DISCRETE APPROXIMATIONS TO THE CONTINUUM AND COMBINATORIAL TRANSVERSE INTERSECTION ALGEBRA

RUTH LAWRENCE-NAIMARK

According to folklore, it is impossible to construct a faithful finite dimensional algebraic model of differential forms which preserves all three properties of (graded) commutativity, associativity and the Leibniz rule. In this talk we will discuss various approaches via infinity algebras in which one of these three properties is dropped in order to allow a model to be constructed which can then be iteratively corrected back. We will then demonstrate how by enlarging a cubical complex by adding certain ""ideal"" elements, a combinatorial transverse intersection algebra model of a torus can be constructed which does have graded commutativity and associativity while the product rule holds for elements of the original complex. One application of this algebra is to create a finite dimensional fluid algebra which can be implemented numerically for approximation to Euler's equation on a torus.

This is joint work with Dennis Sullivan with different parts joint with Daniel An, Nir Gadish, Itay Griniasty, Nissim Ranade, Maor Siboni.