46th Annual Iranian Mathematics Conference
25-28 August 2015
Yazd University

Some properties of multi-Fedosove supermanifolds of order 3

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Abstract

In this paper we define multi-Fedosove supermanifolds and show that every multisymplectic supermanifold of order 3 is a multi-Fedosove supermanifolds. Then we study the curvature tensor of a multi-Fedosove supermanifolds.

Keywords: Multisymplectic supermanifold, multi-Fedosove supermanifolds, curvature tensor
Mathematics Subject Classification [2010]: 58A50, 53D05

1 multi-Fedosove supermanifolds

A supermanifold $\mathcal{M}$ of dimension $n|m$ is a pair $(M, \mathcal{O}_{\mathcal{M}})$, where M is a Hausdorff topological space and $\mathcal{O}_{\mathcal{M}}$ is a sheaf of commutative superalgebras with unity over $\mathbb{R}$ locally isomorphic to $\mathbb{R}^{m|n} = (\mathbb{R}^n, \mathcal{O}_{\mathbb{R}^n} \otimes \Lambda_{\eta^1,\ldots,\eta^m})$, where $\mathcal{O}_{\mathbb{R}^n}$ is the sheaf of smooth functions on $\mathbb{R}^n$ and $\Lambda_{\eta^1,\ldots,\eta^m}$ is the grassmann superalgebra of m generators.

Definition 1.1. Let ξ be a locally free sheaf of $\mathcal{O}_{\mathcal{M}}$-supermodules on $\mathcal{M}$, a connection on ξ is a morphism $\nabla : \mathcal{T}_{\mathcal{M}} \otimes_{\mathbb{R}} \xi \to \xi$ of sheaves of supermodules over $\mathbb{R}$ such that
$\nabla_{fX} v = f\nabla_X v$, $\nabla_X fv = (Xf) + (-1)^{\widetilde{X}\widetilde{f}} f\nabla_X v$ and $\widetilde{\nabla_X v} = \widetilde{v} + \widetilde{X}$,
for all homogeneous function f, vector fields X and section v of ξ.

Let us consider a multisymplectic supermanifold of degree k $(\mathcal{M}, \omega)$, i.e. a supermanifold $\mathcal{M}$ with a closed non-degenerate graded differential k-form ω.

Definition 1.2. A multisymplectic connection on $\mathcal{M}$ is a connection for which:
i- The torsion tensor vanishes, i.e.

$$\nabla_X Y - (-1)^{\widetilde{X}\widetilde{Y}} \nabla_Y X = [X, Y].$$

ii- It is compatible to the multisymplectic form, i.e. $\nabla\omega = 0$.

A multi-Fedosov supermanifold $(\mathcal{M}, \omega, \nabla)$ is defined as a multisymplectic supermanifold $(\mathcal{M}, \omega)$ equipped with a a multisymplectic connection ∇.

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