Mandrov Coherent Gravity

A Subjective Coherence-Based Framework for Emergent Quantum Gravity

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Abstract

This paper proposes an extension of the Mandrov Coherent Field Theory (MCFT) toward a model of quantum gravity. We hypothesize that gravitational geometry emerges from gradients in a scalar coherence field $\mathcal{C}(x^\mu)$, which represents the subjective coherence of an observer across quantum branches. The dynamics of spacetime and gravity arise not from mass–energy alone, but from the optimization of observer-centric coherence. The resulting framework connects general relativity, quantum decoherence, and information-based action principles.

Keywords: quantum gravity, subjective coherence, emergent spacetime, observer, modified Einstein equations

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1 Introduction

Mandrov Coherent Field Theory postulates that the observer's conscious trajectory preferentially follows quantum branches that maximize a functional of subjective coherence $\mathcal{C}$. We extend this idea to spacetime by proposing that coherence acts as a gravitational source, such that the geometry of spacetime reflects a statistical average over coherent observer paths.

2 Coherence as a Field

Let $\mathcal{C}(x^\mu)$ be a scalar field defined over spacetime, representing the local density of subjective coherence. Regions with higher coherence correspond to stable, causally consistent experiences for the observer.

We propose a Lagrangian density of the form:

$$\mathcal{L} = \frac{1}{2}R - \lambda \nabla_\mu \mathcal{C} \nabla^\mu \mathcal{C} - V(\mathcal{C})$$

where:

- R is the Ricci scalar,
- λ is a coupling constant,
- $V(\mathcal{C})$ is a potential function.

3 Field Equations

Varying the action with respect to the metric $g_{\mu\nu}$, we obtain modified Einstein equations:

$$G_{\mu\nu} = 8\pi T^{(\mathcal{C})}_{\mu\nu}$$

where $T^{(\mathcal{C})}_{\mu\nu}$ includes contributions from the coherence field.

4 Extended Formalism

4.1 Coherence Field Dynamics

The scalar field $\mathcal{C}(x^\mu)$ evolves according to a Klein–Gordon-like equation derived from the action:

$$\Box \mathcal{C} - \frac{dV}{d\mathcal{C}} = 0$$

where $\Box = g^{\mu\nu}\nabla_\mu \nabla_\nu$ is the d'Alembert operator.

4.2 Modified Energy-Momentum Tensor

$$T^{(\mathcal{C})}_{\mu\nu} = \lambda \left(\nabla_\mu \mathcal{C} \nabla_\nu \mathcal{C} - \frac{1}{2} g_{\mu\nu} \nabla^\alpha \mathcal{C} \nabla_\alpha \mathcal{C} \right) - g_{\mu\nu} V(\mathcal{C})$$

4.3 Conservation Law

$$\nabla^{\mu} T^{(\mathcal{C})}_{\mu\nu} = 0$$

5 Interpretation of Gravity as Coherence Geometry

Gravity arises as a manifestation of optimal coherence structure. That is, the observed spacetime curvature encodes regions where observer trajectories converge under maximum subjective coherence.

6 Subjective Action Principle

We propose a coherence-optimized action:

$$\delta \int \mathcal{C}(x^{\mu}) \sqrt{-g}\, d^4x = 0$$

This yields dynamics that select spacetime configurations maximizing coherent continuity of observer identity.

7 Conclusion and Outlook

This approach opens the door to:

- A subjective interpretation of gravitational fields,
- Coherence-based emergent spacetime,
- New approaches to the problem of quantum gravity,
- Compatibility with quantum information theory.

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