

A Mathematical Interpretation of Feynman Diagrams and Dimensional Regularization via Hopf Algebras.

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Abstract

A Feynman diagram is a pictorial representation of a specific quantum process. However, this representation corresponds to a perturbative approach of the phenomenon. Due to this appears some kind of divergences, called *ultraviolet divergences*, which are not desirable in the description of an observable phenomenon. In physics this problem is fully described by the *Renormalization Group* method. Nevertheless, there are a lot of problems when we want to understand this method formally. For instances, the formal definition of the *Feynman path-integral* or the *regularization of Feynman integrals*. In this work, we give a abstract definition of Feynman diagrams using Hopf algebras in order to avoid this problems in the formal definition of a quantum field theory. Besides, we also give an own interpretation of the works of Alain Connes and Dirk Kreimer about the abstract view of the dimensional regularization process in a quantum field theory.