APPROACHES TO NEW GAUGE THEORIES

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Abstract

All successful theories describing the fundamental particles and their interactions are gauge theories. In this thesis we make use of two quite different approaches to new gauge theories. In the first approach we construct relativistic particle models from representations of the Poincaré group. Specifically we consider Wigner's infinite spin particle representation and show that it gives rise to particle models described by simple and reparametrization invariant higher order Lagrangians. Possible external interactions are analyzed and a covariant quantization is made using a Gupta-Bleuler method.

In the second approach we consider the Batalin-Vilkovisky (BV) formalism from a reversed point of view, where the BV formalism is used as a framework for generating a class of consistent gauge field theories, rather than as a quantization procedure. Generated theories are obtained by means of a superfield algorithm. An analysis of four and six dimensional theories indicates that many master actions are (anti)canonically equivalent to much simpler master actions. It is shown how topological gauge field theories naturally fit into the framework set up by this superfield algorithm. A generalization of the algorithm is thereafter developed which allows for the construction of higher order gauge field theories.

Keywords: Gauge theory, constraints, superfield formulation, BV quantization, topological field theories.

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