Title: A Unified Abstract Model of Spaces with Dynamic Boundaries, Controls, and Self-Regulation

Author: itzhexen

Abstract:
This paper proposes a unified abstract model representing both electronic transistors and artificial neurons as generalized “spaces” with dynamic boundaries. Each space contains inputs, outputs, controls, and an internal state, with boundaries that can vary from fully closed to fully open in terms of energy level or transparency. Controls can be inside or outside the space, multiple in number, and may be entangled across separate spaces. The model also incorporates self-regulation via internal feedback loops, allowing a space to open or close its boundaries in response to internal needs, analogous to biological neurons regulating energy intake. This framework offers a flexible, high-level abstraction for understanding diverse gating phenomena in natural and artificial systems.

---

1. Introduction

Transistors and artificial neurons are fundamental components in electronics and neural networks, respectively. While they appear different at the device level, they share abstract characteristics: each operates within a “space” that processes inputs and outputs, controlled by some threshold or gate mechanism. This paper presents a unified conceptual model capturing these features and extending them with additional properties like boundary dynamics, multiple inputs/outputs/controls, entanglement, and self-regulation.

---

2. Core Model Components

- Space: An abstract domain where inputs enter and outputs exit. Spaces can be bounded or unbounded, with boundaries that may change transparency or energy levels.

- Boundaries/Gates: Boundaries serve as controls for inclusion or exclusion of signals or energy flow, functioning as gates that can vary in “openness” rather than simple binary states.

- Inputs and Outputs: Inputs represent the signals or resources entering the space, while outputs are the results or emissions after processing.

- Controls: Controls influence the boundary states and can reside inside or outside the space. Multiple controls may operate concurrently, allowing complex gating mechanisms.

- Internal State: The space maintains an internal state representing accumulated resources or conditions, which influences its behavior and regulation.

- Self-Regulation: The space can regulate itself by monitoring its internal state and adjusting boundary openness to maintain optimal functioning, such as opening gates to gather resources and closing once sufficient levels are reached.

---

3. Extensions and Advanced Features

- Multiple Spaces and Entanglement: Multiple spaces can exist independently yet have their controls linked or entangled. A change in one control instantaneously affects others, enabling coordinated gating behavior across distant spaces.

- Dynamic Boundaries: Boundaries are not simply “open” or “closed” but have graded levels of transparency or energy thresholds, allowing nuanced control over flow.

- Multiple Inputs, Outputs, and Controls: Each space can handle various inputs, outputs, and controls tailored to different tasks or functions.

---

4. Conceptual Diagram (Description)

Imagine each space as a container with several gates inside, each gate controlled by one or more control signals. The gates modulate how inputs flow into outputs. The internal state feeds back into the control system, enabling self-regulation by adjusting gates dynamically. Multiple such spaces connect through an entangled control network, where controlling one gate can influence others even if spatially separated.

---

5. Discussion

This abstract model bridges the gap between physical devices like transistors and biological constructs like neurons by focusing on the shared principles of spaces, boundaries, controls, and feedback. It can be applied to design new computing architectures, neural simulations, or energy systems requiring adaptive gating and self-regulation.

---

6. Conclusion

By conceptualizing transistors and neurons as spaces with dynamic boundaries controlled internally and externally, with potential for entangled coordination and self-regulation, this model provides a flexible and powerful abstraction. It invites further exploration into complex systems where control and feedback are distributed and intertwined.

Acknowledgments

Thanks to ChatGPT for assistance in drafting and refining these concepts.

References

[Not included in this abstract draft]