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FERMI-WALKER PARALLEL TRANSPORT ACCORDING TO QUASI FRAME IN THREE DIMENSIONAL MINKOWSKI SPACE

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Abstract. In this paper, we present the Fermi-Walker parallel transport and the generalized Fermi-Walker parallel transport according to quasi frame in three dimensional Minkowski space.

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1. Introduction

A relativistic observer ξ needs reference frames in order to measure the movement and position of a object. If ξ is free falling, its restspaces are transported with Levi-Civita parallelism. For accelerated observers, the restspaces are not transported by the Levi-Civita parallelism. In this case Fermi-Walker parallelism is used to define constant directions. Fermi-Walker parallelism is an isometry between the tangent spaces along relativistic observer ξ. [6, 11].

Balakrishnan *et al* investigated time evolutions of the space curve associated with a geometric phase using Fermi-Walker parallel transport in three dimensional Euclidean space [2]. Gürbüz had introduced new geometric phases according three classes of a curve evolution in Minkowski space [7, 8].

Usual Fermi-Walker parallel derivative for any vector field A is given with respect to Frenet frame $\{t, n, b\}$ in three dimensional Euclidean space as following (cf. [9])

$$\frac{\mathcal{D}^f A}{\mathcal{D}^f s} = \frac{\mathrm{d}A}{\mathrm{d}s} - \langle t, A\rangle \frac{\mathrm{d}t}{\mathrm{d}s} - \langle \frac{\mathrm{d}t}{\mathrm{d}s}, A\rangle t.$$

Dandoloff and Zakrzewski [4] introduced the modified Fermi-Walker derivative of the vector field A according to Frenet frame in three dimensional Euclidean space as

$$\frac{\mathcal{D}^f A}{\mathcal{D}^f s} = \frac{\mathrm{d}A}{\mathrm{d}s} - \langle b, A\rangle \frac{\mathrm{d}b}{\mathrm{d}s} - \langle \frac{\mathrm{d}b}{\mathrm{d}s}, A\rangle n.$$

Generalized Fermi–Walker parallelism is used by both accelerated observers and not accelerated observers and it offers better choice of reference systems than the

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