HAMILTONIAN FORMULATION OF QUADRATIC POINCARÉ GAUGE THEORY OF GRAVITY

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We started with Poincaré gauge theory of gravity which permits the dinamical role of torsion. The Lagrangian of such theory is most general scalar formed from the gauge field strengths - Riemann tensor R_{ijkl} and torsion T_{ijk}. Beside the Einstein term proportional to R it contain 9 quadratic terms with 9 undetermined constants. Various choices of this constants corresponds to various theories, with different number of physical degrees of freedom.

The investigation of that problem can be done in the linearized version of the theory where we consider propagation of various particles [1], or in the Hamiltonian formulation where we must use Dirac method for systems with constraints. We established correspondence between infinite masses of the particles and existence of the constraints in Hamiltonian formulation.

The Hamiltonian formulation is necessary if such theory is to be quantized. All gauge potentials are treated as independent variables, as in ref. 2), where the same problem for the Einstein-Cartan theory is solved. For the physical reasons we work in the time gauge where the x^o coordinate has a clear meaning.

References:

1) K. Hayashi, T. Shirafuji, Prog. of Theor. Phys., 64, No.4. pp.1435 (1980).
2) M. Blagojević, I. Nikolić, D. Popović and Dj. Živanović, Il Nuovo Cimento, 62 B, No.2. (1981)