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Universal R-matrices and the center of the quantum generalized Kac-Moody algebras

Seok-Jin KANG* and Toshiyuki TANISAKI

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ABSTRACT. We extend the result in [13] to those for the quantization of generalized Kac-Moody algebras introduced in [10]. The existence of the universal R-matrix is proved, and a structure theorem for the center is given.

0. Introduction

The quantum groups—more precisely, the quantization of the universal enveloping algebras of Kac-Moody algebras—were independently introduced by Drinfel'd ([6]) and Jimbo ([7]) through their investigation of R-matrices which are the solutions to the Yang-Baxter equation. Its importance partly comes from the fact that there exists a solution to the Yang-Baxter equation inside the quantum group, called the *universal R-matrix*, so that one can obtain various R-matrices as its specialization on the representations of the quantum group.

On the other hand, the notion of Kac-Moody algebras was generalized to the so-called *generalized Kac-Moody algebras* ([1]), and it was used crucially in Borcherds' proof of the moonshine conjecture ([2]). In [10], the first-named author extended the quantum groups to those for the generalized Kac-Moody algebras, and proved some fundamental results on their structures and their representations.

In this paper, we continue the investigation by extending the results in [13] to the quantum groups of generalized Kac-Moody algebras. In the first half of this paper, we construct an analogue of the Killing form and prove the existence of the universal R-matrix. The proofs are very similar to those in [13] and the analogue of the Killing form plays a crucial role. In the second half, we investigate the structure of the center of the quantum groups for generalized Kac-Moody algebras. The case of quantized universal en-

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