

Contributed Talk

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Title: Motion of a gyroscope on a closed timelike curve

Abstract: We consider the motion of a gyroscope on a closed timelike curve (CTC). A gyroscope is identified with a unit-length spacelike vector - a spin-vector - orthogonal to the tangent to the CTC, and satisfying the equations of Fermi-Walker transport along the curve. We investigate the consequences of the periodicity of the coefficients of the transport equations, which arise from the periodicity of the CTC, which is assumed to be piecewise C^2 . We show that every CTC with period T admits at least one T -periodic spin-vector. Further, either every other spin-vector is T -periodic, or no others are. It follows that gyroscopes carried by CTCs are either all T -periodic, or are generically not T -periodic. We consider examples of spacetimes admitting CTCs, and address the question of whether T -periodicity of gyroscopic motion occurs generically or only on a negligible set for these CTCs. We discuss these results from the perspective of principles of consistency in spacetimes admitting CTCs.