Classical and quantum gauge theories on manifolds with boundary

Michele Schiavina

Institüt für Mathematik, Universität Zürich

michele.schiavina@math.uzh.ch

One of the long term goals of modern mathematical physics is to understand the quantisation of physical theories under a general and mathematically sound framework. Among physical theories, those presenting local symmetries of the action (gauge theories) are of fundamental relevance, and the related issues that appear when ensuing their quantisation are addressed under a variety of points of view.

One of the most celebrated mechanism to quantise gauge symmetric theories is the BRST formalism (Becchi, Rouet, Stora; Tyutin [1]), but there are many important examples where it does not apply or it is not optimal.

The extension of BRST to more general symmetries that do not come from the action of a Lie group (or that do, up to the equations of motion) goes under the name of BV formalism (Batalin, Vilkovisky [2, 3]). More recently it turned out [4, 5] that this formalism provides a natural way to treat gauge theories on manifolds with boundary, even when the theory can be cast in the BRST formalism.

In this talk I will outline the generalities of the CMR (Cattaneo, Mnev, Reshetikhin) formalism for gauge theories on manifolds with boundary, focusing on examples both worked out and in progress.

References

[1] C. Becchi, A. Rouet, R. Stora, Phys. Lett. B52 (1974) 344.

[2] I. A. Batalin, G. A. Vilkovisky, Gauge Algebra and Quantization, Phys. Lett. B 102 (1): 2731 (1981).

[3] I. A. Batalin, G. A. Vilkovisky, Quantization of Gauge Theories with Linearly Dependent Generators, Physical Review D 28 (10): 25672582.

[4] A. S. Cattaneo, P. Mnev, N. Reshetikhin, Classical BV theories on manifolds with boundary, arXiv:1201.0290.

[5] A. S. Cattaneo, P. Mnev, N. Reshetikhin, Classical and quantum Lagrangian field theories with boundary, arXiv:1207.0239.