Gravitational Gauge Interactions of Scalar Field

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Abstract: Quantum gauge theory of gravity is formulated based on gauge principle. Because the Lagrangian has strict local gravitational gauge symmetry, gravitational gauge theory is a perturbatively renormalizable quantum theory. Gravitational gauge interactions of scalar field are studied in this paper. In quantum gauge theory of gravity, scalar field minimal couples to gravitational field through gravitational gauge covariant derivative. Comparing the Lagrangian for scalar field in quantum gauge theory of gravity with the corresponding Lagrangian in quantum fields in curved space-time, the definition for metric in curved space-time in geometry picture of gravity can be obtained, which is expressed by gravitational gauge field. In classical level, the Lagrangian and Hamiltonian approaches are also discussed.

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