

ABSTRACT

A survey on homological perturbation theory

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Higher homotopies are nowadays playing a prominent role in mathematics as well as in certain branches of theoretical physics. Homological perturbation theory (HPT), in a simple form first isolated by Eilenberg and Mac Lane in the early 1950's, is nowadays a standard tool to handle algebraic incarnations of higher homotopies. A basic observation is that higher homotopy structures behave much better relative to homotopy than strict structures, and HPT enables one to exploit this observation in various concrete situations. In particular, this leads to the effective calculation of various invariants which are otherwise intractable.

Higher homotopies and HPT-constructions abound but they are rarely recognized explicitly and their significance is hardly understood; at times, their appearance might at first glance even come as a surprise, for example in the Kodaira-Spencer approach to deformations of complex manifolds or in the theory of foliations.

The talk will illustrate, with a special emphasis on the compatibility of perturbations with algebraic structure, how HPT may be successfully applied to various mathematical problems arising in group cohomology, algebraic K -theory, and deformation theory.