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Automatic calculation of one-loop amplitudes

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In order to deal with the data from the experiments at LHC for the study of elementary particles, signals and potential backgrounds for new physics have to be under control at sufficient accuracy. In particular, hard processes with high multiplicities, involving many particles or partons, cannot be neglected. On top of that, such processes have to be dealt with at the next-to-leading order (NLO) level to, for example, reduce the scale dependence of observables and to have a better description of the shape of their distributions. Several fully automatized programs exist to perform leading order calculations for any hard scattering process. At NLO, several calculations exist for multiplicities up to 7 external particles, but no automatic tools to achieve this for arbitrary processes. The calculation of one-loop amplitudes, necessary in any NLO calculation, is a major bottleneck. An algorithm is presented, to automatically compute any one-loop amplitude, for all momentum, color and helicity configurations of the external particles.

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