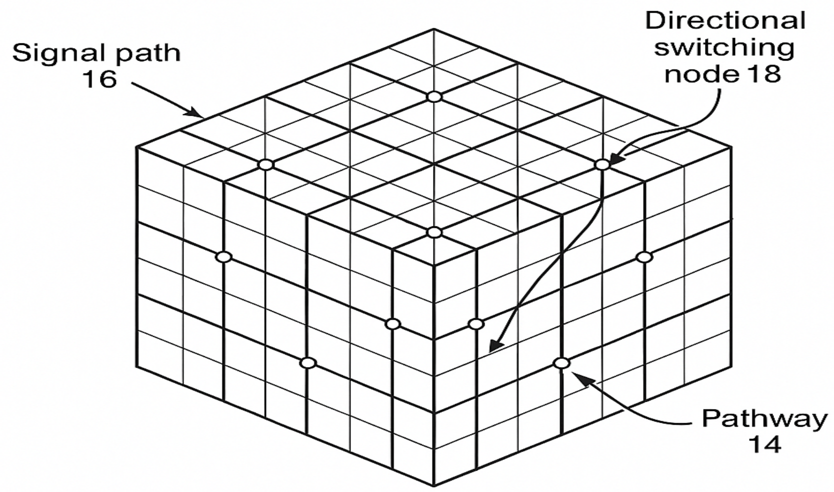

FIG. 2

FIG. 2: Signal path within a block, highlighting multi-directional pathways (14), switching nodes (18), and control channels (16).

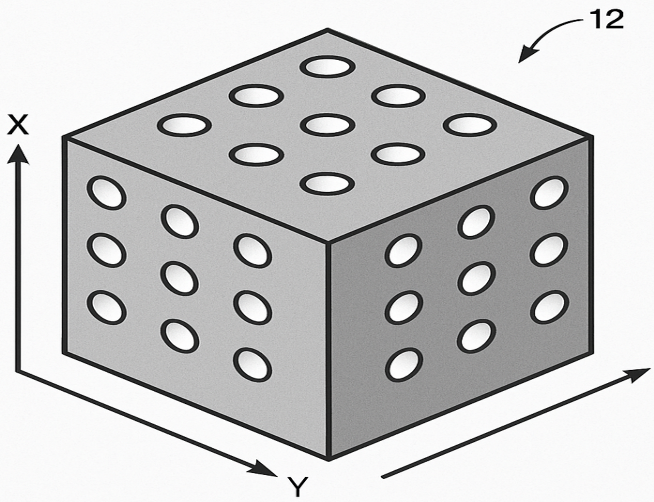

FIG. 1

FIG. 3: System view showing how multiple blocks connect and form a grid, illustrating larger-scale signal propagation.

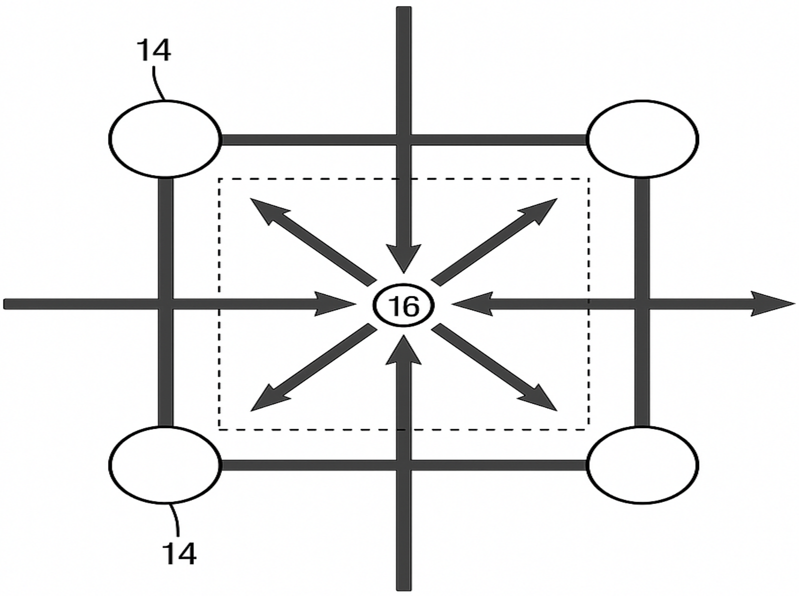

FIG. 2

Note: Image label shows 'Fig. 2' but this is correctly referred to as Fig. 3.

Notes on Components

Labeled parts in the figures include:

• 12: Core signal entry points.

• 14: Directional pathways (analog signal routes).

• 16: Switching or modulation nodes (analog gates).

• 18: Decision points, determining directional flow based on incoming signal context.

The system is designed with minimal moving parts, relying instead on physical orientation and signal logic. Future implementations may use photonic, fluidic, or micro-electromechanical systems (MEMS) to construct real-world versions.

Potential Applications

• Analog field modeling (e.g., weather, magnetism, fluid flow)

• Simulations of natural systems

• Low-energy computation for embedded systems

• Signal routing for quantum-adjacent or neuromorphic computing

Final Notes

This is a conceptual and architectural patent. Specific implementations (electrical, optical, mechanical, or hybrid) are reserved for follow-up filings. The focus here is on the logic design and novel structure.