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Lax operator algebras and integrable hierarchies. (English. Russian original) [Zbl 1235.37022](#)
Proc. Steklov Inst. Math. 263, 204-213 (2008); translation from *Tr. Mat. Inst. Steklova* 263, 216-226 (2008).

Summary: We study applications of a new class of infinite-dimensional Lie algebras, called Lax operator algebras, which goes back to the works by I. Krichever and S. Novikov on finite-zone integration related to holomorphic vector bundles and on Lie algebras on Riemann surfaces. Lax operator algebras are almost graded Lie algebras of current type. They were introduced by I. Krichever and the author as a development of the theory of Lax operators on Riemann surfaces due to I. Krichever, and further investigated in a joint paper by M. Schlichenmaier and the author. In this article we construct integrable hierarchies of Lax equations of that type.

MSC:

- 37K10** Completely integrable infinite-dimensional Hamiltonian and Lagrangian systems, integration methods, integrability tests, integrable hierarchies (KdV, KP, Toda, etc.)
- 37K20** Relations of infinite-dimensional Hamiltonian and Lagrangian dynamical systems with algebraic geometry, complex analysis, and special functions
- 17B80** Applications of Lie algebras and superalgebras to integrable systems

Full Text: [DOI](#)

References:

- [1] H. Garland, "The Arithmetic Theory of Loop Groups," *Publ. Math., Inst. Hautes Étud. Sci.* 52, 5–136 (1980). · [Zbl 0475.17004](#) · [doi:10.1007/BF02684779](#)
- [2] V. G. Kac, "Simple Irreducible Graded Lie Algebras of Finite Growth," *Izv. Akad. Nauk SSSR, Ser. Mat.* 32(6), 1323–1367 (1968) [*Math. USSR, Izv.* 2, 1271–1311 (1968)].
- [3] V. G. Kac, *Infinite Dimensional Lie Algebras* (Cambridge Univ. Press, Cambridge, 1990). · [Zbl 0716.17022](#)
- [4] I. M. Krichever, "Vector Bundles and Lax Equations on Algebraic Curves," *Commun. Math. Phys.* 229(2), 229–269 (2002). · [Zbl 1073.14048](#) · [doi:10.1007/s002200200659](#)
- [5] I. M. Krichever, "Isomonodromy Equations on Algebraic Curves, Canonical Transformations and Whitham Equations," *Moscow Math. J.* 2, 717–752 (2002); arXiv: hep-th/0112096. · [Zbl 1044.70010](#)
- [6] I. M. Krichever and S. P. Novikov, "Holomorphic Bundles over Algebraic Curves and Non-linear Equations," *Usp. Mat. Nauk* 35(6), 47–68 (1980) [*Russ. Math. Surv.* 35 (6), 53–79 (1980)]. · [Zbl 0501.35071](#)
- [7] I.M. Krichever and S. P. Novikov, "Holomorphic Bundles over Riemann Surfaces and the Kadomtsev-Petviashvili Equation. I," *Funkts. Anal. Prilozh.* 12(4), 41–52 (1978) [*Funct. Anal. Appl.* 12, 276–286 (1978)]. · [Zbl 0393.35061](#)
- [8] I. M. Krichever, "Commutative Rings of Ordinary Linear Differential Operators," *Funkts. Anal. Prilozh.* 12(3), 20–31 (1978) [*Funct. Anal. Appl.* 12, 175–185 (1978)]. · [Zbl 0405.58049](#) · [doi:10.1007/BF01077560](#)
- [9] I. M. Krichever and S. P. Novikov, "Algebras of Virasoro Type, Riemann Surfaces and Structures of the Theory of Solitons," *Funkts. Anal. Prilozh.* 21(2), 46–63 (1987) [*Funct. Anal. Appl.* 21, 126–142 (1987)]. · [Zbl 0634.17010](#)
- [10] I. M. Krichever and O. K. Sheinman, "Lax Operator Algebras," *Funkts. Anal. Prilozh.* 41(4), 46–59 (2007) [*Funct. Anal. Appl.* 41, 284–294 (2007)]; arXiv:math.RT/0701648. · [Zbl 1160.17017](#) · [doi:10.4213/faa2878](#)
- [11] R. V. Moody, "Euclidean Lie Algebras," *Can. J. Math.* 21, 1432–1454 (1969). · [Zbl 0194.34402](#) · [doi:10.4153/CJM-1969-158-2](#)
- [12] M. Schlichenmaier, "Local Cocycles and Central Extensions for Multipoint Algebras of Krichever-Novikov Type," *J. Reine Angew. Math.* 559, 53–94 (2003). · [Zbl 1124.17305](#)
- [13] M. Schlichenmaier, "Higher Genus Affine Algebras of Krichever-Novikov Type," *Moscow Math. J.* 3, 1395–1427(2003). · [Zbl 1115.17010](#)
- [14] M. Schlichenmaier and O. K. Sheinman, "Central Extensions of Lax Operator Algebras," arXiv: 0711.4688. · [Zbl 1204.17016](#)
- [15] O. K. Sheinman, "Affine Krichever-Novikov Algebras, Their Representations and Applications," in *Geometry, Topology, and Mathematical Physics: S.P. Novikov's Seminar 2002–2003*, Ed. by V. M. Buchstaber and I. M. Krichever (Am. Math. Soc., Providence, RI, 2004), AMS Transl., Ser. 2, 212, pp. 297–316; arXiv:math.RT/0304020. · [Zbl 1081.17014](#)
- [16] O. K. Sheinman, "On Certain Current Algebras Related to Finite-Zone Integration," in *Geometry, Topology, and Mathematical Physics: S.P. Novikov's Seminar 2006–2007*, Ed. by V. M. Buchstaber and I. M. Krichever (Am. Math. Soc., Providence, RI,

2008), AMS Transl., Ser. 2, 224, pp. 271–284. · [Zbl 1196.17022](#)

- [17] A. N. Tyurin, "Classification of Vector Bundles on an Algebraic Curve of an Arbitrary Genus," *Izv. Akad. Nauk SSSR, Ser. Mat.* 29(3), 657–688 (1965).

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