

Difference Discrete Variational Principle, Euler-Lagrange Cohomology and Symplectic, Multisymplectic Structures II: Euler-Lagrange Cohomology

GUO Han-Ying,¹ LI Yu-Qi,¹ WU Ke^{1,2} and WANG Shi-Kun³

¹ Institute of Theoretical Physics, Academia Sinica, P.O. Box 2735, Beijing 100080, China

² Department of Mathematics, Capital Normal University, Beijing 100037, China

³ Institute of Applied Mathematics, Academy of Mathematics and System Sciences, Academia Sinica, P.O. Box 2734, Beijing 100080, China

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Abstract: In this second paper of a series of papers, we explore the difference discrete versions for the Euler-Lagrange cohomology and apply them to the symplectic or multisymplectic geometry and their preserving properties in both the Lagrangian and Hamiltonian formalisms for discrete mechanics and field theory in the framework of multi-parameter differential approach. In terms of the difference discrete Euler-Lagrange cohomological concepts, we show that the symplectic or multisymplectic geometry and their difference discrete structure-preserving properties can always be established not only in the solution spaces of the discrete Euler-Lagrange or canonical equations derived by the difference discrete variational principle but also in the function space in each case if and only if the relevant closed Euler-Lagrange cohomological conditions are satisfied.

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