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Application of the Lie symmetries in the moving frames theory to solve nonholonomic constraints problems

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Abstract: The main goal of this work is to use the Lie symmetries in the moving frames theory to solve a mechanical problem with nonholonomic constraint. The extraction of Lie symmetries in motion equations can be used to reduce the order and to obtain conservation quantities. Additionally, the classification of motion equations, i.e., to apply a transformation to obtain an already known solution of a mapped equation, can be effectuated with a Cartan's moving frame theory. In order to illustrate the approach a nonholonomic constrained mechanical system is solved to obtain a general closed-solution in explicit form. A full detailed analysis is discussed to explain the Lie symmetries and the correspondent moving frame obtained.

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