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THE MIXED HODGE STRUCTURE ON THE FUNDAMENTAL GROUP OF THE FIBER TYPE 2-ARRANGEMENT

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Abstract. The complement of an arrangement of hyperplanes is a good example of the mixed Hodge structure on the fundamental group of an algebraic variety. We compute its isomorphic class using iterated integrals in the fiber type case and then get the combinatorial and projective invariant.

Introduction

The mixed Hodge structure on the homotopy group of the algebraic variety was constructed in two different ways. One way is Morgan's construction based on Sullivan's theory of minimal models [M]. The other way is Hain's method based on the bar construction [H5]. We shall deal with Hain's method as this approach is very natural from the topological viewpoint and it directly gives precise results on the fundamental group.

Due to Hain [H1], we can construct a mixed Hodge structure on the fundamental group of an algebraic variety using iterated integrals defined by K-T. Chen as follows. Let V be an algebraic variety over $\mathbb{C}$. We fix a point x of V and consider the truncation

$$\mathbb{Z}\pi_1(V, x)/J^{s+1}$$

of the group algebra of the fundamental group $\pi_1(V, x)$ over $\mathbb{Z}$ by some power of its augmentation ideal J. An iterated integral is a function on the space of paths in V. Let us denote the space of iterated integrals with length $\leqq s$ that are *homotopy functionals* on the space of loops based at x (i.e. its value depends only on the homotopy class of the loop.), by

$$H^0(B_s(V), x).$$

Then the integral map

$$H^0(B_s(V), x) \to \mathrm{Hom}_{\mathbb{Z}}(\mathbb{Z}\pi_1(V, x)/J^{s+1}, \mathbb{C})$$

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