4th Workshop on Hamiltonian Systems and Related Topics

October 14-15, 2010

Niigata University Satellite Campus ``Tokimeito'' (Lecture Room A (2F))

Organizers:

Hidekazu Ito (Kanazawa University)
Mitsuru Shibayama (Kyoto Univeristy)
Kazuyuki Yagasaki (Niigata University)

October 14

- 12:55

  Opening

- 13:00-14:00

  Juan J Morales-Ruiz (Universidad Politecnica de Madrid)

  Non-integrability of dynamical systems by means of the variational equations: a survey

- 14:20-15:20

  Katsunori Iwasaki (Hokkaido University)

  Part 1. Algebraic analysis of the sixth Painleve equation

- 15:40-16:40

Hiroshi Umemura (Nagoya University)

Sato's soliton theory is abelian

- 17:00-18:00

  Masafumi Yoshino (Hiroshima University)

  Analytic-Liouville-nonintegrable Hamiltonian systems and nonanalytic-integrability

- 18:30-

  Welcome Party

October 15

- 10:00-11:00

  David Blazquez-Sanz (Niigata University, Universidad Sergio Arboleda)

  Differential Galois approaches for some new problems in dynamical systems

- 11:20-12:20

  Katsunori Iwasaki (Hokkaido University)

  Part 2. Algebraic analysis of the sixth Painleve equation

- 12:20-14:00

  Lunch

- 14:00-15:00

  Mitsuru Shibayama (Kyoto University)

  Non-integrability and collision manifold in the three-body problem

- 15:20-16:20

Hidekazu Ito (Kanazawa University)

Normal forms of non-commutatively integrable vector fields near singular points

- 16:20

  Closing

Contact:

Kazuyuki Yagasaki
Mathematics Division
Department of Information Engineering
Niigata University
TEL & FAX: 025-262-5763
Email: yagasaki@ie.niigata-u.ac.jp

Welcome Party:

Izakaya (Japanese-style bar)
Negi-Bouzu (TEL: 025-240-6363)
Japanese website

Fee: 5,000 Yen (approx.)

Hamiltonian Dynamical Systems Seminar (in Japanese)

Latest Updating is on October 12, 2010.

Sato's soliton theory is abelian

Hiroshi Umemura

Abstract. Since the success of Morales-Ramis theory that Liouville-Arnold integrability is detected Galois theoretically, we encountered many non-integrable systems. It is marvelous that the principle is so effective. On the other hand, Soliton theory is one of the most remarkable theories developed in the last century. It started in the 19th century by observation of phenomena, mathematical modeling, inverse scattering method, experiments combined with computer science and finally Sato formulated mathematically the whole theory. We observe Sato's theory by our general Galois theory to conclude that Galois group of KP hierarchy is abelian. This shows that KP hierarchy is very much integrable as expected. The result is a simple Galois theoretic interpretation of Sato's great theory.

ANALYTIC-LIOUVILLE-NONINTEGRABLE HAMILTONIAN SYSTEMS AND NONANALYTIC-INTEGRABILITY

MASAFUMI YOSHINO

Abstract. In [2] Bolsinov and Taimanov studied a Hamiltonian system related with a geodesic flow which is smooth- Liouville-integrable and analytic-Liouville-nonintegrable. They showed that analytic nonintegrability is closely related with non Abelian property of a monodromy group of a return map of the flow. They also showed smooth integrability of an analytic-nonintegrable system by constructing concretely a first integral with essential singularity. Similar study was also made in [5].

In this talk, we study necessary conditions for analytic- Liouville- integrability of Hamiltonian systems with resonance dimension one or two. Our necessary condition for the analytic integrability may be seen as an analytic counterpart of Taimanov's monodromy condition. We then show the sectorial (smooth) integrability of an analytic-nonintegrable system. In proving this we use expansions in terms of functions involving essential singularity, which we call transseries. We note that such an expression was implicitly used by Taimanov in [2], while it was first introduced by Ecalle (cf. [4]) and used by several authors. (See also [3]). In discussing smooth integrability we also show a close relation between representation of first integrals by transseries and that by the Birkoff normal form theory for Hamiltonians with simple resonance (so-called S-normal form theory developped by Ito. (cf. [6])). Part of the results in this talk will be published in [1] as the jointwork with Werner Balser.

References

[1] Balser, W. and Yoshino, M., Integrability of Hamiltonian systems and transseries expansions, *to be published in Math. Z.*

[2] Bolsinov, A.V. and Taimanov, I.A.: Integrable geodesic flows with positive topological entropy. Invent Math. **140** (3), 639-650 (2000).

[3] Costin, O., *Asymptotics and Borel summability*, Chapman Hall/CRC Monographs and Surveys in Pure and Applied Mathematics, 141. CRC Press, Boca Raton, FL, xiv+250 pp. ISBN: 978-1-4200-7031-6 (2009).

[4] Ecalle, J., Six lectures on transseries, analysable functions and the constructive proof of Dulac's conjecture, *Bifurcations and periodic orbits of vector fields (Montreal, PQ, 1992)*, NATO Adv. Sci. Inst. Ser. C Math. Phys. Sci., 408, 75-184, Kluwer Acad. Publ., Dordrecht (1993).

[5] Gorni, G. and Zampieri, G.: Analytic-non-integrability of an integrable analytic Hamiltonian system. Differ. Geom. Appl. **22**, 287-296 (2005).

[6] Ito, H.: Integrability of Hamiltonian systems and Birkoff normal forms in the simple resonance case. Math. Ann. **292**, 411-444 (1992).

Department of Mathematics, Graduate School of Science, Hiroshima University, 1-3-1 Kagamiyama, Higashi-Hiroshima, Hiroshima 739-8526, Japan

E-mail address: yoshino@math.sci.hiroshima-u.ac.jp

Partially supported by Grant-in-Aid for Scientific Research (No. 20540172), JSPS, Japan.