N-WITTEN VERTEX OPERATOR ALGEBRA VIA INVERSE QUANTUM HAMILTONIAN REDUCTION

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Abstract:

For any simple Lie algebra g and pair (x, f) such that ad(x) is diagonalizable on g and [x, f] = −f where f is an even nilpotent element, Kac, Wakimoto and Roan constructed the universal affine W–algebra Wk(g, x, f). We have noticed that their construction can be applied for some non-reductive Lie algebras and obtain different type of affine W-algebras with interesting properties. In particular, such algebras don't need to have primary strong generators. Inverse Quantum Hamiltonian Reduction(QHR) recently attracted a lot of interest because of its application in the representation theory of affine vertex algebras and W-algebras. It is a natural framework for constructing and analyzing logarithmic modules. It is also interesting to study inverse QHR for affine W-algebras associated to non-reductive Lie algebras.

In this talk we are focused on the example of the Nappi-Witten Lie algebras h4 and the associated affine vertex algebra V1(h4). We identify pair (x, f) such that universal affine W-algebra W1(h4, x, f) is isomorphic to the Heisenberg-Virasoro vertex algebra of level zero LHV ir, introduced by Y. Billig, which appears in the theory of toroidal Lie algebras. Then we construct inverse QHR and identify V1(h4) as a vertex subalgebra of LHV ir $\otimes$ $\Pi(0)$ where $\Pi(0)$ is a certain lattice-like vertex algebra. Using inverse QHR procedure we construct all relaxed highest weight V1(h4)–modules, and a large family of logarithmic V1(h4)–modules. The Loewy diagrams of these logarithmic modules are completely analogous to the Loewy diagrams of projective modules of weight Lk(sl2) modules.

This talk is based on a joint paper with A. Babichenko.