General Relativity and Quantum Cosmology

A solution of the non-uniqueness problem of the Dirac Hamiltonian and energy operators

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In a general spacetime, the possible choices for the field of orthonormal tetrads lead (in standard conditions) to equivalent Dirac equations. However, the Hamiltonian operator is got from rewriting the Dirac equation in a form adapted to a particular reference frame, or class of coordinate systems. That rewriting does not commute with changing the tetrad field (u_α). The data of a reference frame F fixes a four-velocity field v, and also fixes a rotation-rate field $\Mat{\Omega}$. It is natural to impose that $u_0=v$. We show that then the spatial triad (u_p) can only be rotating w.r.t. F, and that the title problem is solved if one imposes that the corresponding rotation rate $\Mat{\Xi}$ be equal to $\Mat{\Omega}$ - or also, if one imposes that $\Mat{\Xi}=\Mat{0}$. We also analyze other proposals which aimed at solving the title problem.

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