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Gelfand-Kirillov dimension and reducibility of scalar generalized Verma modules

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Generalized Verma modules are important objects in generalized BGG category. In this article, the authors study the reducibility of the generalized Verma modules by means of Gelfand-Kirillov dimensions. The study of reducibility of representations or modules is one of the fundamental problems in representation theory. Although Jantzen's simplicity criterion gives a beautiful description for reducibility of any generalized Verma module, the computation is in general much involved when one uses it directly. The authors of this article mainly deal with the generalized Verma modules of scalar type; that is, the generalized Verma modules induced from 1-dimensional modules of some parabolic subalgebras. The authors prove that a generalized Verma module of scalar type is irreducible if and only if its Gelfand-Kirillov dimension coincides with the dimension of the nilpotent radical of the corresponding parabolic subalgebra (Theorem 1.1). As an application, the authors compute the reducibility of the generalized Verma modules of scalar type associated to Hermitian symmetric pairs, which just coincides with the classification results in [1].

The article is interesting because it deals with the algebraic problem by a geometric tool. The authors emphasize in the article that Theorem 1.1 does not hold for the general generalized Verma modules. However, it would be interesting to classify

all the irreducible generalized Verma modules whose Gelfand-Kirillov dimensions coincide with the dimensions of the nilpotent radicals of the corresponding parabolic subalgebras.

REFERENCES

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