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Simplicial Graviton from Selfdual Ashtekar Variables

Monday, 8 July 2024 15:00 (45 minutes)

Selfdual gravity is a reformulation of general relativity on the phase space of an SL(2,C) gauge theory. As pointed out by Abhay Ashtekar in the mid 1980ies, this reformulation lead to a remarkable simplicity of Hamiltonian GR. Using selfdual variables, the constraints simplify and assume the simplest possible polynomial form. In this talk, I lay out a new non-perturbative lattice approach for selfdual gravity. Three results will be discussed. First of all, I explain how to introduce a local kinematical phase space at the lattice sites. At each lattice site, a set of constraints is found that replace the generators of hypersurface deformations in the continuum. The second and most intriguing result is that the discretized constraints close under the Poisson bracket. The resulting reduced phase space describes the two radiative modes at the discretized level. As consistency check, I apply the construction to gravity in three-dimensions. In this way, the established spin-network representation of three-dimensional gravity is recovered from a local quantisation of space. The talk is based on arXiv:2305.01803

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