

Contact symmetries of constrained quadratic Lagrangians

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The conditions for the existence of (polynomial in the velocities) contact symmetries of constrained systems that are described by quadratic Lagrangians are presented. These Lagrangians mainly appear in mini-superspace reductions of gravitational plus matter actions. In the literature, one usually adopts a gauge condition (mostly for the lapse N) prior to searching for symmetries. This, however, is an unnecessary restriction which may lead to a loss of symmetries and consequently to the respective integrals of motion. A generalization of the usual procedure rests in identifying the lapse function N as an equivalent degree of freedom and extending accordingly the form of the infinitesimal generator. In the general case, conformal Killing tensors of the mini-superspace metric can define (autonomous or even rheonomous) integrals of motion (in contrast to regular systems, where only Killing tensors can be used).