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Holomorphic General Coordinate Invariant Modified Measure Gravitational Theory

Abstract

Complexifying space time has many interesting applications, from the construction of higher dimensional unification, to provide a useful framework for quantum gravity and to better define some local symmetries that suffer singularities in real space time. In this context here spacetime is extended to complex spacetime and standard general coordinate invariance is also extended to complex holomorphic general coordinate transformations.

This is possible by introducing a non Riemannian Measure of integration, which transforms avoiding non holomorphic behavior. Instead the measure transforms according to the inverse of the jacobian of the coordinate transformation and avoids the traditional square root of the determinant of the metric $\sqrt{-g}$. which is not globally holomorphic , or the determinant of the vierbein which is sensitive to the vierbein orientations and not invariant under local lorentz transformations with negative determinants. A contribution to the cosmological term appears as an integration constant in the equations of motion. A proposed action for Finsler geometry, which involves $-g$ rather than $\sqrt{-g}$ will also constitute an example of a Holomorphic General Coordinate Invariant Modified Measure Gravitational Theory. REFERENCE, ANNALS OF PHYSICS, November 2023, Volume 458, Part 2