Quantum Field Theory in Terms of Consistency Conditions

We propose a new approach to quantum field theory in terms of consistency conditions. The key input in this approach is a suitable version of the Wilson operator product expansion (OPE). The consistency conditions arise as an associativity law for the coefficients in this expansion. We explain how to intrinsically characterize perturbation theory in this framework via cyclic Hochschild cohomology, and we explain how solutions to the consistency conditions (corresponding to particular QFT models) can be obtained. Our approach thereby in particular gives a new practical algorithm for perturbative calculations of OPE coefficients. The approach bears some resemblance to the concept of so-called "Vertex Operator Algebras", but is not limited to 2 dimensions, nor to conformal field theories. In particular, it is applicable to quantum Yang-Mills theories in 4 dimensions.

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