

Integrating Factors and Conservation Laws for Relativistic Mechanical System

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Abstract: In this paper, we present a new method to construct the conservation laws for relativistic mechanical systems by finding corresponding integrating factors. First, the Lagrange equations of relativistic mechanical systems are established, and the definition of integrating factors of the systems is given; second, the necessary conditions for the existence of conserved quantities of the relativistic mechanical systems are studied in detail, and the relation between the conservation laws and the integrating factors of the systems is obtained and the generalized Killing equations for the determination of the integrating factors are given; finally, the conservation theorem and its inverse for the systems are established, and an example is given to illustrate the application of the results.

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Key words: relativity, mechanical system, conservation law, integrating factor, Killing equation

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