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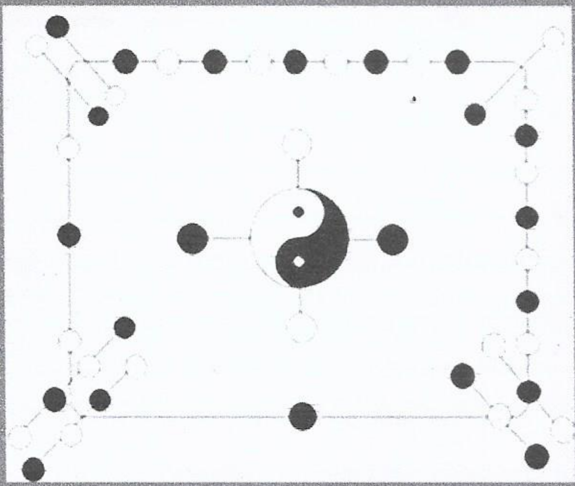

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D-homothetic Deformations of Lorentzian Para-Sasakian Manifold

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Abstract: The aim of the present paper is to prove some results on the properties of LP-Sasakian manifolds under D-homothetic deformations. In the later sections we give several results on some properties which are conformal under the mentioned deformations. Lastly, we illustrate the main theorem by giving a detailed example.

Key Words: D-homothetic deformation, LP-Sasakian manifold, ϕ-section, sectional curvature.

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§1. Introduction

The notion of Lorentzian almost para-contact manifolds was introduced by K. Matsumoto [3]. Later on, a large number of geometers studied Lorentzian almost para-contact manifold and their different classes, viz., Lorentzian para-Sasakian manifolds and Lorentzian special para-Sasakian manifolds [4], [5], [6], [7]. In brief, Lorentzian para-Sasakian manifolds are called LP-Sasakian manifolds. The study of LP-Sasakian manifolds has vast applications in the theory of relativity.

In an n-dimensional differentiable manifold M, (ϕ, ξ, η) is said to be an almost paracontact structure if it admits a $(1,1)$ tensor field ϕ , a timelike contravariant vector field ξ and a 1-form η which satisfy the relations:

$$\eta(\xi) = -1, \tag{1.1}$$

$$\phi^2 X = X + \eta(X)\xi, \tag{1.2}$$

for any vector field X on M. In an n-dimensional almost paracontact manifold with structure (ϕ, ξ, η), the following conditions hold:

$$\phi\xi = 0, \tag{1.3}$$

$$\eta \circ \phi = 0, \tag{1.4}$$

$$rank\ \phi = n - 1. \tag{1.5}$$

Let M^n be differentiable manifold with an almost paracontact structure (ϕ, ξ, η). If there exists a Lorentzian metric which makes ξ a timelike unit vector field, then there exists a

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tensor as follows:

$$R(e_1, e_2)e_2 = 3e_1, \quad R(e_1, e_2)e_1 = 3e_2, \quad R(e_2, e_3)e_3 = -e_2,$$
$$R(e_1, e_3)e_2 = 0, \quad R(e_1, e_3)e_1 = -e_3, \quad R(e_2, e_3)e_2 = e_3,$$
$$R(e_1, e_2)e_3 = 0.$$

In equation (3.22) we put $X = e_1, Y = \phi e_1, Z = e_1$. Taking inner product with ϕe_1 we obtain

$$a\overline{K}(e_1, \phi e_1) - K(e_1, \phi e_1) = a - \frac{1}{a}.$$

Hence, by this example Theorem 3.4 is verified.

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