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n-CHARACTERISTIC VECTOR FIELDS OF CONTACT MANIFOLDS

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Abstract. In present paper we define and study n-characteristic vector fields. We present definition of Tanaka-Webster connection, then use it for studying the behavior of n-characteristic vector fields. Also we show some results about of these vector fields by Tanaka-Webster connection.

MSC: 53D10
Keywords: Contact manifold, n-characteristic vector field, Tanaka-Webster connection

1. Introduction

The main goal of this paper is to study a special type of vector fields. These vector fields are defined in contact metric manifolds and called n-characteristic vector fields or briefly n-char vector fields. All of them are commutate with characteristic vector field and the bracket of both n-char vector fields is multiple of characteristic vector field and it is proved that the bracket of n-char vector fields commutate with other components of tangent bundle. It has been shown if tangent space of each contact metric manifold contained a n-char vector field, then characteristic vector is commutate with all vector fields. The *Tanaka-Webster connection* [3] first time defined by Shukichi Tanno for contact manifold. The study of n-char vector fields with *Tanaka-Webster connection* resulted in interesting results.

2. Preliminaries

Let M be an almost contact manifold, i.e., it is a $(2m+1)$-dimensional smooth manifold with an almost contact structure (φ, ξ, η) consisting of an endomorphism ϕ of the tangent bundle, a vector field ξ, its dual one-form η as well as M is equipped with a Riemannian metric g, so that the following relations are valid

$$\varphi\xi = 0, \qquad \phi^2 = -\mathrm{Id} + \eta \otimes \xi, \qquad \eta\xi = 1 \tag{1}$$

$$g(\varphi X, \varphi Y) = g(X, Y) - \eta(X)\eta(Y) \tag{2}$$

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