Spin-compatible construction of a consistent Quantum Gravity model from Minimum Information

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Abstract
It has been shown in [1] that a quantum gravity formulation exists on the basis of quantum number conservation, the laws of thermodynamics, unobservable interactions, and locally maximizing the rate of resulting degrees of freedom per imposed degree of freedom of the theory. A generalization of the first Law of thermodynamics has been imposed on the boundary of space-time volumes, while no explicit microscopic quantum structure was required. From this model, Quantum Field Theory and General Relativity have been recovered as special cases. This paper presents the generalized action in terms of tetrads and shows how the action may be related to the spin of matter fields.

Intruding Space-Time Parameter:
Lorentz-Space (n = 3 + 1)

Result do:
\[ N_{\text{com}} = n^2 = 16 \]

Input do:
\[ N_{\text{com}} = 4 + 3 + 3 \text{ (transl. + rot. + boosts)} \]

Ratio \[ N_{\text{com}} \]

Space is arbitrary & \( T \) smooth [1]

Geometry is generated by tetrads \( e_a^\mu \)

Exchange of Quanta by Packets of fixed quantum numbers (Particle Species A):

Boundary of Thermally Small Volume [1]*

Boundary of Isolated Space-Time Manifold

Assumption: The boundary reveals all the physics of the content (as also proposed by [3]).

Systems (Collections of \( N \) mass-energy quanta):

Gravitational Field
Interaction Particle
Current Field
Potent. Self-
Particle
Field
Dynamics

Special Case at Second Order in the dimension of derivatives \( \psi^\mu \)

Special Case: Fermionic Matter at Lowest Order in the dimension of derivatives of \( \psi^\mu \), \( \dot{\psi}^\mu = \dot{\psi}^\mu - \psi^\mu V_\lambda \)

Leading to Dirac Field Action:

General Case: Formal Expansion in Connection and Particle Functions (omitting the indices)

References