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REMARKS ON POISSON REDUCTION ON k-SYMPLECTIC MANIFOLDS*

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Abstract. Two reduced standard k-symplectic Poisson manifolds with respect to the action of a Lie group G are considered, and the relation between the corresponding Poisson structures is established.

1. Introduction

Starting with a Poisson manifold, one can construct by reduction other Poisson manifolds. This procedure is well known and important in the symplectic mechanics having applications in fluids [5], electromagnetism and plasma physics [4], etc. Let us mention also that Juan-Pablo Ortega and Tudor Raţiu [7] described the Poisson reduction specifying the assumptions under that a Poisson manifold could be reduced to a Poisson manifold, too.

In what follows we shall present the Poisson reduction in the case of the standard k-symplectic manifold $(T_k^1)^*\mathbb{R}^n$ with the canonical k-symplectic structure induced from $(\mathbb{R}^n, \omega_0)$ [1]. Then, using a diffeomorphism, we can endow $T_k^1\mathbb{R}^n$ with a k-symplectic structure that will be reduced, too (the two manifolds $T_k^1\mathbb{R}^n = T\mathbb{R}^n \oplus \overset{k}{\cdots} \oplus T\mathbb{R}^n$ and respectively $(T_k^1)^*\mathbb{R}^n = T^*\mathbb{R}^n \oplus \overset{k}{\cdots} \oplus T^*\mathbb{R}^n$ will be identified with the Whitney sum of k-copies of $T\mathbb{R}^n$ and respectively of $T^*\mathbb{R}^n$ [6]). Finally, we shall discuss the relation between the two induced Poisson structures on the reduced manifolds.

In order to do this, we consider an appropriate action of a Lie group G on the two manifolds. Such canonical actions can be obtained, for instance, by lifting an arbitrary action of G on $\mathbb{R}^n$ to $(T_k^1)^*\mathbb{R}^n$ and $T_k^1\mathbb{R}^n$ respectively.

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