Generalized Canonical Noether Theorem and Poincaré-Cartan Integral Invariant for a System with a Singular High-Order Lagrangian and an Application

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Abstract: Based on the canonical action, a generalized canonical first Noether theorem and Poicaré-Cartan integral-invariant for a system with a singular high-order Lagrangian are derived. It is worth while to point out that the constraints are invariant under the total variation of canonical variables including time. We can also deduce the result, which differs from the previous work to require that the constraints are invariant under the simultaneous variations of canonical variables. A counter example to a conjecture of the Dirac for a system with a singular high-order Lagrangian is given, in which there is no linearization of constraint.

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