QSTIQ: A Hybrid Cognitive Rendering Model Based on Formal Quantum Non-locality

A System Engineering Analysis of the Perception-Recall Resolution Gap

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Abstract

This paper proposes a theoretical model to explain the resolution gap between perception and recall/imagination in human cognition. While traditional neuroscience models the brain as a local computing and storage system, this approach faces challenges in explaining the high-resolution spatiotemporal experience maintained under a limited energy budget (~20W) versus the low-quality, delayed nature of recollection. We propose a hybrid structure consisting of **Direct-Reference Processing (DRP)** for perception and **Local Reconstruction (LR)** for memory. This process is defined as **Spatiotemporal Information Querying (QSTIQ)**. By adopting the concept of non-locality from quantum information theory as a formal analogy, we describe perception as a high-frequency synchronization with external information structures, rather than internal data generation.

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1. Introduction

Human consciousness exhibits a profound asymmetry: perception is vivid, continuous, and high-resolution, whereas recollection is fragmented, delayed, and low-resolution. This paper redefines this gap not as a failure of "storage capacity," but as a fundamental difference in "information access methodology." We introduce the **QSTIQ framework** to bridge system engineering principles with cognitive science.

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2. Theoretical Framework

2.1 The Cognitive Subject as a Query Node

In this model, the 'Self' is functionally defined as a **Functional Query Node**. Instead of being a container of data, the subject acts as a hub that dynamically synchronizes with and accesses spatiotemporal information.

2.2 Perception: Direct-Reference Processing (DRP)

Perception is modeled as a state of high-frequency correlation between the cognitive node and the environmental information structure.

Mechanism: Direct synchronization without intermediary reconstruction.
Characteristics: Zero-latency (formal), high fidelity, and continuous stability.
Formal Analogy: This is analogous to Quantum Non-locality, where two systems maintain a correlation without a physical signal transmission for every pixel of information.

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3. The QSTIQ Model for Memory and Imagery

3.1 Definition of QSTIQ

Spatiotemporal Information Querying (QSTIQ) is the process of accessing past experiences. Unlike perception, memory does not "hold" the data but "queries" it using specific indices.

Spatiotemporal Index (S_i,T_i): Pointers to the coordinates of the experience.
Relational Graph: The structural connectivity between objects and contexts.
Reconstruction Function (f_{recon}): The local algorithm that converts structural cues back into sensory-like imagery.

3.2 Formal Decoherence and Bottlenecks

The degradation of resolution in recall is explained by:

1. Formal Decoherence: The loss of correlation strength during the transition from direct-reference to local query.
2. Reconstruction Bottleneck: The visual cortex's limited computational power to render complex textures from compressed structural seeds.

4**. System Engineering Analogy: SSR vs. LR**

To clarify, we compare this to modern web architectures:

Perception (SSR - Server Side Rendering): The "Environment" (Server) provides the full resolution; the "Brain" (Client) simply displays the synchronized state.
Recall (LR - Local Rendering): The "Brain" receives only the "Code" (Query results) and must render the image locally, leading to lower quality and higher latency.

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5. Discussion and Implications

Energy Efficiency: Explains how the brain maintains vivid consciousness with minimal wattage by "referencing" rather than "generating" reality.
Falsifiability: The model predicts distinct information entropy signatures between perception and recall that cannot be explained by simple signal-to-noise ratios.

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6. Conclusion

The QSTIQ model provides a new lens to view the human mind as a hybrid interface. By treating the brain as a terminal that queries a non-local information field, we can unify the disparate characteristics of perception and memory. This formal framework invites further exploration into the intersection of quantum information theory and cognitive system engineering.
