

There are three separate approaches to the challenge of constructing WCW Kähler geometry and spinor structure. The first one relies on a direct guess of the Kähler function. Second approach relies on the construction of Kähler form and metric utilizing the huge symmetries of the geometry needed to guarantee the mathematical existence of Riemann connection. The third approach relies on the construction of spinor structure assuming that complexified WCW gamma matrices are representable as linear combinations of fermionic oscillator operator for the second quantized free spinor fields at space-time surface and on the geometrization of super-conformal symmetries in terms of spinor structure.

In this chapter the construction of Kähler form and metric based on symmetries is discussed. The basic vision is that WCW can be regarded as the space of generalized Feynman diagrams with lines thickened to light-like 3-surfaces and vertices identified as partonic 2-surfaces. In zero energy ontology the strong form of General Coordinate Invariance (GCI) strongly suggests effective 2-dimensionality and the basic objects are taken to be pairs of partonic 2-surfaces X^2 at opposite light-like boundaries of causal diamonds (CDs). This has however turned out to be too strong formulation for effective 2-dimensionality string world sheets carrying induced spinor fields are also present.

The hypothesis is that WCW can be regarded as a union of infinite-dimensional symmetric spaces G/H labeled by zero modes having an interpretation as classical, non-quantum fluctuating variables. A crucial role is played by the metric 2-dimensionality of the light-cone boundary δM^4_+ and of light-like 3-surfaces implying a generalization of conformal invariance. The group G acting as isometries of WCW is tentatively identified as the symplectic group of $\delta M^4_+ \times CP_2$. H corresponds to sub-group acting as diffeomorphisms at preferred 3-surface, which can be taken to correspond to maximum

of
Kahler function.

In zero energy ontology (ZEO) 3-surface corresponds to a pair of space-like 3-surfaces at the opposite boundaries of causal diamond (CD) and thus to a more or less unique extremal of Kahler action. The interpretation would be in terms of holography. One can also consider the inclusion of the light-like 3-surfaces at which the signature of the induced metric changes to the 3-surface so that it would become connected.

An explicit construction for the Hamiltonians of WCW isometry algebra as so called flux Hamiltonians using Hamiltonians of light-cone boundary is proposed and also the elements of Kahler form can be constructed in terms of these. Explicit expressions for WCW flux Hamiltonians as functionals of complex coordinates of the Cartesian product of the infinite-dimensional symmetric spaces having as points the partonic 2-surfaces defining the ends of the the light 3-surface (line of generalized Feynman diagram) are proposed.

This construction suffers from some rather obvious defects. Effective 2-dimensionality is realized in too strong sense, only covariantly constant right-handed neutrino is involved, and WCW Hamiltonians do not directly reflect the dynamics of Kahler action. The construction however generalizes in very straightforward manner to a construction free of these problems. This however requires the understanding of the dynamics of preferred extremals and Kahler-Dirac action.

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