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LIE–HAMILTON SYSTEMS ASSOCIATED WITH SYMPLECTIC LIE ALGEBRA $\mathfrak{sp}(6,\mathbb{R})$

OSCAR CARBALLAL SOBRIDO, RUTWIG CAMPOAMOR-STURSBERG and FRANCISCO J. HERRANZ

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New classes of Lie–Hamilton systems are obtained from the six-dimensional fundamental representation of the rank-three real symplectic Lie algebra. The ansatz is based on a recently proposed procedure for constructing higher-dimensional Lie–Hamilton systems through the representation theory of Lie algebras. As applications of the procedure, we study a time-dependent electromagnetic field and several types of coupled oscillators. The irreducible embedding of the special unitary Lie algebra on three dimensions into the symplectic algebra is also considered, yielding Lie–Hamilton systems arising from the sum of the quark and antiquark three-dimensional representations of the special unitary algebra, which are applied in the construction of t-dependent coupled systems. In addition, t-independent constants of the motion are obtained explicitly for all these Lie–Hamilton systems, which allows the derivation of a nonlinear superposition rule.

MSC: 17B10, 34A26, 34C14, 58A30
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Contents

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