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Mathematical Physics

Regard Renormalization in QED as Functor between Categories

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To unify the quantum electrodynamics (QED) under the first principle which brings the renormalization unartificially, we study Feynman diagrams in QED according to the set theory and the category theory. We add the restriction on the electromagnetic interaction that a particle can and only can interact with particles which never interact with onself. Thus, fermiors (lines) in tree diagrams belong to sets, but belong to proper classes when they are in five primitive divergent diagrams. Fermiors, photons, fermior mass and charge compose together categories in which the group product of the local U(1) group and the propr Lorentz group is the morphism. There is the functor projecting the category containing fermiors in tree diagrams into the category containing fermior in divergent diagrams. Because proper classes have not the measure, this functor avoids the restriction of the measure. It can be regarded as the renormalization in QED and all renormalization constants have not a fixed magnitude.

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