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Title: A New Approach to Quantum Fields: Category Algebras and States on Categories

Abstract: We propose a new approach to quantum fields in terms of category algebras and states on categories. By defining a quantum field and its state as a category algebra and its state over a causal category with a partial involution structure, we can directly integrate relativity as a category-theoretic structure and quantumness as a noncommutative probabilistic structure. From a mathematical point of view, it is a generalization of the groupoid approach to quantum theory into the (dagger-) category theoretic context. If time permits, the relationship with conventional approaches to quantum fields, such as algebraic quantum field theory (AQFT) and topological quantum field theory (TQFT), will also be discussed.