

MARTY: a C++ symbolic computation library for High Energy Physics

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Studies Beyond the Standard Model (BSM) will become more and more important in the near future with a rapidly increasing amount of data from different experiments around the world. The full study of BSM models is in general an extremely time-consuming task involving long and difficult computations. It is in practice not possible to do exhaustive predictions in these models by hand, in particular if one wants to perform a statistical comparison with data and the SM. Some Mathematica packages can perform this kind of computations automatically. However we are some times interested in a different formulation of a given theory, a low energy effective theory. In this case, one must compute Wilson coefficients instead of amplitudes. This is the case in flavor physics, the study of flavor-changing quark currents which concentrates many hopes of new physics discovery, where physical observables are fully expressed in terms of an effective theory.

Here we present CSL (C++ Symbolic computation Library) together with CSL-HEP (CSL extended for High Energy Physics), a new C++ framework that fully automates computations from the lagrangian to physical quantities such that amplitudes or cross-sections. This framework can fully simplify, automatically and symbolically, physical quantities in a very large variety of models. CSL-HEP can also compute Wilson coefficients for arbitrary operators in an effective theory. This will considerably facilitate the study of BSM models in flavor physics.

CSL-HEP aims to give a unique, free, open-source, powerful and user-friendly tool for high-energy physicists studying predictive BSM models, in effective or full theories, up to the 1-loop order. With a few lines of code and in very little time (less than a second to a few seconds for one process) one can gather final expressions that may be evaluated numerically for statistical analysis. Features like automatic generation and manual edition of Feynman diagrams, exhaustive and comprehensive manual and documentation, clear and easy to handle user interface, will make the life of users easier.

I read the instructions

Secondary track (number)

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