Abstract

Operads and their variants, modular and cyclic operads, naturally describe compositions of objects of various types. We provide an accessible introduction to the theory of operads, the formalism for modular operads from [1] and modern application of modular operads to physics, due to Barannikov [2]. Through examples, we introduce Batalin-Vilkovisky formalism as a tool for cohomological integration of path integral in quantum field theories. A master equation, consistency condition for action, follows from this formalism. Solutions to master equation also describe algebras over Feynman transform of a modular operad. We explore the master equation defined in terms of modular operad and review an application to closed string field theory.

[1] Martin Doubek, Branislav Jurco, and Korbinian Muenster. Modular operads and the quantum open-closed homotopy algebra. 2013. arXiv: 1308.3223 [math-AT].
[2] Serguei Barannikov. “Modular operads and Batalin-Vilkovisky geometry”. In: International Mathematics Research Notices 2007 (2007), rnm075.